DATAMATION 83®

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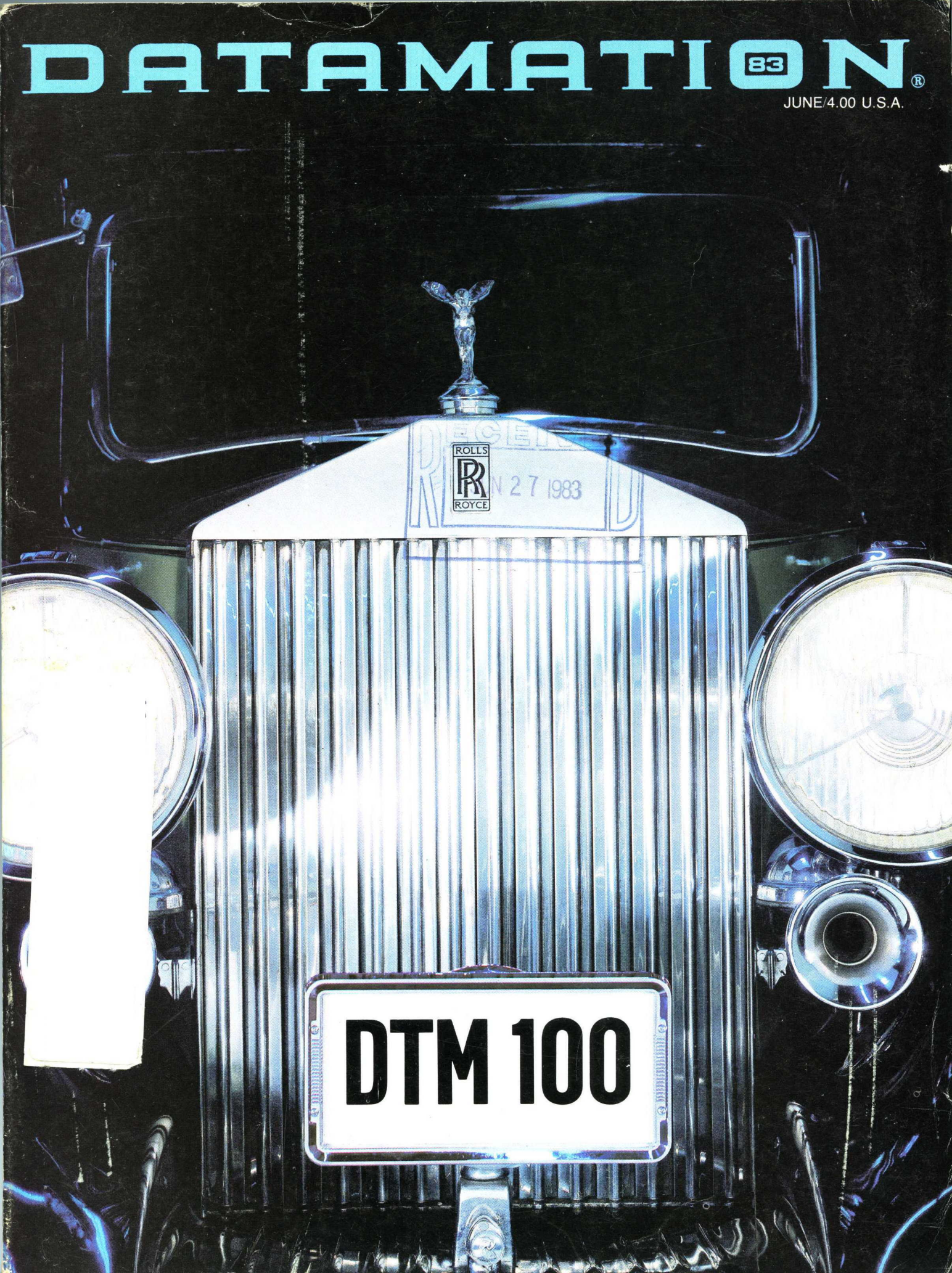

You've concluded that you need the performance and capacity that only an 8 inch Winchester drive can provide. Which one should you buy?
There are 109 different models available.
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28 of these 109 perform an average seek in 30 milliseconds or less.
And of this 109, only 17 offer true SMD compatibility.
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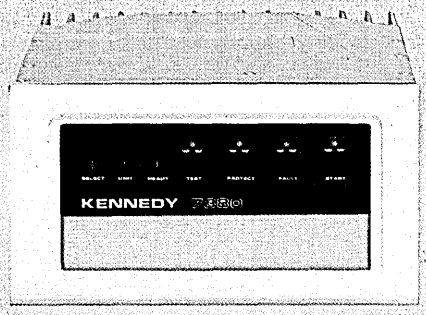

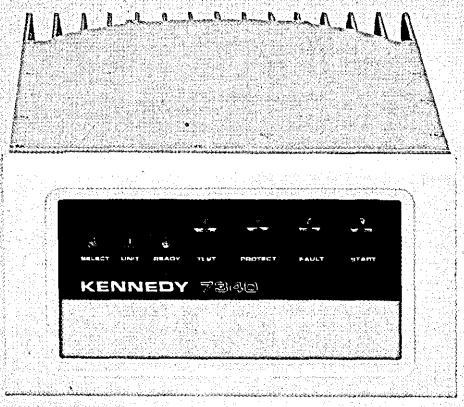

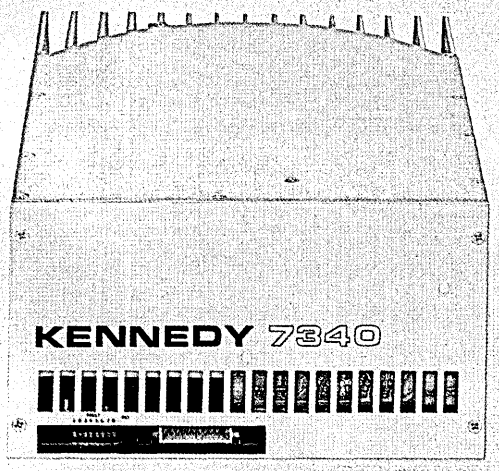

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- Q100: $2,560/$3,195

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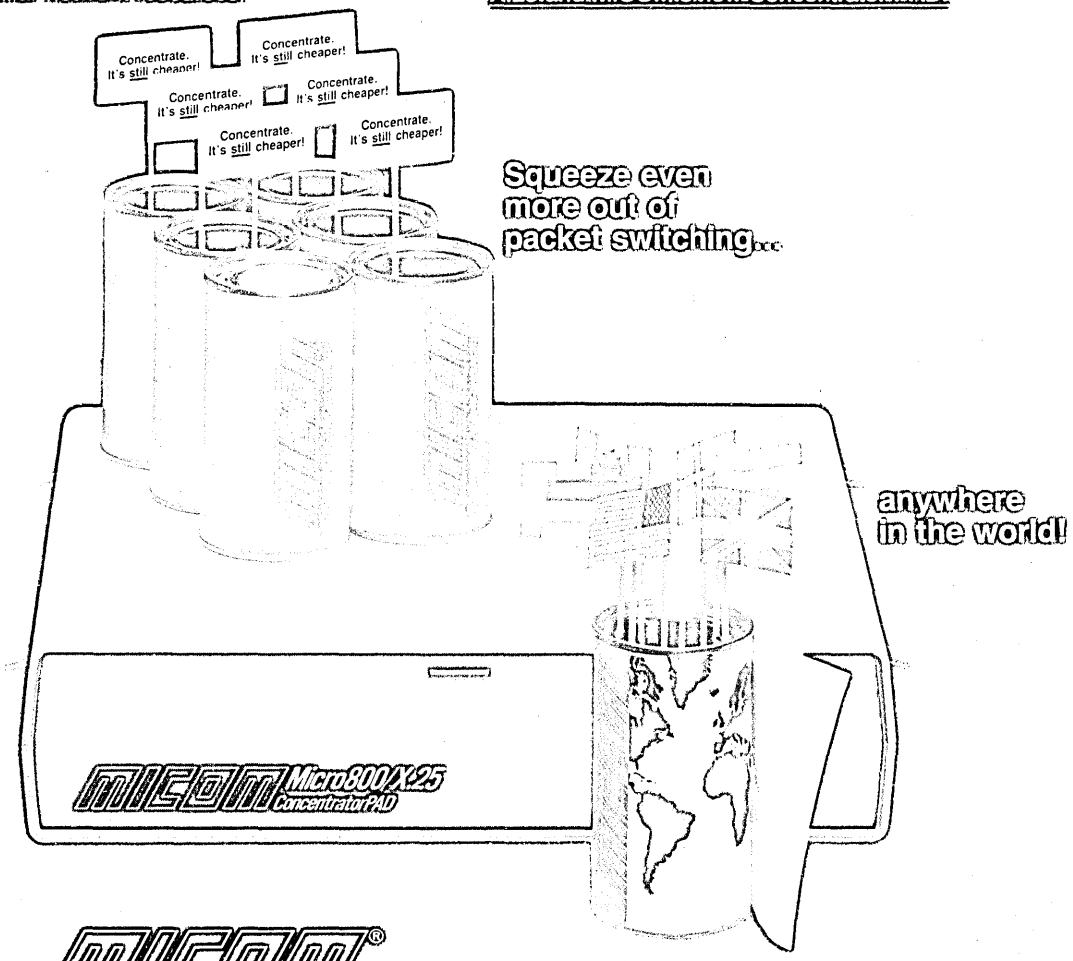

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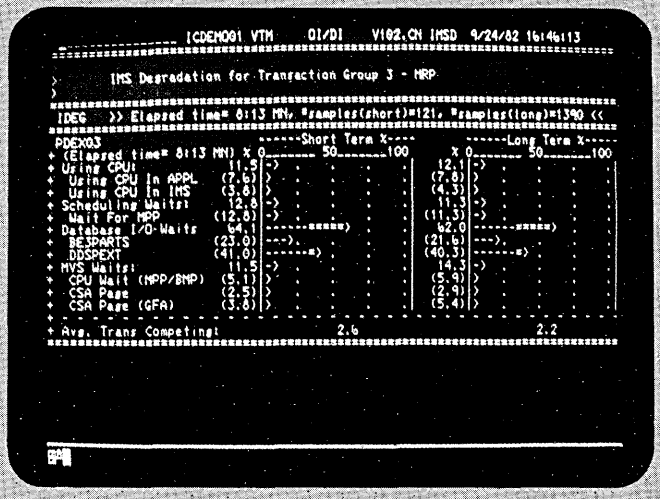
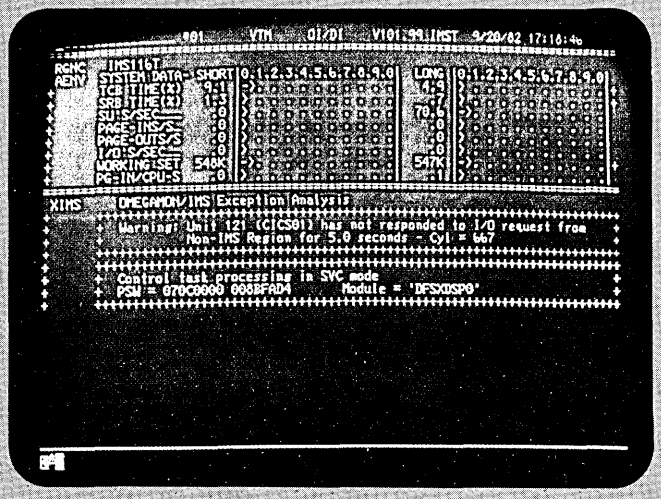
CIRCLE 4 ON READER CARD

!Candle™ announces

Two Exciting Windows into IMS Performance Problems

Today, thousands of computer systems all over the world are having their MVS and CICS performance diagnosed every few seconds by Candle's software monitors. Now Candle's innovative technology can illuminate performance and availability problems in IMS.

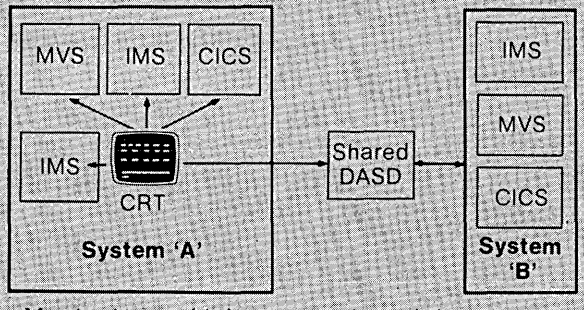




DEXAN™/IMS enables IMS specialists to quickly and easily zero in on why IMS transactions are running slowly. This ease of use is achieved through a diagnostic technique that Candle presented for MVS and CICS called degradation analysis. In the above example, transactions wait 64% on DB I/O (BE3PARTS=23%, DDSPEXT=41%).

OMEGAMON®/IMS will alert operators of problems in IMS by color messages and audible alarms. Comprehensive views into IMS performance and activity (400 commands) are provided for systems programmers. Dynamic screen formatting, tutorials, action commands and PFK support enhance the power of OMEGAMON/IMS for all users.

Integrated Multisystem Monitoring



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A-189

CIRCLE 5 ON READER CARD

DATAMATION®

JUNE 1983/$4.00 U.S.A.
VOLUME 29 NUMBER 6
This issue, 167,305 copies

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Pamela Archbold
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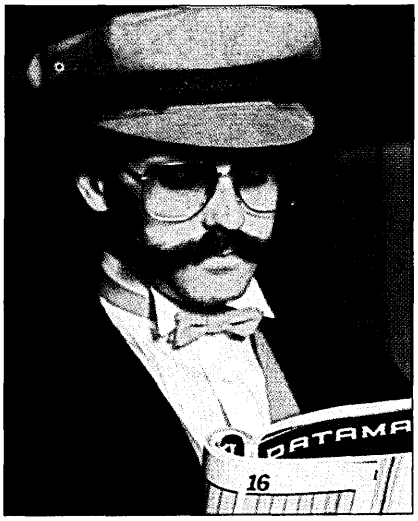

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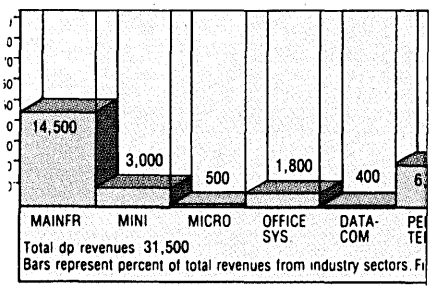

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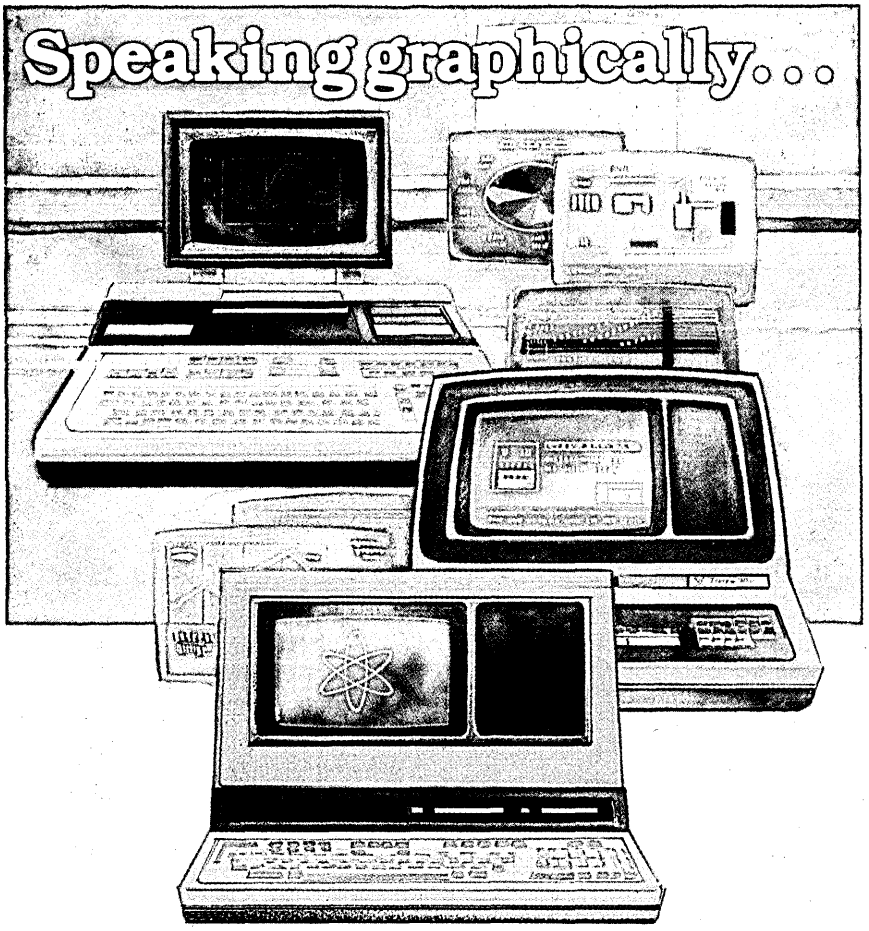
COVER PHOTOGRAPH BY STEVE COOPER



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EDITORIAL OFFICES
Headquarters: 875 Third Ave., New York, NY 10022. Phone (212) 605-9400; telex 429073. **New England:** 1 Chaucer St., RFD 2, Sandwich, MA 02563, (617) 888-6312. **Midwestern:** 3607 Garfield Ave. S., Minneapolis, MN 55409, (612) 827-4664. **Western:** 1801 S. La Cienega Blvd., Los Angeles, CA 90035, (213) 559-5111; 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **International:** 130 Jermyn St., London SW14UJ, England, (441) 839-3916, telex 914911; 13 Stanley Place, Budd Lake, NJ 07828, (212) 605-9400.

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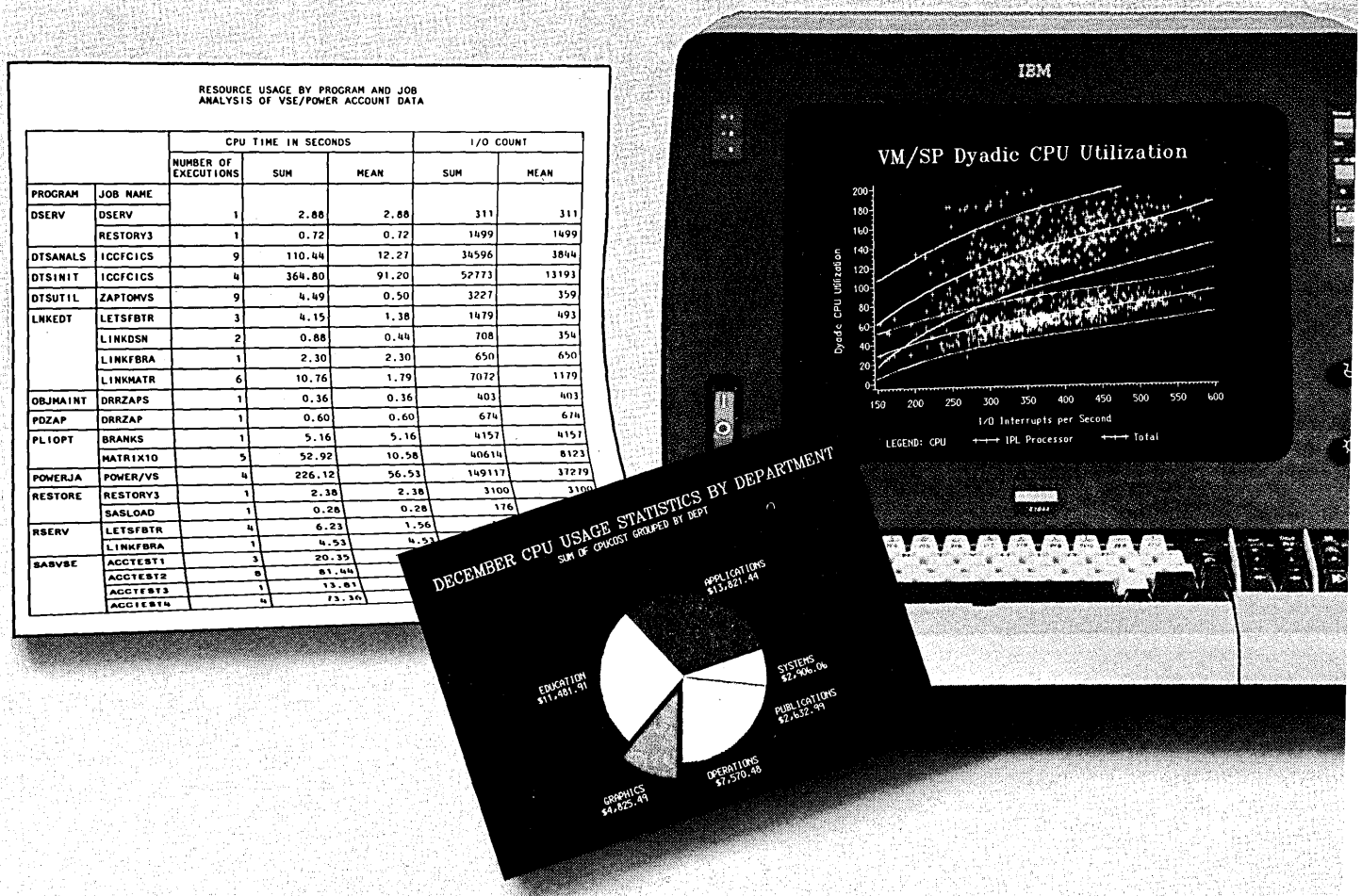

		CPU TIME IN SECONDS			I/O COUNT	
PROGRAM	JOB NAME	NUMBER OF EXECUTIONS	SUM	MEAN	SUM	MEAN
DSERV	DSERV	1	2.88	2.88	311	311
	RESTORY3	1	0.72	0.72	1499	1499
DTSANALS	ICCFCICS	9	110.44	12.27	34596	3844
DTSINIT	ICCFCICS	4	364.80	91.20	52773	13193
DTSUTIL	ZAPTOMVS	9	4.49	0.50	3227	359
LNKEDT	LETSFBTR	3	4.15	1.38	1479	493
	LINKDSN	2	0.88	0.44	708	354
	LINKFBRA	1	2.30	2.30	650	650
	LINKMATR	6	10.76	1.79	7072	1179
OBJMAINT	DRRZAPS	1	0.36	0.36	403	403
PDZAP	DRRZAP	1	0.60	0.60	674	674
PLIOPT	BRANKS	1	5.16	5.16	4157	4157
	MATRIX10	5	52.92	10.58	40614	8123
POWERJA	POWER/VS	4	226.12	56.53	149117	37279
RESTORE	RESTORY3	1	2.38	2.38	3100	3100
	SASLOAD	1	0.28	0.28	176	
RSERV	LETSFBTR	4	6.23	1.56		
	LINKFBRA	1	4.53	4.53		
SASVSE	ACCTEST1	3	20.35			
	ACCTEST2	8	81.44			
	ACCTEST3	1	13.81			
	ACCTEST4	4	73.34			

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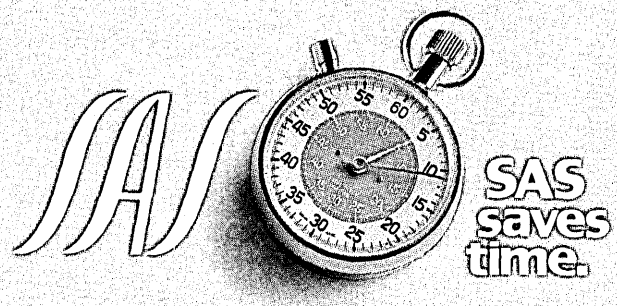

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CIRCLE 7 ON READER CARD

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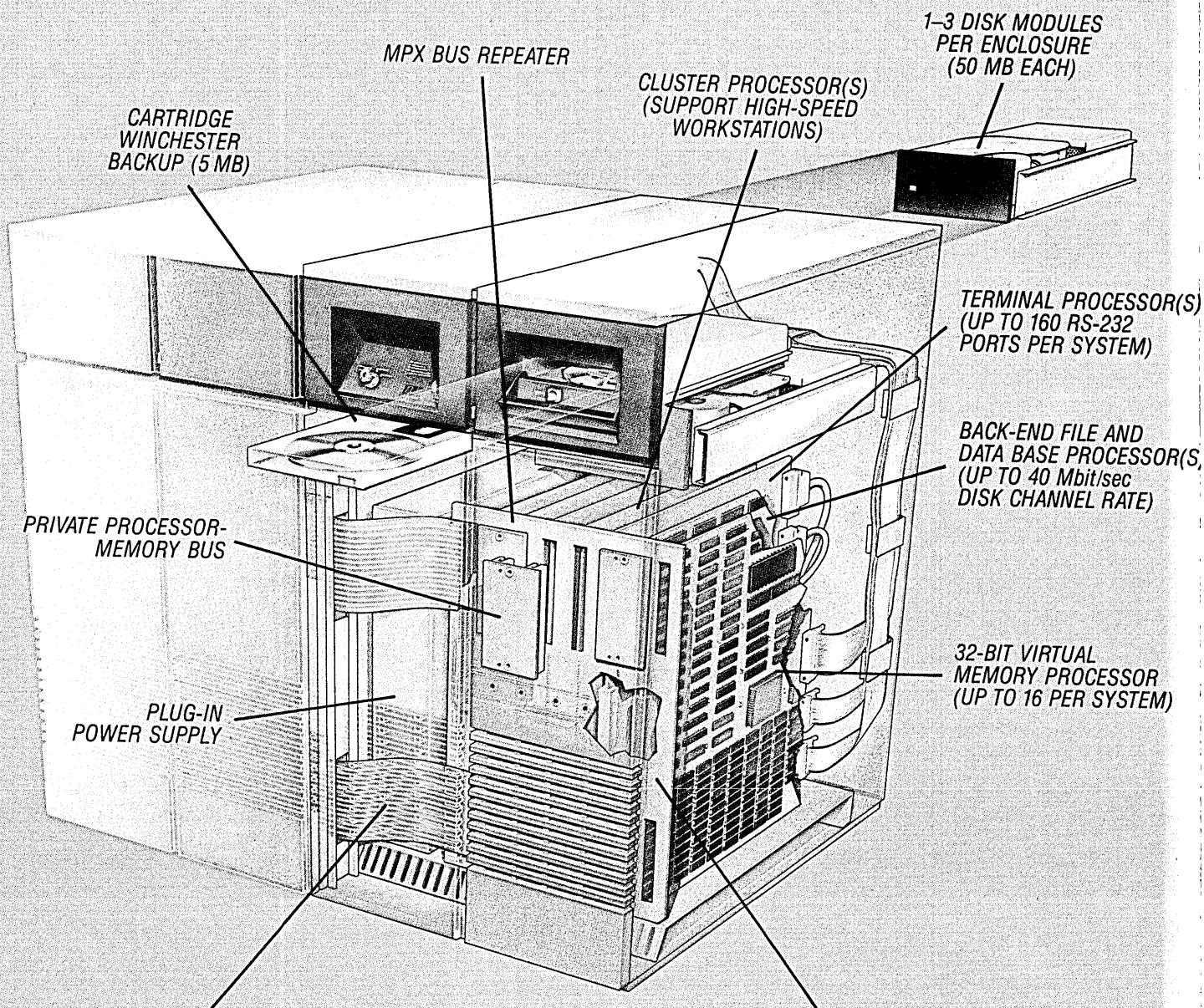

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☐ **Supports multiple operating systems (including UNIX) simultaneously sharing files and resources.**

☐ **Multiple specialized processors distribute the workload to achieve outstanding performance.**

☐ **Designed to support workstations and terminals to achieve a least-cost fit for any application.**

☐ **Low-cost processor modules provide incremental expansion from 8 to 128 users.**

Computer manufacturers and system builders face tough demands these days—demands that are just about impossible to meet with conventional hardware. So Convergent designed Megaframe: a highly unconventional new system. Its innovative archictectural features solve with one stroke the major problems of multiuser system design.

The Distributed Mainframe: Multiple processors, multiple operating systems.

Programs in a Megaframe system run on up to sixteen virtual-memory Application Processors—each with a 32-bit CPU, private RAM, and UNIX operating system kernel. But when a program needs to access a disk, communications line, or other system resource, the request is sent to one of the specialized high-performance service processors. So the application's I/O overhead is reduced to virtually zero.

But that's only the beginning. You can add separate processors to the Megaframe to simultaneously run completely different operating systems—like CTOS,™ which provides real-time multitasking and supports attached clusters of Convergent workstations.

The independent File Processors function as powerful back-end Data Base machines, providing relational DBMS, ISAM, and other disk-related services, with fully transparent file sharing by all operating systems.

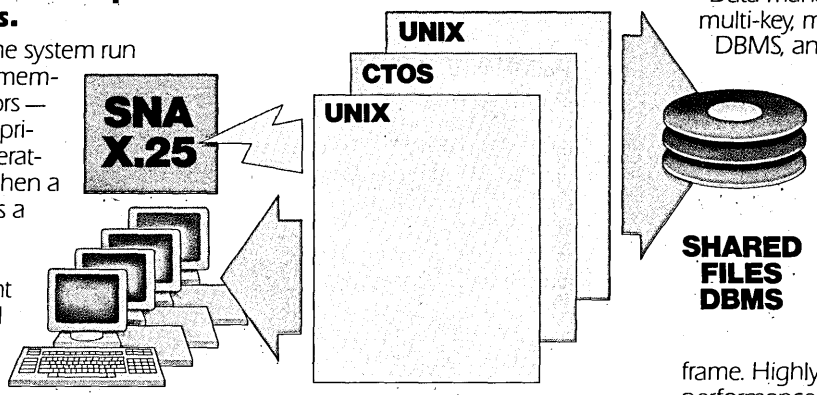
Megaframe's dedicated front-end Terminal Processors and Cluster Processors offload user communications from the Application Processors, ensuring fast, flexible response. They also manage access to facilities like SNA and X.25 networks, print queues, local-area networks, etc.

Configurable to exactly match application load profile

The various Megaframe processors can be installed in multiples, depending on the requirements of the specific application.

CPU-intensive jobs can utilize multiple Application Processors and expansion RAM. Systems with heavy disk usage can distribute this load among several File Processors. And the number of user ports can be expanded at any time by installing more Terminal Processors and/or Cluster Processors.

Modularity even extends to disk storage. Compact, 50-megabyte Winchester modules simply plug in—up to four per cabinet. High-capacity



SMD devices can be attached via a separate intelligent interface processor. File backup utilizes compact Winchester cartridges, ½" magnetic tape, or both.

Multiple cabinets daisy-chained for up to 8 MIPS and 128 users

A minimum Megaframe system supports 16 users efficiently for about $20,000—quantity one. As needs grow, Megaframe grows—to a 128-user system, with up to 8 MIPS execution, 24 MB of error-correcting RAM, and 21 billion bytes of disk.

Megaframe software: ready-made solutions

Megaframe offers system builders an extremely wide range of choices in application development tools.

If the chosen configuration includes Cluster Processors, then any software running on an existing Convergent cluster can be supported unchanged.

Inclusion of one or more Application Processors allows running UNIX System V. All standard UNIX tools including C are included, along with COBOL, FORTRAN 77, a BASIC interpreter and compatible compiler, plus Pascal.

Communications options include 3270 and 2780/3780 emulation (both Bisync and SNA), X.25, and Convergent's media-independent network software.

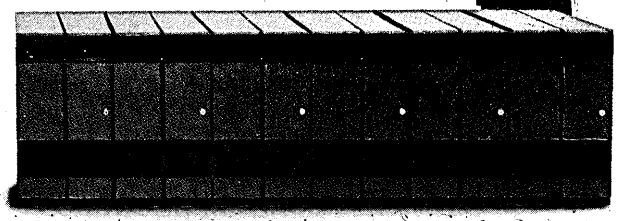
Data management facilities include multi-key, multi-user ISAM, relational DBMS, and a powerful ad hoc query language and report generator.

Megaframe: The solution with staying power

No system has ever combined the power, flexibility, and expandability of the Megaframe. Highly cost-effective at any performance level from "supermicro" up, with a per-user cost that will embarrass DEC, DG, and H-P, Megaframe is the ideal solution when needs are unpredictable or subject to rapid change.

Megaframe represents a true turning point in computer system evolution. The direction for the future is clear. Join us...don't be left behind.

For more information about the new Convergent Megaframe call (800) 538-7560 (in California (408) 980-0850), or write:
Convergent Technologies
Dept. D683
3055 Patrick Henry Drive
Santa Clara, CA 95050



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CIRCLE 8 ON READER CARD

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CIRCLE 9 ON READER CARD

LOOKING BACK

AD-LIB

June 1963: Tired of beating around the bush, RemRand launched a highly aggressive advertising campaign upon its number one rival, all but spelling out IBM's name. Describing the other company—"Univac's giant competitor"—as the most advertised, publicized, quoted, and promoted, the ad claimed only that Univac was "the most advanced." DATAMATION gave the following sample of the ad copy: "You can't help being impressed with the sheer magnitude of our giant competitor (if you're buying sheer magnitude)."

The article noted this was the boldest approach since Honeywell started the ball rolling with its "There's a little bit of chicken in all of us" campaign. Other companies were remaining low-key; GE was showing an oven assembly line in its ads, and IBM was refraining from advertising its products at all.

PALEVSKY'S PICASSO

Four months shy of celebrating its second birthday, Scientific Data Systems claimed it would be the third computer manufacturer to go into the black. The date for this achievement was given as the end of the month. Apparently, some presumably grateful company directors gave credence to the boast by presenting president Max Palevsky with a token of their appreciation. The gift? A genuine Picasso to hang in his otherwise prosaic office.

ENTERING SURFDOM?

June 1973: Barefoot girls in tattered shorts, serapes, and hats and men with Hawaiian shirts—or no shirts at all—busily engaged in a variety of activities, bobbing their heads to the beat of rock music from a distant speaker. Nope, not Woodstock. This was the Goleta, Calif., manufacturing facility of Information Magnetics Corp.

Michael Cashman, then DATAMATION's product editor, toured the facility and found that the manufacturer of magnetic disk drive heads, access arms, and motors (for such customers as Burroughs, Control Data, Honeywell, ICL, Mitsubishi, and Toshiba) had a few new ideas on improving the productivity of its employees.

Richard L. Teague, vp of manufacturing for the company, put it this way: "Make no mistake about it, this is no country club. We issue some pretty high standards and quotas for our people to meet. It's just that we don't care how they do it—so long as they do."

According to Paul Coleman, marketing manager of the company, the kids were doing okay; the field acceptance rate of 97% was better, he said, than any he'd seen here or abroad. He also thought that maybe the company's tape head division in England could stand to loosen up a bit. Cashman said that meant shelving such traditional management artifacts as time clocks, break and lunch schedules, rigid attendance requirements, and curtailed talking among employees.

Teague felt they were "luckier than most facilities," since most of the employees had higher than average education levels. Workers filled in their own time cards, took breaks whenever they wanted, and were, he believed, remarkably honest. The key was whether or not the work was getting out. If not, management gave pep talks, which didn't happen very often. Teague also noted that if they didn't think there was a definite advantage running the company that way, they wouldn't do it.

One of the advantages was that when a priority order came in and employees were asked to work a few extra hours, they would wind up staying so long that management would have to ask them to knock off and go home.

There were a few drawbacks to running a shop like that, Teague noted. Like when the sun was out and the surf was up, the kids liked to go to the beach. How did Teague feel about that? "We understand that—hell, we like the sun, too—and so we staff for it. By our giving in to things like this, however, we are blessed with a very low turnover in personnel."

—Lauren D'Attilo

COMPLETE™ Teleprocessing Monitor

Communication without aggravation.

The very word "teleprocessing" has the ring of urgency, a tool to provide quick response in a dynamic data processing environment. So why do most TP monitors available for IBM 4300 and 370 systems take up to 2 years to develop an application and several weeks to make even minor changes? One reason is that some systems don't support online interactive development. Some have such a complex operating system interface that only the most experienced system programmers can communicate with the system. And some force you to waste time and computer resources using separate development and production systems because they don't offer a comprehensive storage protection scheme.

COM-PLETE from Software AG is attuned to the real-world needs of teleprocessing users. Those applications that take as long as 10 to 20 months to develop with other systems can be finished in 1 to 2 months with COM-PLETE. Highly specialized programmers aren't required because COM-PLETE is user friendly and operating system independent. Also, built-in storage protection means you can handle development and production on the same system.

If you're getting nowhere fast with a conventional TP monitor, or are evaluating alternatives for a new 4300, consider the COM-PLETE alternative from Software AG.

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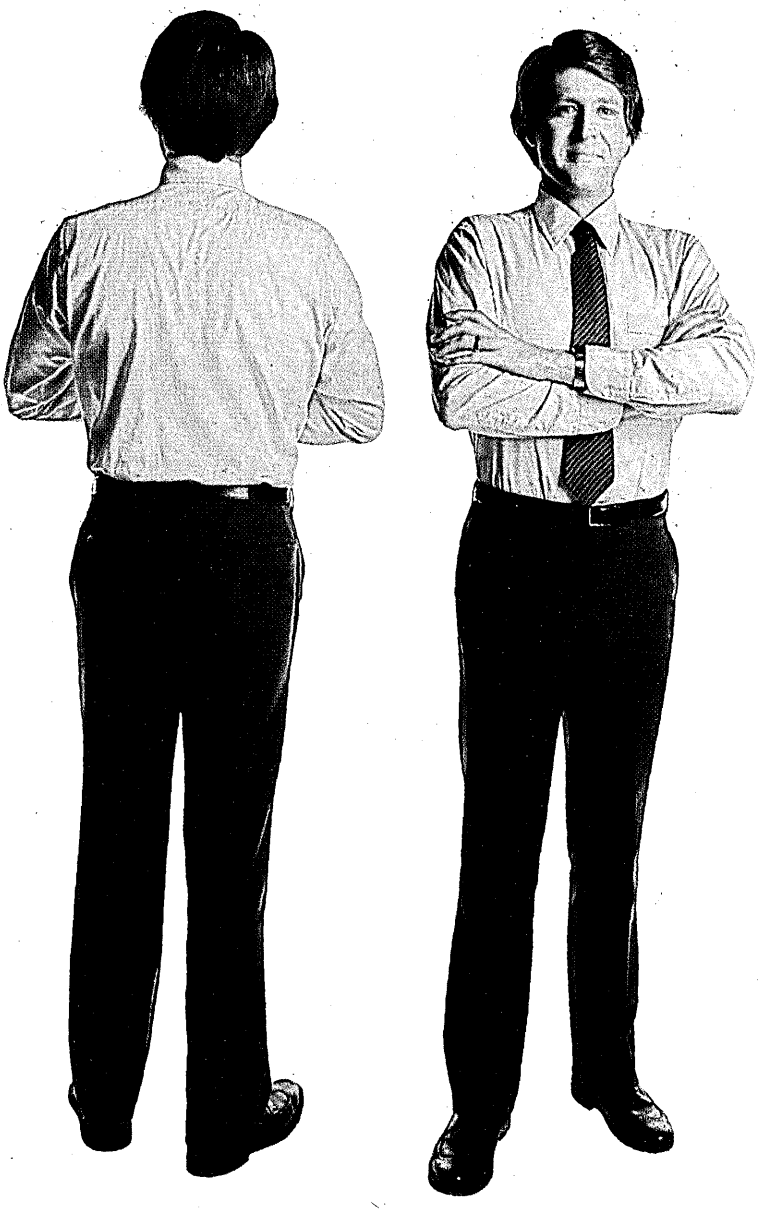

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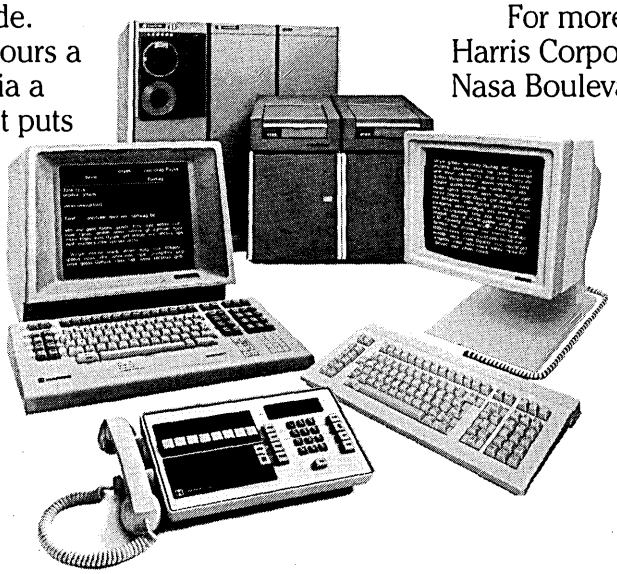

Harris thinks ahead.

CIRCLE 11 ON READER CARD

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CIRCLE 12 ON READER CARD

LOOK AHEAD

SCREENED OUT	Honeywell has just lost the chance to showcase its videotex technology at J.C. Penney, which recently bought into the promising market through the acquisition of a pilot project from First Bank System of Minneapolis. The project was developed using Honeywell DPS 6 minis, but Penney is going to convert the videotex software to run on IBM's Series/1. Penney is piggybacking many information-based services on a nationwide network that, using IBM's SNA, connects some 1,700 department stores. In addition to videotex, Penney will offer credit authorization services for third parties such as oil companies.
CAMPUS OF THE FUTURE?	Apollo Computer, Xerox, IBM, and Apple Computer are understood to be leading contenders for a massive contract for personal computers to be installed at Brown University. Already a leader in the development of campus-wide networks, Brown plans to automate libraries, courseware, and certain classroom activities in both liberal arts and the sciences. The Providence, R.I., school may spend as much as $50 million on educational computing over the next decade.
SECOND THOUGHTS	Sytek, the Sunnyvale, Calif., local networking company, came close to pulling the plug on its delayed Sunflower project. Originally due out this month, Sunflower enables 3270-type devices to communicate with non-IBM devices over the Sytek broadband network. The product "has some performance flaws," a company source says, and "decisions had to be made whether to spend resources to fix the product or develop one of 26 others." Now that Sunflower has been deemed worthy, it has been delayed while Sytek adds some new features to make it more competitive with similar schemes introduced by Datastream Communications, Santa Clara, Calif., and Lee Data, Minneapolis.
EASY READER	A Woburn, Mass., startup this month will introduce a universal graphics front end for existing applications programs. Interactive Images Inc.'s Easel system presents the end user with a series of graphical menus that are tailored for specific applications such as database inquiry systems on mainframes, executive workstations, and customer self-service terminals. The user interacts with menus through a touch-sensitive screen, mouse, or track ball, according to president and founder Leonard I. Hafetz. Easel will first be offered

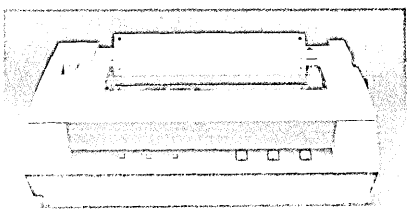
LOOK AHEAD

	as a $19,900 development system, followed by a run-time implementation for the IBM P.C. Customers already using the machine are said to include Chemical Bank and Bank of New England.
CRAY CHOOSES UNIX	You'd think an exotic, liquid-cooled supercomputer would use an equally exotic operating system. That's not the case for Cray Research's Cray-2 machine scheduled for delivery next year. Cray has apparently chosen AT&T's Unix system, pending agreements to be hammered out between the two firms. That choice may mean significant conversion problems for current Cray-1 users. Meanwhile, arch-rival Control Data is understood to be evaluating Unix for its 800 series and its Cyber 205, but has made no commitments yet.
PARC MAKES NOISE	Xerox Corp.'s release of Smalltalk-80, an exploratory programming system developed at the firm's Palo Alto, Calif., research facility, will please a host of users and systems designers who have been clamoring to use the advanced software for years. Xerox, for its own reasons, has kept the system to itself, using its principles in the development of the Star workstation. Meanwhile, those same concepts were put to use by Apple in its Lisa workstation. A failed attempt to bring a nonauthorized Smalltalk -- Rosetta -- to market occurred several years ago. Observers say the Rosetta team did not have powerful enough hardware to make its implementation of the language work. Xerox now says it has run Smalltalk-80 on a 68000-based microcomputer and expects it to be a popular choice of future hardware by others.
MICRO TO MAINFRAME	Linking micros to mainframes is the name of the game these days. Applications Software Inc. has quietly shown selected customers a PC connection for its ASI-Inquiry, an IMS query language. The firm claims the system offers language compatibility between both machines and runs in real time on the mainframe instead of in batch mode.
RUMORS AND RAW RANDOM DATA	We hear that Control Data has been pitching Xerox's 9700 electronic printer to selected customers....Look for Time Inc., through its Home Box Office (HBO) cable tv operation, to come out with a voice/data communications offering....AT&T is understood to be putting some 1,000 of its "data communications specialists" through two years of technical and marketing training....Insiders say Wang Labs so far has 28 Wangnet installations worldwide, but the firm apparently has not worked out the bugs in the areas of IBM compatibility.

[illegible] Writer, on [illegible] designed from [illegible] to run at full [illegible] without break [illegible]

quality throughout its 100 million-plus character life.

The 8510 also offers advanced paper handling features. You get bi-directional tractor and friction feed capability to handle paper widths from 4.5" to 10." Positive paper positioning for rapid bi-directional paper motion without short repetitive motions. Manual form alignment—even with power on. And a print line that can be easily



observed during printing.

Other features include built-in graphics with excellent resolution (144 x 160 dots per square inch). Five unique alphabets, eight character sizes. Mixed fonts during a single line pass bi-directionally. Variable form length, 6-channel electronic vertical formatting. The list goes on and on.

It's no wonder that so many major OEMs have selected the 8510 Pro/Writer design as their standard printer.

They know that in the real world, only the fittest survive.

For full details, contact C. Itoh Electronics, Inc., [illegible]

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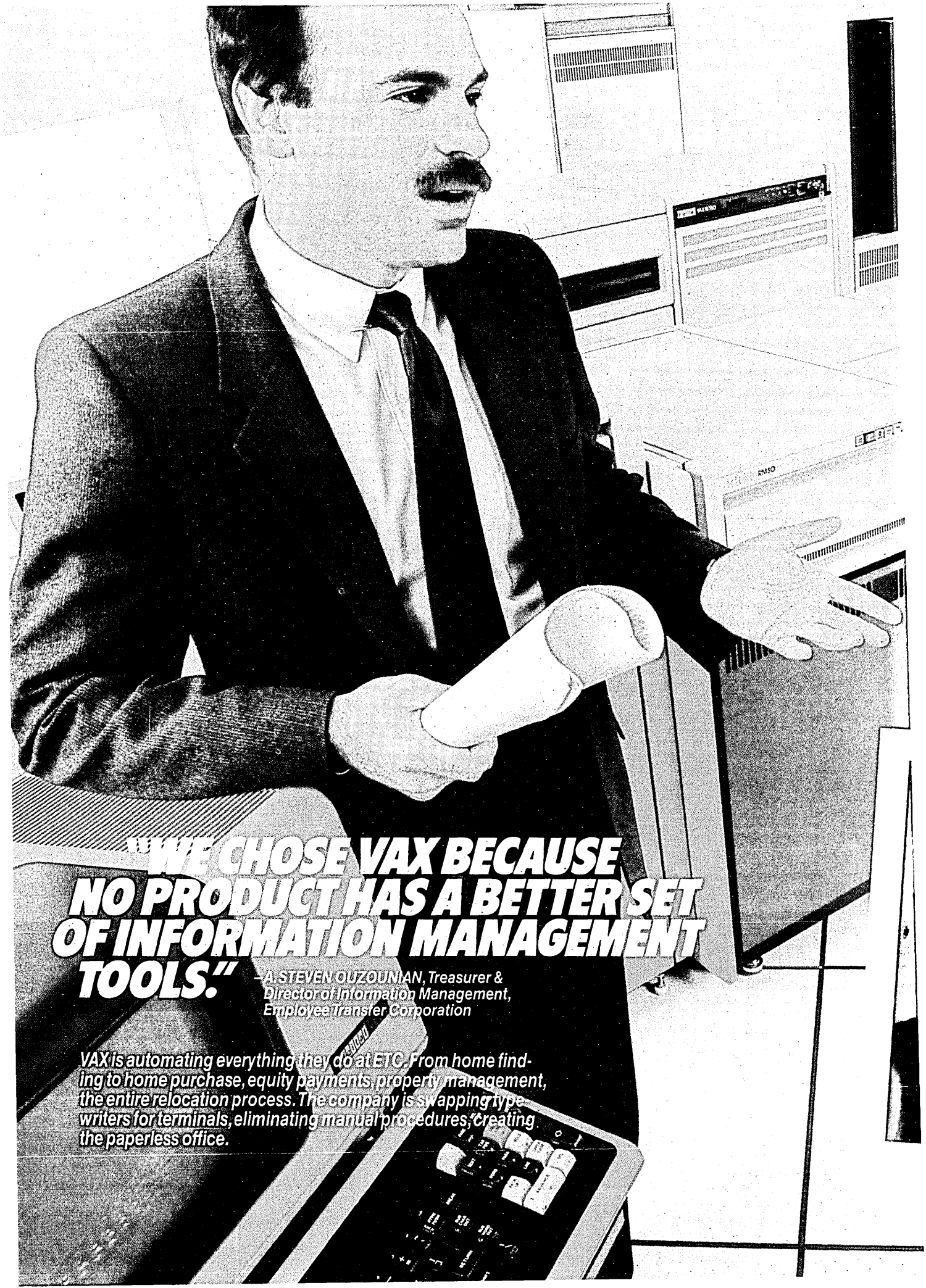

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VAX

At Employee Transfer Corporation they're installing what Steve Ouzounian calls, "the best system in the relocation business for collecting and distributing information.

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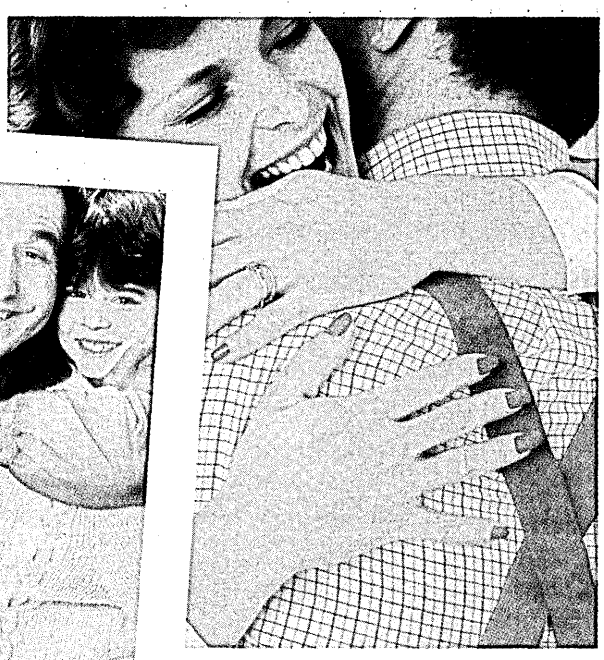
The network is designed to put up-to-date information into the hands of ETC's counselors in five seconds or less anywhere in the country.

"Responsiveness is the key," Steve explains. "Our people can now make the transferee confident about every decision he or she has to make. With VAX™ systems we've got the answer, or the way to find out.

"We shopped hard," Steve recalls, "and VAX Information Architecture clearly had the best integrated, easiest-to-use tools. We're using them all. DBMS, DATATRIEVE™ reporting, FMS forms management, plus ALL-IN-1,™ Digital's new office information package. VAX has catapulted us into the Information Age.

"With Digital's help, we've got VAX systems operating in a mainframe environment. They've met our demanding phase-in schedule, and helped to design a system that expands with our business. Quite simply, they've made us more competitive for years to come."



Meanwhile, it's getting harder and harder at ETC to find a typewriter, or a pencil. Or a question that can't be answered.

Ask us about VAX. Call toll-free: 1-800-DIGITAL, extension 200. Or write: Digital Equipment Corporation, 200 Baker Avenue, Attention: Media Response Manager, CF01/M94, West Concord, MA 01742.

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CALENDAR

JUNE

International Robot Conference & Exhibition (INTEROBOT '83).
June 14-16, Long Beach, Calif., contact: Tower Conference Management Co., 143 N. Hale St., Wheaton, IL 60187, (312) 668-8100.

11th Annual EDP Auditors Association International Conference.
June 19-22, Los Angeles, Calif., contact: EDP Auditors Association, 373 South Schmale Rd., Carol Stream, IL 60187, (312) 682-1200.

Computech '83.
June 21-26, Taipei, Taiwan, Contact: Philip Snare, American Institute in Taiwan, 11310 Palisade Ct., Kensington, MD 20895, (301) 652-6406.

1983 American Control Conference.
June 22-24, San Francisco, Calif., contact: Dr. Harish S. Rao, Systems Control, Inc., 1801 Page Mill Rd., Palo Alto, CA 94303, (415) 494-1165.

National Computer Graphics Association '83.
June 26-30, Chicago, Ill., contact Nancy Lefebvre, NCGA, 8401 Arlington Blvd., Fairfax, VA 22031, (703) 698-9600.

Videotex '83.
June 27-29, New York, N.Y., contact Online Conferences, Ltd., Argyle House, Northwood Hills, Middlesex HA6 1TS, England, 44 9274 28211, telex: 923498.

20th Design Automation Conference.
June 27-29, Miami Beach, Fla., contact: Paul Losleben, DARPA/IPTO, 1400 Wilson Blvd., Arlington, VA 22209, (202) 694-5037.

JULY

10th Annual Conference on Computer Graphics and Interactive Techniques (SIGGRAPH '83).
July 25-29, Detroit, Mich., contact: ACM/Siggraph, 111 E. Wacker Dr., Chicago, IL 60601, (312) 644-6610.

AUGUST

1983 International Computer Engineering Conference & Exhibit.
Aug. 7-11, Chicago, Ill., contact: The American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017, (212) 705-7740.

National Conference on Artificial Intelligence (AAAI-83).
Aug. 22-26, Washington, D.C., contact: Claudia Mazzetti, AAAI, 445 Burgess Dr., Menlo Park, CA 94025, (415) 328-3123.

IBM PC Faire.
Aug. 26-28, San Francisco, Calif., contact: Jim Warren, Computer Faire, 345 Swett Rd., Woodside, CA 94062-9990, (415) 851-7077.

Eurographics '83.
Aug. 31-Sept. 2, Zagreb, Yugoslavia, contact: ATLAS, Congress Dept., P.O.B. 17, YU-41001 Zagreb, Yugoslavia, telex: 22413 yu atlcon.

SEPTEMBER

Federal Computer Conference.
Sept. 13-15, Washington, D.C., contact: Federal Computer Conference, P.O. Box 368, Wayland, MA 01778, (617) 358-5301.

Word Processing & Office Environment Trade Show & Conference, (WPOE '83).
Sept. 13-15, San Jose, Calif., contact: Cartlidge & Associates Inc., 4030 Moorpark Ave., San Jose, CA 95117, (408) 554-6644.

Euromicro '83.
Sept. 14-16, Madrid, Spain, contact: Euromicro, TH Twente, P.O. Box 217, Dept. INF, room A312, 7500 AE Enschede, the Netherlands, telex: 44200 Thes.

IFIP Ninth World Computer Congress.
Sept. 18-23, Paris, France, contact: AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3600.

Sixth International Conference on Digital Satellite Communications.
Sept. 19-23, Phoenix, Ariz., contact: Conference Administrator, c/o COMSAT, 950 L'Enfant Plaza S.W., Washington, DC 20024, (202) 863-6248.

COMPCON Fall '83.
Sept. 26-30, Arlington, Va., contact: IEEE, P.O. Box 639, Silver Spring, MD 20901, (301) 589-8142.

OCTOBER

Seventh International Fiber Optics and Communications Expo and Second International Expo on Local Area Networks (FOC/LAN '83).
Oct. 10-14, Atlantic City, N.J., contact: Information Gatekeepers Inc., 167 Corey Rd., Brookline, MA 02146, (617) 739-2022.

EduTech/East '83.
Oct. 13-15, Philadelphia, Pa., contact: Carol Houts, Judco Computer Expos, Inc., 2629 N. Scottsdale Rd., Scottsdale, AZ 85257, (800) 528-2355.

The National Software Show.
Oct. 19-21, San Francisco, Calif., contact: Raging Bear Productions, Inc., 21 Tamal Vista Dr., Corte Madera, CA 94925, (415) 924-1194.

ACM '83.
Oct. 24-26, New York, N.Y., contact: the Association for Computing Machinery, 11 W. 42 St., New York, NY 10036, (212) 869-7440.

What to look for in a word processing printer.

And what to look out for.

First of all, look for a daisywheel printer. Daisywheels produce crisp, sharp characters that readers can't tell from the finest office typewriter.

They're the best choice for printing letters, proposals, contracts and other important documents that call for a professional look.

We make the DP-55 and DP-35 daisywheels, which print at 55 and 35 characters per second (CPS).

Rule of thumb: Faster is better.

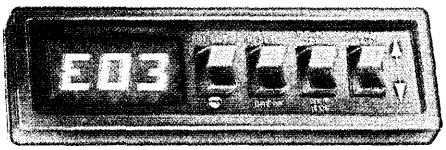
Our DP-55 will print a one-page letter in about a minute. A 12 CPS machine takes five.

You may be happy to wait five minutes for your letter. But remember, while the computer is tied up running the printer, it may not be available for other jobs.

Bad design can make a smart operator look dumb.

People with otherwise normal dexterity sometimes become all thumbs around a computer printer. The fault is usually the machine's.

Our DP-Series printers were designed with the operator in mind. A status display is standard on the DP-55. The printhead mechanism tilts a full 90° to make printwheel changes a snap.



Industry standard ribbons and plastic or metal printwheels are available from Dataproducts or local office supply stores. More than a hundred type styles are available, so you can match most any office typewriter.

A printer's no better than the technology behind it.

Some companies are pushing the limits of their technical knowhow and offer little more than souped up typewriters. Dataproducts has decades of experience in the design and manufacture of sophisticated, high-speed computer printers.

Our daisywheel printers are serious business machines, engineered to perform reliably for years and years. And to provide their users the greatest productivity at the lowest cost of ownership.

Depend on the world leader.

Virtually every major computer manufacturer buys printers from Dataproducts, then resells them with their name on them. For them, Dataproducts is synonymous with quality and reliability.

It's that reputation that made us the largest independent manufacturer of computer printers in the world.

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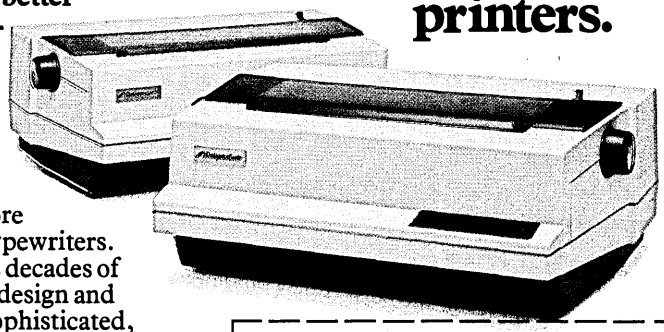

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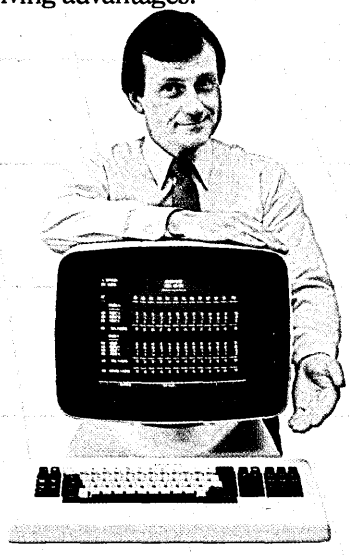
Finally, there's a single, universal way to satisfy the individual information processing needs of all your people. From sales manager to accountant. From research to production. The Lee Data Universal Terminal System can do it all.

And our system is modular by design to provide you any or all of these cost-effective, problem-solving advantages:



3270-compatibility plus more

Combine complete 3270 system-compatibility with an innovative Lee Data design and you have a System that delivers greater convenience and flexibility.

As an example, you can choose from a full line of terminal capabilities, beginning with our cost-effective 3178-compatible display on up to our popular All-In-One Display which offers, in a single unit, four selectable screen sizes —including 132-column—a great advantage in program development, spread sheet applications and many others where flexibility is required.

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For even easier reading, our Dynamic Color Assignment feature lets you change color fields at the work station or cluster level.

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Plus, when our color display replaces IBM monochrome, it looks even more cost-effective. You see, ITT Courier color is priced about the same as IBM monochrome.

So, looking at the big picture, an ITT Courier color display is not only easy to read, it's easy to buy. Or to lease.

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Our easy-reading color display is a member of the ITT Courier family of IBM-compatible products.

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CIRCLE 17 ON READER CARD

LETTERS

BRAZILIAN BLUNDER

Constantly fascinated at the diversity of knowledge one can acquire from Dun & Bradstreet publications—witness hitherto secret political development whereby after Falklands defeat, Argentina has now taken over Brazil and made Rio de Janeiro the new Argentinian capital (March, table of contents).

While we at Kensington Datacom found the article "Roundup in Rio" quite informative on data communications in Latin America, we were particularly delighted to find the political intelligence in respect to Rio's new capital city status so subtly placed in the table of contents on p. 3.

DATAMATION gets better with each issue.

ALLAN NEWMARK
Chairman
Kensington Datcom Ltd.
London, England

Shortly after the issue went to press, a counter-coup quietly overthrew the insurgent Argentine forces and returned lovely Brasília as the capital of Brazil. Stay tuned to DATAMATION for the best in political coverage. —Ed.

MORE THAN JUST THE THREE Rs

I applaud your March issue editorial (a liberal arts renaissance) except for two things:

1. "Consider . . . that our future ability to *compete* (my emphasis) in world markets . . .," you say. You express a sentiment that may be the death of us all. Is it so obvious that we must cooperate, in so many ways, in so many spheres of activity, that there is no need to mention cooperation? I believe not. Moreover, I also believe, if we are to survive, not just as a nation state, but as a species, we had better learn to hone our cooperating skills. What better place to do that than in our schools?

2. It was easy for me to infer from your editorial that the purpose of tertiary education is to prepare people to be employable consumers. That may not be what ought to be the purpose of education, but a veritable encyclopedia of quotations, including your own, could be compiled to support the use of the present indicative in the first sentence in this paragraph. I suggest to you that there is more to life than work, than gainful employment and the consumption of the material fruits of our labor. The rearing of young people, including the time they spend in the places we call schools, ought to prepare them for those other things.

ROBERT M. GORDON
Robert M. Gordon & Associates
Irvine, California

GRIM TAIL

Unless you are using the word "tail" in a rather obscure way (February, table of contents), I think you have a typographical error. I enjoy reading your magazine, but I thought this note might give you a chuckle.

DAVID L. SHAW
Director, Data Systems
American Bell
Morristown, New Jersey

We chuckled when we wrote it, thinking we could milk a few laughs from the cash cow's "tail." Were we udderly ridiculous? —Ed.

MANUFACTURERS RATE SURVEY

I applaud your effort to provide buyers of highly specific applications-oriented software with useful data on package performance gathered from current users. The survey results reported in your article "End Users Rate Applications Software" (March, p. 132), however, may be less useful than you intended. In doing market research to help the business community, great care must be taken to assure that the results reflect statistical integrity within a properly selected universe. Otherwise, the results could be misleading and political.

The grouping of packages into nine categories for "more meaningful averaging and comparison" has produced some potentially misleading comparisons. For example, in the insurance packages group, only two of the seven packages compete against one another. The other packages are such entirely dissimilar applications that you end up comparing apples to oranges to bananas. Since my company is in competition with one of the nine included in the insurance package group (ERISCO), I feel compelled to point out to buyers of claim processing software that there are over 15 other packages available to them that are not included in the survey, even though many of those companies have over $5 million in sales (the cutoff for being included in the survey). Neither my company nor our users were contacted. I am afraid that an incorrect conclusion will be drawn about a company and its package when it has not had to stand up against its competition.

While your intentions were admirable, the information you have made available may have less value than is immediately apparent.

THOMAS G. EADY
Vice President-National Director of Sales
Woodward Ryan Sharp and Davis
New York, New York

I read with great interest the article "End Users Rate Applications Software." We at the General Electric Co. were very disappointed to find that our product was not among those reviewed.

MIMS-MFG packaged application software is the *only* packaged manufacturing information system written in a fourth generation language (4GL). The MIMS system is the base upon which MIMS-MFG application software is built. The MIMS system consists of the 4GL MIMS and the MIMS database management system. The MIMS Request Language is a fourth generation application development language that can dramatically reduce the programming time required to accomplish a broad spectrum of data processing tasks. MIMS is a nonprocedural language, and most users report tenfold increases in productivity versus third generation languages. Some report much greater gains. These capabilities let MIMS users significantly reduce both maintenance costs and applications backlogs.

MICHAEL J. SCHOZER
General Electric Information Services Co.
Rockville, Maryland

4GLS 4U

I was very interested in reading "Language Barrier to Productivity" (February, p. 209). I'm glad these fourth generation languages are available. However, more information in a subsequent issue would be helpful—are the 4GLs user friendly enough so

LETTERS

that the average engineer, businessman, etc. could learn them in eight hours? Just what can they do, especially in files manipulation? What are the strong and weak points of each? Which personal computers can handle them? What do they cost? In short, how do we decide if they would be useful, which is best for a given need, and how do we get off and running with one?

From my viewpoint, a user-friendly files processing language is needed that will accept old or new categories of data, as many categories as I want, at any time, in any length, with footnotes. (This would probably require nonstructured files rather than the rigid matrices used at present.) And I think I should be able to sort or search or print data from such files with one-line commands. A really good language with such capability would be highly useful to many people.

P. F. BROWN
Oak Ridge, Tennessee

LOUIE LOUIE

What does DATAMATION have against Louis XIV? Last August one of your articles had him beheaded in place of his descendent Louis XVI, and now the February issue (In Focus) attributes Versailles, his glorious creation, to Louis IV. Louis IV (921-954) was one of the last Carolingian kings of France, and is only typographically related to Louis XIV.

CARLA MARCEAU
Product Management
NCR Corporation
Ithaca, New York

MORE POWER TO YOU

At long last a glimmer of light! Ever since some academic buzzworded the phrase "structured programming" about a decade ago, most software managers have implicitly embraced the philosophy that programmers are idiots who must be instructed explicitly how to dot their Is and cross their Ts, and cannot be trusted to show any creativity.

Admittedly, Beau Sheil's article, "Power Tools for Programmers" (February, p. 131), was limited in the scope of its application, but I suspect this was because it was the only way he could get the article published. Now that one sensible idea has unexpectedly infiltrated the entrenched position of college professors and managers who haven't written a program in 20 years, is it possible that we are finally emerging from the Dark Ages? I doubt it.

JOHN T. DWYER
Cherry Hill, New Jersey

I was delighted to read your article "Power Tools for Programmers" and the message it delivered against that much-vaunted entity "structured programming." However, I was disappointed to see the article develop into an exposition of highly academic specialty packages as necessities, when the essence of the approach is achievable with more mundane software. The essence is that high-quality automated systems must be founded on fundamentals, not superficialities, and must be attuned to the computer, not merely use it. At the University of Alberta Hospital, we do design in real-time COBOL, demonstrating the preferred design live rather than through paper specifications. With standard program skeletons, a repertoire of general purpose routines, and everyday software, this can be done in very few days. Sure, we have to reprogram at times—but, with on-line programming, that is no slower than respecifying and otherwise saves the duality of specify then program as well as really showing the design to the user.

Incidentally, while I find structured programming a methodology from the batch age that presents many execution problems in a virtual memory real-time system, I don't think it is antithetical to this argued approach. The salient facet is that the approach sees programming as the *design* function (and hence the specification) in contrast to program writing being merely a transcriptive coding process. Many of us have used it like that for years, just as we adopted compilable listings in place of flow-charts in the 1960s; but all these realizations take a long time to spread. Given that we do all our work on Tandem computers, it was then very sad to find in the pertinent article in your next issue ("Nonstop Transaction Processing," March) such expressions as "from the time design is frozen and coding begins." This could be etched into the millstone the industry wears. For 20 years, computers have done the coding.

D. FENNA
Professor, University of Alberta
Director, Information Systems Planning
University of Alberta Hospital
Edmonton, Alberta Canada

NICHE GLITCH

Reference is made to the article "New Niches for Switches" (March) by Harris, Sweeney, and Vonderohe. My daughter is an undergraduate resident student at the University of Chicago, presently at home during the spring break. I showed her the article, thinking she might find it of interest. She did. She just laughed and laughed and laughed.

Since the new system was put in at the university, "chaos" is the word for the telephones in the dormitory. Outgoing calls cannot be made; incoming calls can. When called, a number keeps ringing until disconnection is made. This could take hours, if the student be at the library, class, lunch, etc. (Nobody has measured how long it would go on if the student were on break—days, weeks?)

Not to fault the article. Theory is good—but practice?

NAME WITHHELD BY REQUEST
Potomac, Maryland

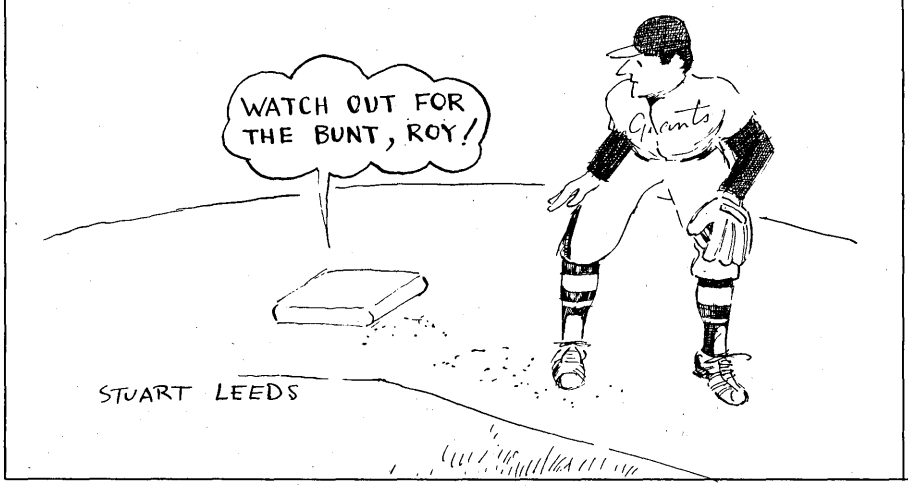
ALPHABET SOUP

I found the letter from Steve White of Arens Applied Electromagnetics (December) very interesting. It reminded me of the well-known integrated circuit manufacturer who requires the same special treatment for the letter of the alphabet that it has acquired as a mark for its line of microprocessors and supporting devices. To avoid any legal problems, I will not mention the letter itself, except to say that it is not included in the following set: (a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y).

BOB SCHUCHMAN
Development Engineering
DatagraphiX Inc.
San Diego, California

CORRECTION

The price of the Sorcim Corp. Superwriter text processing program was incorrectly listed in the February Software and Services section. The $295 program uses a command structure similar to the vendor's other programs, but it does not include a utility to allow CP/M products to share information with the program, as reported.



CARTOON BY STUART LEEDS

How to buy a computer by the numbers.

Introducing the Cromemco C-10 Personal Computer. Only $1785, including software, and you get more professional features and performance for the price than with any other personal computer on the market. We've got the numbers to prove it.

The C-10 starts with a high-resolution 12" CRT that displays 25 lines with a full 80 characters on each line. Inside is a high-speed Z-80A microprocessor and 64K bytes of on-board memory. Then there's a detached, easy-to-use keyboard and a 5¼" disk drive with an exceptionally large 390K capacity. That's the C-10, and you won't find another ready-to-use personal computer that offers you more.

But hardware can't work alone. That's why every C-10 includes software—word processing, financial spread sheet, investment planning and BASIC. Hard-working, CP/M[R]-based software that meets your everyday needs. Software that could cost over $1000 somewhere else. FREE with the C-10. There's really nothing else to buy.

But the C-10's numbers tell only part of the story. What they don't say is that Cromemco is already known for some of the most reliable business and scientific computers in the industry. And now for the first time, this technology is available in a personal computer.

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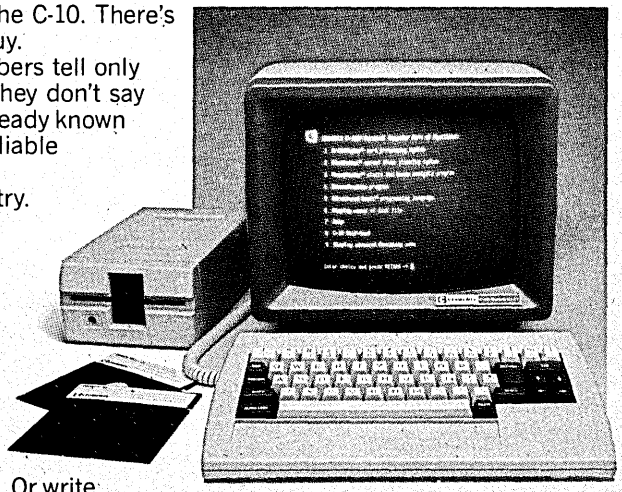

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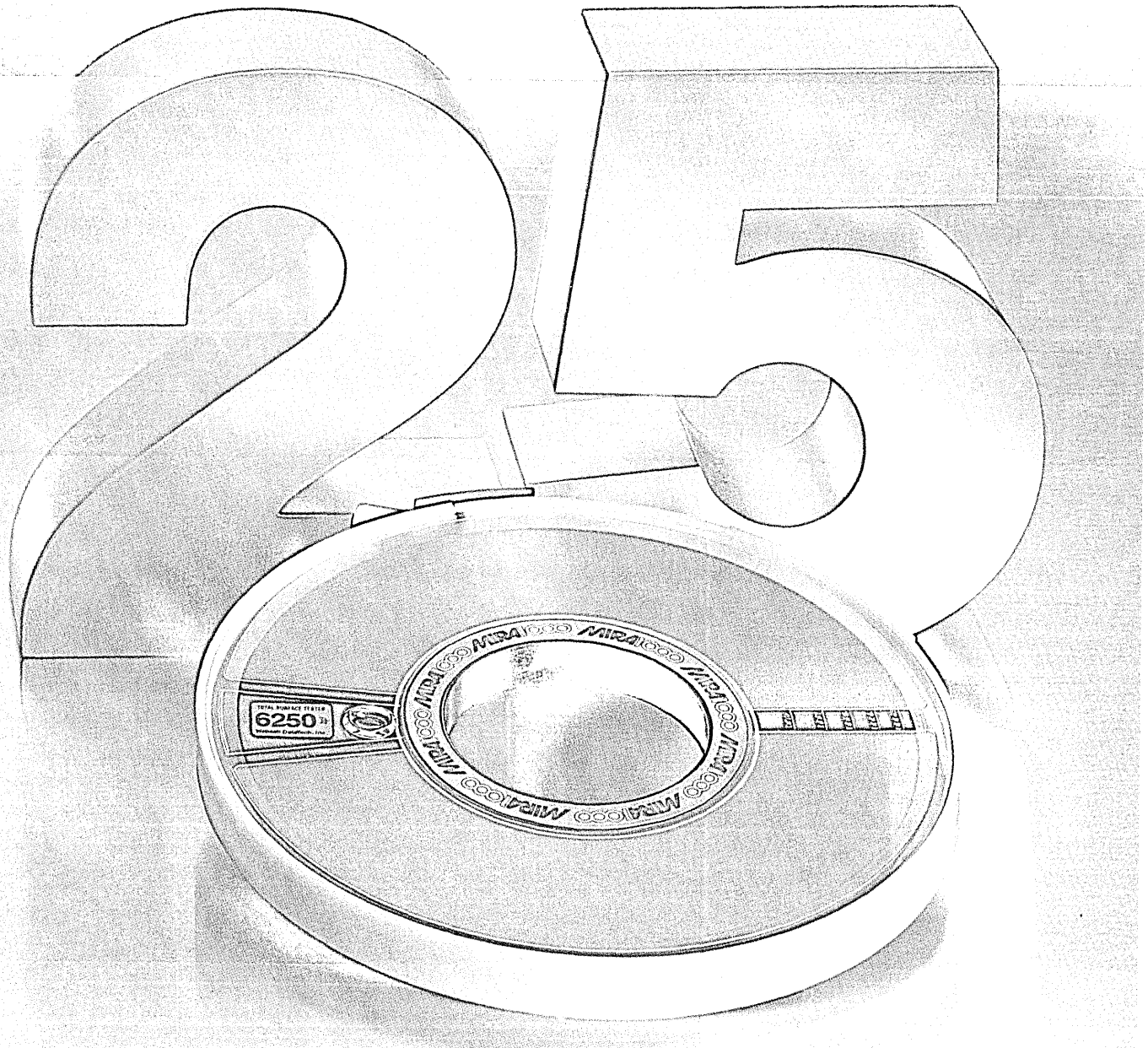
Now, Wabash DataTech Introduces MIRA 1000

Proven superior to any other tape for 6250 drives. Tests at a major university confirm it!

Chances are your 6250 drive isn't giving you maximum performance, but Wabash DataTech has the solution. MIRA-1000 is a miracle in magnetic media, backed by proof-positive from leading drive manufacturers, and confirmed by a major American university. In test after rigorous test, MIRA-1000 computer tape outclassed the competition in sharper signal output, increased reliability, and head life longevity up to 10 times longer than conventional tape.

MIRA-1000 is the ultra smooth, ultra-high performance tape engineered for maximum integrity on your 6250 drives. Our proprietary oxide formulation was proven to be inherently smoother, so MIRA-1000 is... quite simply... consistently the cleanest running tape ever produced. That means low abrasion, improved head life, and greater accuracy for your 6250 operations and at future higher recording densities as well.

Backed with our confident 25-Year Warranty, MIRA-1000 delivers the performance that other tapes only promise on today's high-speed, high-density equipment.



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History will record as a profound irony
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CIRCLE 20 ON READER CARD

John L. Kirkley, Editor

EDITORIAL

COMPUTERS AND THE LAW

Computer technology, which is affecting almost every sector of our society, is finding slow going penetrating the nation's law schools.

The situation is not nearly as bad as the erroneous and misleading "Careers" column in the April 20 *New York Times* would lead one to believe; there, two "legal experts" were quoted as saying that they knew of no computer law courses at leading law schools. In fact, there are (and have been for some time) computer law courses at many of the top schools, including Columbia University School of Law, Georgetown Law Center, and the George Washington University National Law Center.

Despite these educational efforts, there is a pressing need to increase the legal profession's "computer literacy," particularly at the undergraduate and graduate student level. Areas of potential study range from intellectual property considerations to societal impact, from law office management, administration, and legal research to computer technology, and even complex issues that arise from advances in artificial intelligence.

We hope, given the tendency of our society toward excessive litigation, that a humanitarian philosophy will underlie all university curricula dealing with computers and the law.

The rest of this column is devoted to a brief essay by Roberto P. Laurel, a lawyer from the Philippines, written for a graduate course on computers and the law taught by Milton Wessel at Columbia. We feel it should be required reading for every lawyer considering making information processing his or her specialty.

ILLUSTRATION BY DORIS ETTLINGER

"The world is rapidly changing. What used to be pure imagination a mere two decades ago is now reality. Man on the moon, satellites in space for simultaneous communication, transplants of artificial human organs, databanks, data processing, and robotics are just a few examples.

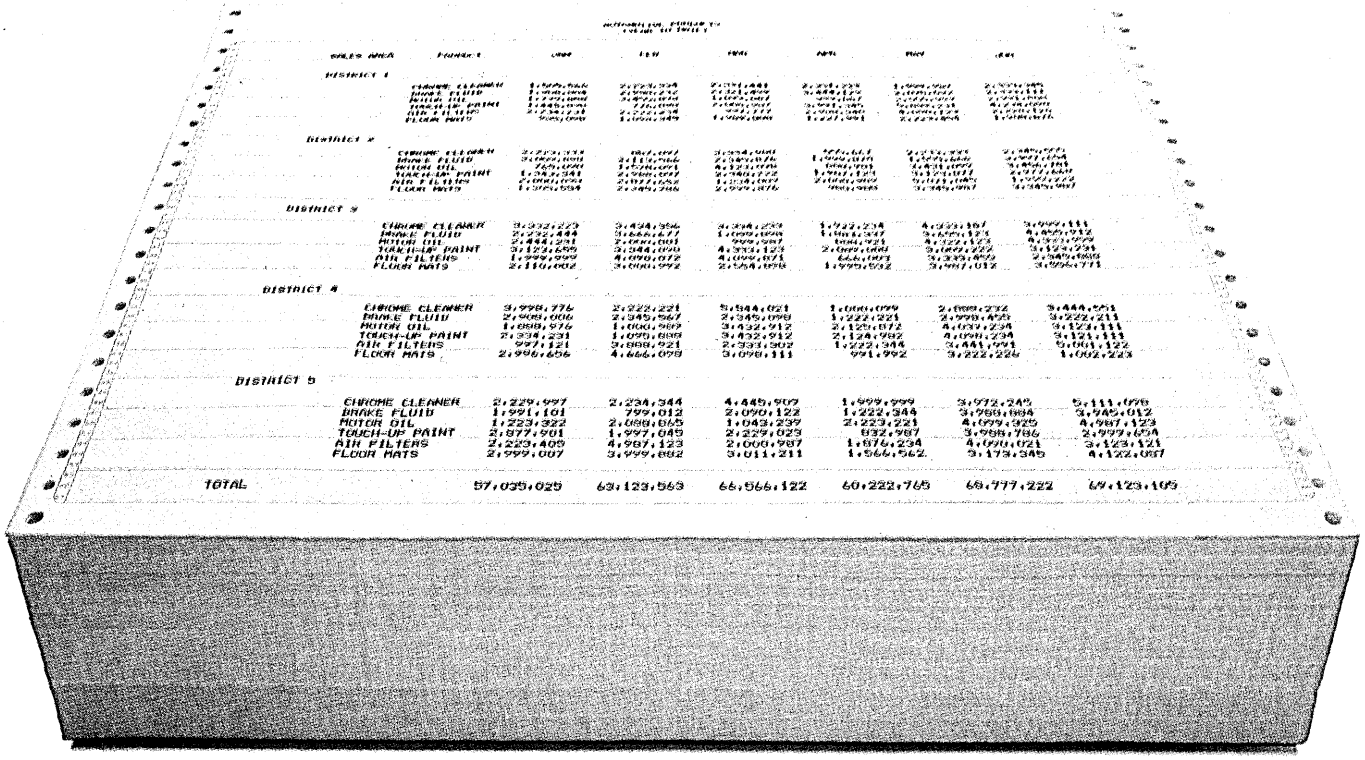
"In the face of this technological revolution, the question is raised: how is one who has been trained and molded in the law to react? The issues being raised are novel, while the principles of law fashioned over the course of centuries do not supply the ready answers. To judge technology *in vacuo* is not to judge it at all, for always it must be measured with society as a backdrop—whether it fulfills man's needs and assists in developing him to his full human potential.

"Precisely because the world has just entered the technological revolution, the impact of which is still being speculated, that interface between ends and means, between policy and implementation, is particularly wide and critical. Its ramifications cannot be ignored.

"It is the contention of this brief essay that lawyers no longer have a choice as to the role they will play out in their careers. The human resource is the most valuable of all resources. To confine oneself to litigation and the resolution of disputes would be a misallocation and an inefficient use of talent. Lawyers are, according to president Bok of Harvard, the 'best and the brightest.' Indeed, '[It] would be artificial as it would be wasteful . . . to believe that the lawyers should or could confine themselves to strictly legal issues.'

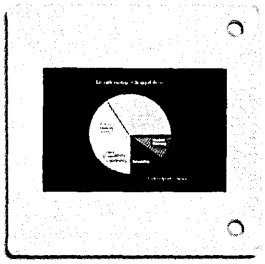
"This is the challenge that all lawyers face—to take up that responsibility that has been thrust upon them by the changing times—to take an active role in the decision-making process that seeks to shape a better future."*

Management will the D.P. department



SALES AREA	PRODUCT						
DISTRICT 1							
	CHROME CLEANER	1,505,366	2,253,334	2,721,448	2,241,253	1,999,292	2,333,111
	BRAKE FLUID	1,745,888	2,555,212	3,444,121	3,555,121	3,765,884	3,945,012
	MOTOR OIL	1,445,100	776,000	1,041,147	1,041,147	4,099,325	4,987,123
	TOUCH-UP PAINT	2,234,231	2,222,434	997,121	1,991,121	4,441,991	5,011,122
	AIR FILTERS	2,996,656	4,666,079	3,098,111	991,992	3,222,224	1,002,223
	FLOOR MATS	500,000	1,000,349	1,998,888	1,227,341	2,123,456	1,000,000
DISTRICT 2							
	CHROME CLEANER	2,250,111	997,007	3,334,000	999,111	2,333,221	2,987,221
	BRAKE FLUID	3,000,000	2,111,766	2,100,876	1,000,000	3,000,000	3,000,000
	MOTOR OIL	749,000	3,100,001	4,123,000	999,000	3,000,000	3,000,000
	TOUCH-UP PAINT	1,543,341	2,100,000	2,100,000	1,000,000	3,000,000	3,000,000
	AIR FILTERS	2,000,000	2,007,652	1,100,000	1,000,000	3,000,000	3,000,000
	FLOOR MATS	1,305,554	2,345,366	2,994,876	999,998	3,384,007	4,000,000
DISTRICT 3							
	CHROME CLEANER	3,332,223	3,434,356	2,334,233	1,222,234	4,333,107	3,999,111
	BRAKE FLUID	2,733,444	3,666,227	1,099,098	1,001,227	3,555,121	4,857,212
	MOTOR OIL	2,444,231	2,000,001	999,987	1,000,921	4,322,153	4,332,000
	TOUCH-UP PAINT	3,123,699	3,344,000	4,332,123	2,099,000	3,000,000	3,123,234
	AIR FILTERS	1,999,999	4,000,021	2,100,000	666,001	3,233,892	3,345,000
	FLOOR MATS	2,110,002	3,000,992	2,334,998	1,999,502	3,987,012	3,000,771
DISTRICT 4							
	CHROME CLEANER	3,998,776	2,222,221	5,944,021	1,000,099	2,099,232	3,444,551
	BRAKE FLUID	2,468,006	2,345,567	2,345,098	1,222,221	2,798,458	3,222,211
	MOTOR OIL	1,898,976	1,000,989	3,432,912	2,125,072	4,099,234	3,123,111
	TOUCH-UP PAINT	2,334,231	1,098,888	3,432,912	2,124,982	4,098,234	3,121,111
	AIR FILTERS	997,121	3,868,921	2,331,502	1,222,344	3,441,991	5,011,122
	FLOOR MATS	2,996,656	4,666,079	3,098,111	991,992	3,222,224	1,002,223
DISTRICT 5							
	CHROME CLEANER	2,229,997	2,234,344	4,445,902	1,999,999	3,972,245	5,111,098
	BRAKE FLUID	1,991,101	799,012	2,090,122	1,222,344	3,768,884	3,945,012
	MOTOR OIL	1,223,322	2,088,865	1,043,237	2,223,221	4,099,325	4,987,123
	TOUCH-UP PAINT	2,877,901	1,997,089	2,229,029	832,987	3,988,786	2,999,654
	AIR FILTERS	2,223,405	4,987,123	2,000,987	1,876,234	4,090,021	3,123,121
	FLOOR MATS	2,999,007	3,999,882	3,011,211	1,566,562	3,173,345	4,122,087
TOTAL		57,035,025	63,123,563	66,566,122	60,222,765	68,777,222	69,123,105

Before ISSCO



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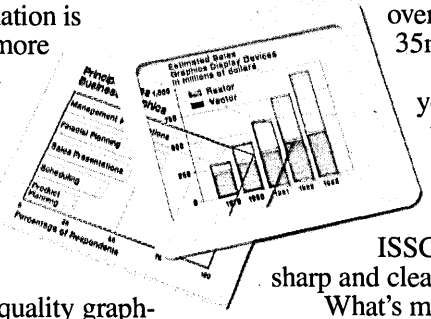

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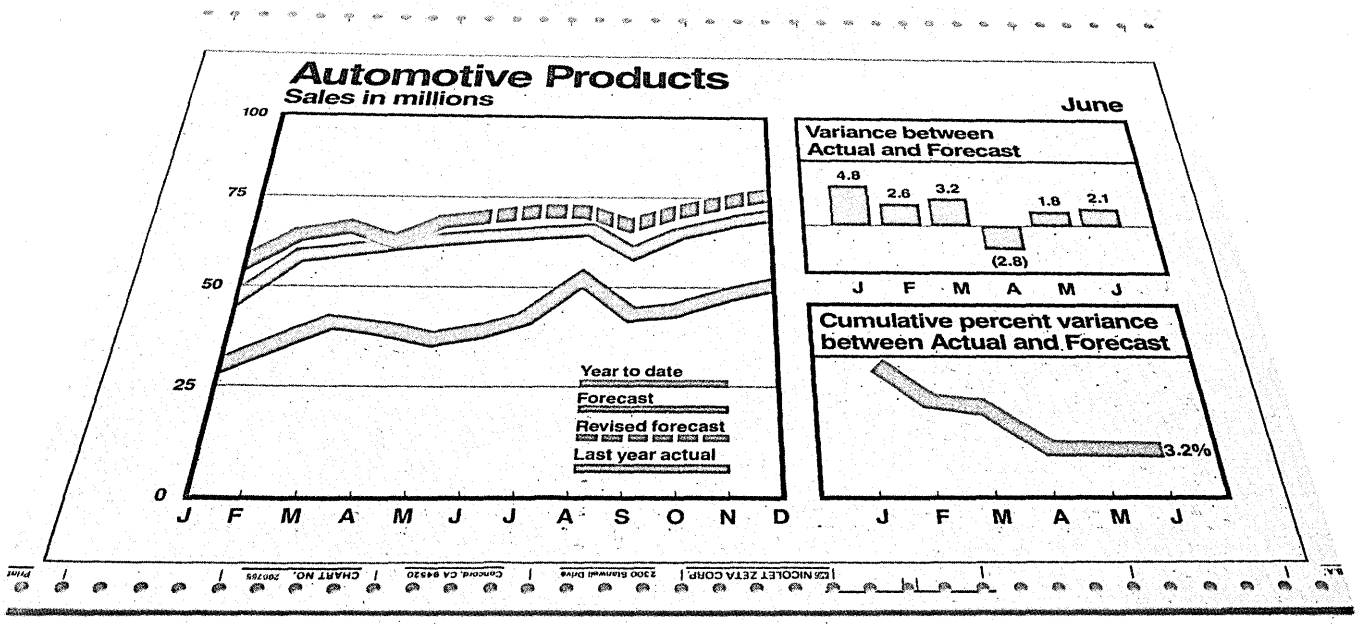

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graphics themselves. Since TELL-A-GRAF uses conversational English commands, almost anyone can learn how to work the system.

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CIRCLE 25 ON READER CARD

IN FOCUS

IS MARKET RESEARCH RATIONAL?

And are connections between consulting and investing services liable to get some firms in hot water?

by Ulric Weil

Among vendors, users, and investors in the information systems industry, the hunger for market and product information has never been greater. What accounts for this voracious appetite for data and projections, no matter how inaccurate, and interpretive analysis, no matter how tenuous?

First, there is the penchant for secrecy exhibited by vendors of information systems. Companies such as IBM, Digital Equipment, and Xerox compete fiercely with one another and are greatly concerned—as is the U.S. government—over the mounting Japanese challenge. Patents play only a limited role in this competition, and cross-licensing of technology takes place on a global scale. Secrecy is a vendor's chief weapon in protecting information such as share and growth rates in a particular market segment, target dates of new product releases, and price/performance and functional specifications of new products.

As the dominant company, style-setter, price leader, and firm most likely to have its products copied, IBM feels a particular need to keep secrets. Several recent actions (suits against Cybernet, Hitachi, and NRC-Comten) indicate how jealously IBM guards its proprietary information.

At the same time, everyone in the industry has an urgent need to obtain market and product information, especially information on IBM. Almost by definition, IBM-compatible vendors want to know as much as possible about the company's product plans, including architectural implementation, new product price/performance and functional characteristics, and forthcoming price changes on currently marketed equipment or services. Their survival may depend on timely access to such information.

Of course, what other vendors are planning is also of considerable interest. IBM conducts its own worldwide market intelligence activities in order to avoid competitive surprises.

Users (and, of course, the majority of these users are in the IBM camp) want to have information that helps them with capacity and acquisition planning. Should they enlarge a system in place or wait for the replacing product? Should they purchase now, lease from IBM or a third party, or meet their needs in the used equipment market? Particularly at the high end of the product range, hundreds of thousands of dollars may be at stake. A wrong decision based on an erroneous residual value assumption can be hazardous to the MIS manager's job security.

Investors want information not too dissimilar from that provided to vendors and users, although they do not need all the technical details. Of course, investors also want corroborating information about a company's likely financial performance. Data on backlog, order/shipment rates, purchase/lease ratios, and hiring and cost overruns due to product problems serve as radar on what to expect.

To satisfy this mushrooming demand for both quantifiable and subjective information, a whole subindustry has sprung up: management consultants, the teams of security analysts resident in the brokerage industry, and specialized market research firms. Probably close to $100 million will be spent this year by investors, vendors, and users anxious to obtain such market and product intelligence.

In management consulting, the names are almost household words: Booz, Allen & Hamilton Inc., McKinsey & Co., The Diebold Group, the "big eight" CPA firms, and quite a few others. These firms provide market research services as an outgrowth of, or as an adjunct to, their normal consulting activities.

Close to $100 million will be spent this year by investors, vendors, and users anxious to obtain market and product intelligence.

Several brokerage houses employ analysts to stay on top of the information processing industry. For example, Cowen & Co., Kidder Peabody, Merrill Lynch, Prudential-Bache, and First Boston all support large teams that follow the industry for investment purposes.

Market research firms come in a variety of sizes and orientations and mix their intelligence-gathering activities with various ancillary services. There are large companies (e.g., Arthur D. Little, IDC, IRD, Stanford Research Institute, Quantum Science, and Dataquest) employing 50 or more professionals, plus a number of relative newcomers (the Gartner Group, The Yankee Group, Input, Infocorp., MSRA, Palyn Associates, Strategic, and Future Computing, to name a few). In this latter group, there are even a couple of one- or two-man shops—Enterprise Information Systems, for example.

Unlike the management consulting firms or the analysts who work for brokerages, many of these market research firms

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SEE THE
FUTURE

tend toward offering "pure" market intelligence. To varying extents, they attempt to forecast things like product introductions and pricing strategies.

The economics of the market intelligence industry is relatively straightforward. Every executive heading such a firm, especially the smaller, highly specialized boutiques, has these related goals:

- Gain market share rapidly. This is a people-intensive business and entry is easy. Serving 100 users and 50 vendors doesn't cost much more than serving 10 users and five vendors.
- Offer a broad line of differentiated but related products and services. This increases market share and helps amortize certain fixed and semifixed costs, e.g., printing and publishing. In effect, one basic report can be used in several submarkets with only minor changes.
- Leverage the various products and services across as many different markets as possible. Information developed while working with a particular vendor on a special assignment makes for an interesting written report or presentation at a seminar to users and even investors, although some of the details may be modified in order to preserve confidentiality. Several of the market intelligence firms also pursue venture capital and money management activities, either directly or via their affiliates. These ancillary businesses benefit from having access to the data and analysis developed in the course of the firm's mainstream activity.

Published company information aside, what inputs do market researchers, consultants, and financial analysts use to develop data on market size and growth, product features, price/performance/function characteristics, and product introduction dates? Some market research houses (IDC and Computer Intelligence Corp., for example) have built up substantial databases containing information on computer installations and acquisition modes. Many surveys are taken (e.g., Input's and Cowen & Co.'s) to sample users' buying intentions as well as their opinions of the quality, reliability, and performance of recently introduced products and services. Industry "sources" (mainly former employees of computer or office equipment companies and industry suppliers) may also provide valuable information, but in the end, industry gossip at trade shows, seminars, or cocktail parties in Westchester, Greenwich, Silicon Valley, or suburban Boston may be the most common but least reliable.

What becomes of this information? More often than not, what the subscriber to market research services receives is tenuous projections on market size and growth, orders and shipment rates for key products, and speculative assessments regarding a particular company's future product plans or market and pricing strategies. Clearly, the output contains much sophistry—common sense might lead to the same conclusion with a similar margin of error. To wit, IBM's annual R&D spending averages about $2 billion, which is enough to fund new market entries and replacement of any product three and a half to four years old. Thus, an intelligent guess on likely product releases within the next six months or so has at least a 50% chance of being right.

The information providers deliver their product in a pretty package—colorful reports, streamlined seminars in pleasant locations, and telephone access to their in-house "experts." For their basic products and services, the market research firms charge an annual subscription fee ranging from $15,000 to $25,000. Individual reports on a particular subject are also available at a one-time price of anywhere from $500 to $1,200 per copy. Reports from the Wall Street brokerage firms, by contrast, are available free of charge to their institutional clients, and a nonclient can obtain a specific report upon payment of a relatively nominal charge.

What about value or quality? The sample size for a user survey or the creation of a database often is too small or is insufficiently random to yield reliable results.

The pricey market research houses tend merely to extrapolate prevailing trends—a relatively easy task.

Vendors' new-product plans, price/performance characteristics, and architectural details change frequently and often in unpredictable fashion; this is especially true of IBM. Thus, even "inside" information obtained quite recently may be out of date. The fact that a market research house boasts of just having hired someone from one of the major computer companies may have a positive promotional effect but not lasting value. Industry "sources" may not really know what they purport to know, and at times may—wittingly or unwittingly—give misleading information. If they *are* able to offer inside information on their previous employer's plans, they may find themselves subject to a lawsuit.

The record shows that the pricey market research houses tend merely to extrapolate prevailing trends—a relatively easy task. This is why most of the houses failed to give their subscribers adequate advance warning on several important developments, including:

- The dramatic encroachment of the micro on the minicomputer business.
- The continued popularity of the 8-bit Apple IIe rather than its predicted demise in the face of IBM's 16-bit P.C.
- The rapid growth of the home computer (less than $300 for a basic system) in 1982.
- The industry's pronounced tilt toward purchase, as opposed to rental. Purchase is now the prevailing mode of moving hardware.
- The internationalization of the industry, with even IBM contracting freely with the Japanese whenever a make-buy analysis indicates it makes sense.
- The likelihood and consequences of a sudden, "total" IBM victory in the company's protracted antitrust suit.

On matters like these, the market research houses—whose main claim is that they can provide this type of intelligence—have failed most of the time. In fact, for years several of them have announced repeatedly IBM's imminent release of a new high-performance tape drive subsystem (Ocatillo/Suehiro) and an IBM local area network. These products, of course, are still not here.

Equally important, perhaps, is the fact that industry watchers don't understand the economics of demand well enough to perform a meaningful analysis. For example, the effect of price/function improvements on demand for MIPS (million instructions per second) and megabytes of disk storage has yet to be measured satisfactorily. Neither has the substitution elasticity for automation versus labor been empirically validated. Thus, one can't help questioning the merits of straight-line projections of market size and growth, and models calculating residual value and future customer acceptance of a given product. Comparisons of such forecasts with results, as these become available, usually reveal large discrepancies.

While even a cursory review shows that the market research firms frequently differ on significant points, the steady stream of new products and services generated by this industry assures that the "direction" of their assessments will often be on target. Still, the client (vendor or user) is often as confused as he is enlightened. If he subscribes to more than one service (as many Japanese firms do) he is likely to become even more confused while paying twice as much. In most cases, therefore, one may wonder if the value of the information justifies the high cost of the service. Amazingly, no one ever seems to look back on the record. Instead as the saying goes, "in the land of the blind, the one-eyed man is king."

Much of the information these subscribers receive, moreover, is reported promptly (and just as inaccurately) in the trade press. The business-oriented magazines provide continuous interpretive analysis quite similar to that of the market research houses. Dozens of newsletters are available at a cost of $125 to $250 per year, including IDC's "Gray Sheet," "RELease 1.0" (formerly the "Rosen Electronics Letter"), "Industry Measures," "Infoperspectives," "Computer and Communications Buyer," and at least a dozen others. And services such as Datapro (McGraw-

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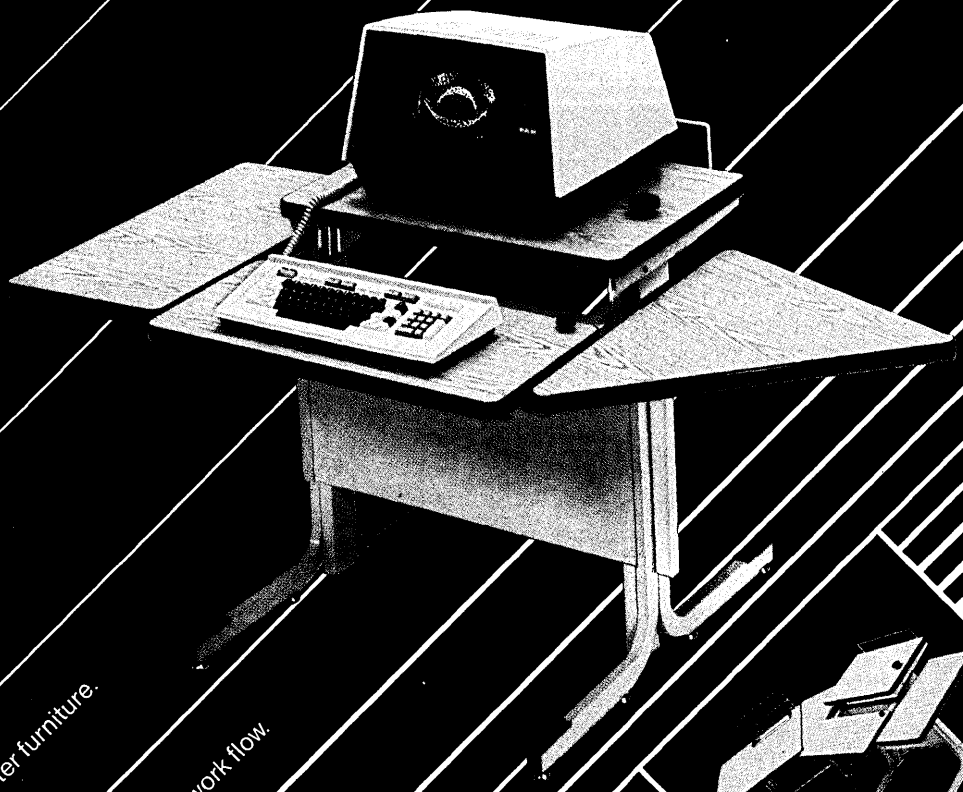

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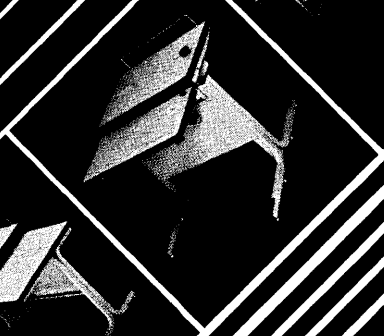

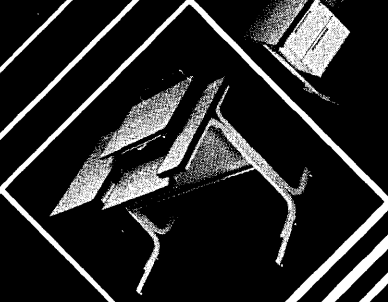

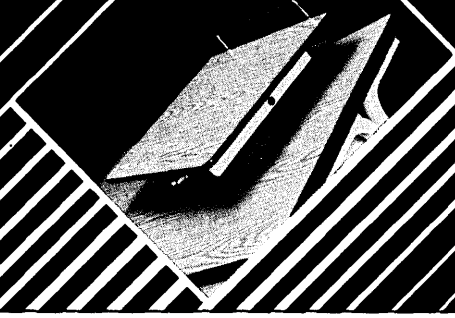

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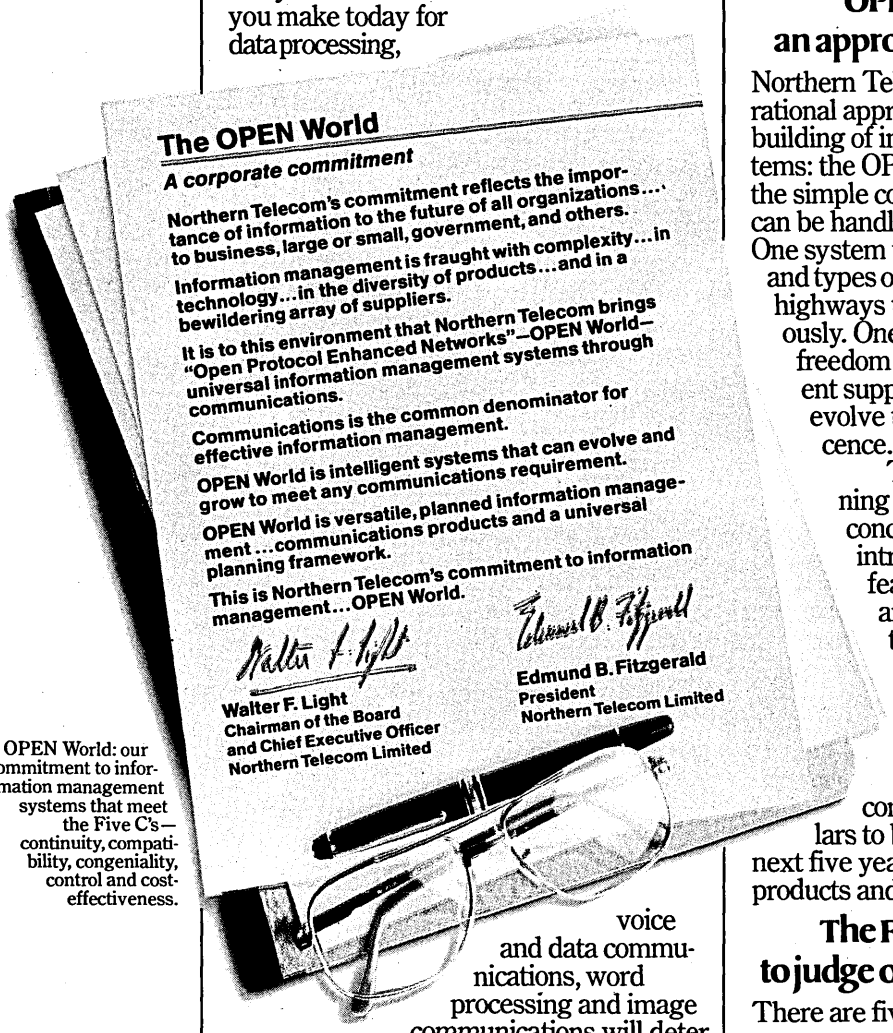
To a world of chaos and confusion rational approach tc

Today, most organizations realize how critical it is to manage information effectively. After all, information is a key resource. So the choices you make today for data processing,



OPEN World: our commitment to information management systems that meet the Five C's—continuity, compatibility, congeniality, control and cost-effectiveness.

voice and data communications, word processing and image communications will determine, to a large extent, your future success.

But deciding on an information management system can be very complex.

Obsolescence is a constant concern. Because of the rapid pace of technology, today's innovation too often becomes yesterday's generation. To compound the problem, the needs of your organization are also constantly changing. How do you know what your requirements are going to be next year?

Also contributing to the complexity is the ever-growing number of suppliers offering a vast array of products and services. Products, which for the most part, are incompatible.

It is a market characterized by chaos and confusion.

OPEN World–finally, an approach that makes sense.

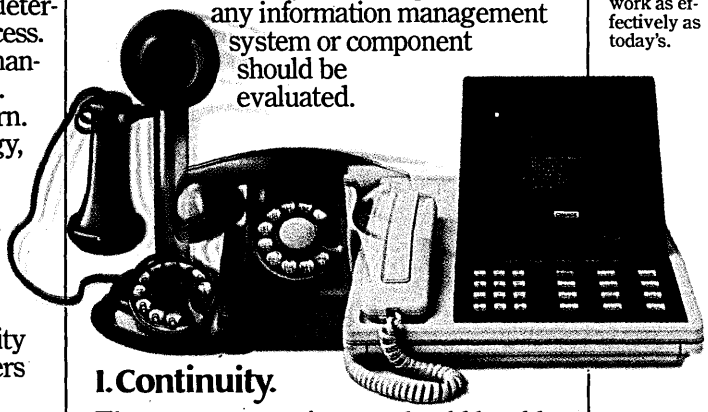
Northern Telecom has introduced a rational approach to the planning and building of information management systems: the OPEN World.* It is based on the simple concept that all information can be handled in one integrated system. One system that will allow many makes and types of equipment and transmission highways to work together harmoniously. One system that will give you freedom to choose from many different suppliers. One system that will evolve to protect against obsolescence.

The OPEN World is a planning framework embodying these concepts, and a program for the introduction of products and features to enable you to plan and build optimum information systems, designed around the key common element—communications.

We're backing the OPEN World with a research and development commitment of one billion dollars to be spent on R & D in the next five years on OPEN World systems, products and features.

The Five C's–five criteria to judge our approach. Or theirs.

There are five key criteria against which any information management system or component should be evaluated.



An example of continuity: we have evolved the telephone network to allow yesterday's equipment to work as effectively as today's.

1. Continuity.

The system or equipment should be able

*Trademark of Northern Telecom Limited.

Northern Telecom brings the first information management.

to evolve to meet future needs, to accommodate future technological developments, and to provide new features. Only in this way can it be "obsolescence-proof."

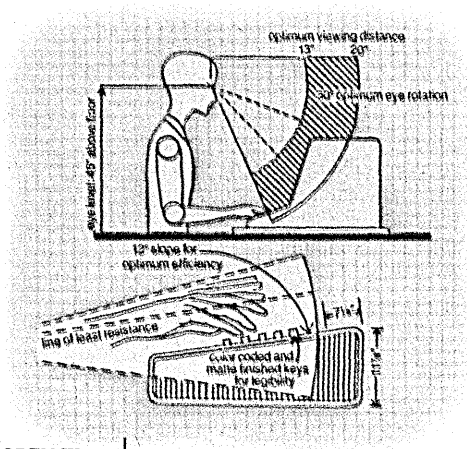
In the OPEN World, many different makes and types of equipment can work together.

2. Compatibility.

Many makes and types of equipment must be able to work together as a harmonious whole. Components and systems from different manufacturers and transmission channels from different suppliers all must be compatible.

3. Congeniality.

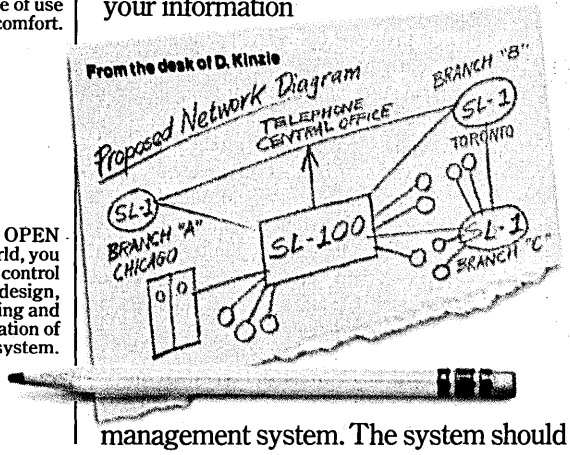
If people find equipment or systems intimidating, unattractive, or difficult to use, they simply won't use them. Even advanced technology should be attractive and simple to use.



OPEN World systems are congenial—designed for ease of use and comfort.

4. Control.

You, not a supplier, should be in control of your information

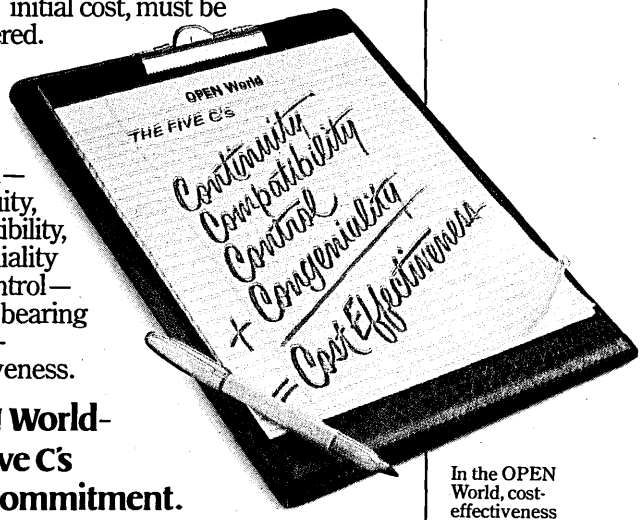


In the OPEN World, you can control the design, building and operation of your system.

management system. The system should not lock you in to a single source or limit options in the future. And the system should also provide the tools to control the cost and flow of information in your organization.

5. Cost-effectiveness.

The bottom line. Long-term financial considerations, as well as initial cost, must be considered. All of the other four criteria—continuity, compatibility, congeniality and control—have a bearing on cost-effectiveness.



In the OPEN World, cost-effectiveness is the bottom line.

OPEN World—the Five C's plus commitment.

As the international leader in digital telecommunications, the technology that ties computers and communications together, Northern Telecom is in the unique position of being able to make the OPEN World a reality.

Our technological heritage allows us to meet the five criteria conclusively, as we have always done, for example, in providing equipment for the telephone network. When you place a long distance call, it may pass through many generations of equipment, all working smoothly together. Use of the telephone is simple, although much complex technology is involved. And the relative cost of using the telephone has steadily decreased, although its capabilities are constantly expanding.

In supplying telephone equipment for over 100 years, we've met all the criteria we propose for business communications.

If you'd like a brochure describing our commitments to each of these criteria, or more information about the OPEN World, write OPEN World, Northern Telecom Inc., 259 Cumberland Bend, Nashville, TN 37228.

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Hill) provide updated, detailed technical manuals on all computer makes and models for a few hundred dollars a year.

Why then do users and vendors subscribe to these high-cost research services? To be fair, as much as 10% of the information disseminated by these houses may have genuine added value, especially if one could know ahead of time what information is right and what is wrong. Whether or not this justifies the annual fee, each subscriber has to decide for himself. The record shows there is no dearth of paying customers (including Morgan Stanley's MIS department).

Besides the need to know, there are other reasons for subscribing. Most of us derive some satisfaction from feeling we're among the first to know about important developments. Some managers want their troops to know that the company is willing to spend money to keep them up-to-date on industry trends. And being selected by the boss to attend one of the seminars can be regarded as recognition for a job well done. Data processing departments at major corporations may subscribe just to make sure the competition doesn't get the jump on them. Second- and third-tier vendors may subscribe just to make sure the research firm is aware of them and remembers to include them when drawing up a list of vendors serving their particular market.

Because some of the market research houses also act, directly or indirectly, as investment advisors, conflict of interest questions are currently being raised. The Gartner Group markets its information to Wall Street via Dillon Read; Yankee Group does so via Morgan Keegan; MSRA Inc. is a registered New York Stock Exchange member; Dataquest has spun off its investment advisory business and recently sold this unit. (DQ Securities) to Prudential-Bache.

Second- and third-tier vendors may subscribe just to make sure the research firm is aware of them.

It is not difficult to see how a conflict can develop: a vendor may contract for the services of one of these market research houses and may divulge proprietary information on market entry, his new product and pricing plans, etc. Such essentially confidential information, or a version thereof, may reach selected institutional investors and, via a market research house's affiliation, certain venture capitalists and money managers.

The brokerage industry, which is subject to regulations of the Securities Exchange Commission and the major stock exchanges, insulates investment research from corporate finance activities via the "Chinese wall." The market research houses, not being registered member firms, are not required to maintain such a separation and, in fact, may not want to do so in order to leverage their information (and their people) to the greatest degree possible. As a result, a vendor may unwittingly give inside information to the financial community. But, the market research boutiques may be trying to prevent this from happening. Ben Rosen, for example, recently sold his highly regarded proprietary newsletter in order to avoid a possible conflict with his activities in consulting and venture capital.

There are other potential problems. A few months ago, a front-page news story highlighted the fact that the privileged client-attorney relationship so rigorously defended by the legal profession does not apply here. After years of having had a close consulting relationship with its major foreign client, Palyn Associates blew the whistle when it perceived that its client may have violated U.S. trade secret laws. Henceforth that client will likely be more cautious in dealing with purveyors of market intelligence.

The compiling and selling of market intelligence is becoming a very competitive business. To attract new clients, especially the demanding Japanese, an information provider may have to promise more than he can deliver. The resulting pressures may lead to quid pro quo relationships that raise ethical questions.

As long as some people need to keep secrets and others need to know what's likely to happen, the market research industry will continue to flourish. As it grows, however, it will probably have to learn to police itself—as do management consultants, for example, and the brokerage industry, and many other professions. Some firms have already taken steps to avoid conflicts of interest, but more effort is clearly needed. Without it, there's a chance for the kind of accident that would motivate vendors to rethink their relationships with these firms and cause the SEC to look more closely at some of their business practices.

Ulric Weil is a principal at Morgan Stanley, the New York investment banking and brokerage firm. He follows the information processing industry for the firm's institutional clients.

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NEWS IN PERSPECTIVE

MICROCOMPUTERS

16-BIT OS RACE HEATS UP

Are MS-DOS and Unix destined to be the big two? Not if the others can help it.

Is there a brass ring out there for suppliers of operating systems for the 16- and 32-bit microcomputer world?

A study by Creative Strategies International, San Jose, Calif., says OS suppliers will compete "with results anywhere from market extinction to market dominance." If dominance could be considered a brass ring, the answer could be yes.

Contenders for the elusive prize are Microsoft's MS-DOS, Digital Research's CP/M-86, Bell Labs' Unix, Pick from Pick Systems, and SofTech Microsystems' p-System.

San Jose computer consultant David E. Gold doesn't think there'll ever come a time when "somebody can stand up on a soapbox and say we won and you lost." But he does see a big two emerging in terms of market share and he has no doubt that they'll be MS-DOS and Unix because "the world is looking for more, not less standardization."

Gold points out there are two keys to operating systems gaining acceptance as de facto standards: enthusiastic support from hardware vendors and wide availability of applications software. He sees both of his candidates as having both of these keys, although in applications software, he says, Unix is lagging behind MS-DOS. "Thousands and thousands" of MS-DOS applications were written when IBM packaged it with its P.C., he notes.

The market for which all five contenders are competing is a market that has reached $350 million. Jean Yates, president of Yates Ventures, Los Altos, Calif., believes it will grow to $2.2 billion by 1987. Yates looks for AT&T and DEC to soon enter into alliances with an OS vendor the way IBM did with Microsoft.

She also sees IBM support for Unix on the P.C. as inevitable. "I'm positive this will happen because a number of independent vendors are already offering it [Unix for the IBM P.C.]."

Unix has been talked about as a potential OS standard for the 16-bit world since Western Electric lowered its licensing fees in late 1981 (Jan. 1982, p. 77). Following Unicom, a Unix user conference and exhibit in San Diego last January at which both AT&T and Digital Equipment Corp. announced support for Unix, such speculation became louder and more widespread.

"Unix has become the CP/M of the 16-bit world," exults Tom Cull, president of Interactive Systems Corp., Santa Monica, the first company to bring the Bell Labs operating system to the commercial marketplace. (Digital Research's CP/M is widely conceded to be the de facto standard operating system for 8-bit microcomputers.) But, where CP/M had no competition in the 8-bit arena, Cull concedes that in the 16-bit world, Unix is not the only game in town.

It is, though, a popular game. "Unix is the operating system of today with a life span that could last far into the future," says David Callan, president of Callan Data Systems, Westlake Village, Calif., which produces Unix-based systems.

"One of the reasons that the Unix system is evolving so rapidly as a viable entity in the industry is that it is a proven commodity," he said. "For the first time in the history of microcomputers, you have a

"Unix has become the CP/M of the 16-bit world."

10-year-old, mature and reliable operating system that works so nicely with the more recently developed 68000 microprocessor. In all previous cases, you started with an established microprocessor and a primitive operating system that, over a period of time, got better and better. But, by the time the operating system reached its maturity, the computer's central processing unit, based on the old microprocessor, was obsolete. As far as we're concerned, that can't happen with Unix."

Gnostic Concepts, Menlo Park, Calif., predicts annual shipments of Unix-based computer systems will exceed 100,000 by 1985 and total value of domestic end-user expenditures on Unix-related systems and associated software will top $5.1 billion.

"There's never been any doubt that Unix is a powerful operating system," said Bob Katzive, program manager of Gnostic's Unix Information Service. "Now that software developers have succeeded in making commercial-grade adaptations of Unix, we're seeing a dramatic rise in the number of systems that support it."

One criticism often directed at Unix is that is was developed by programmers for programmers and is not very "friendly." Katzive notes that a number of "shells" have been developed around Unix to facilitate error handling and to provide a more friendly environment. One such is Interactive Systems' Advance Productivity System (APS), which incorporates a shell by which users can examine, organize, and compute all data in a Unix system by pointing at objects on a video screen and using a few powerful function keys.

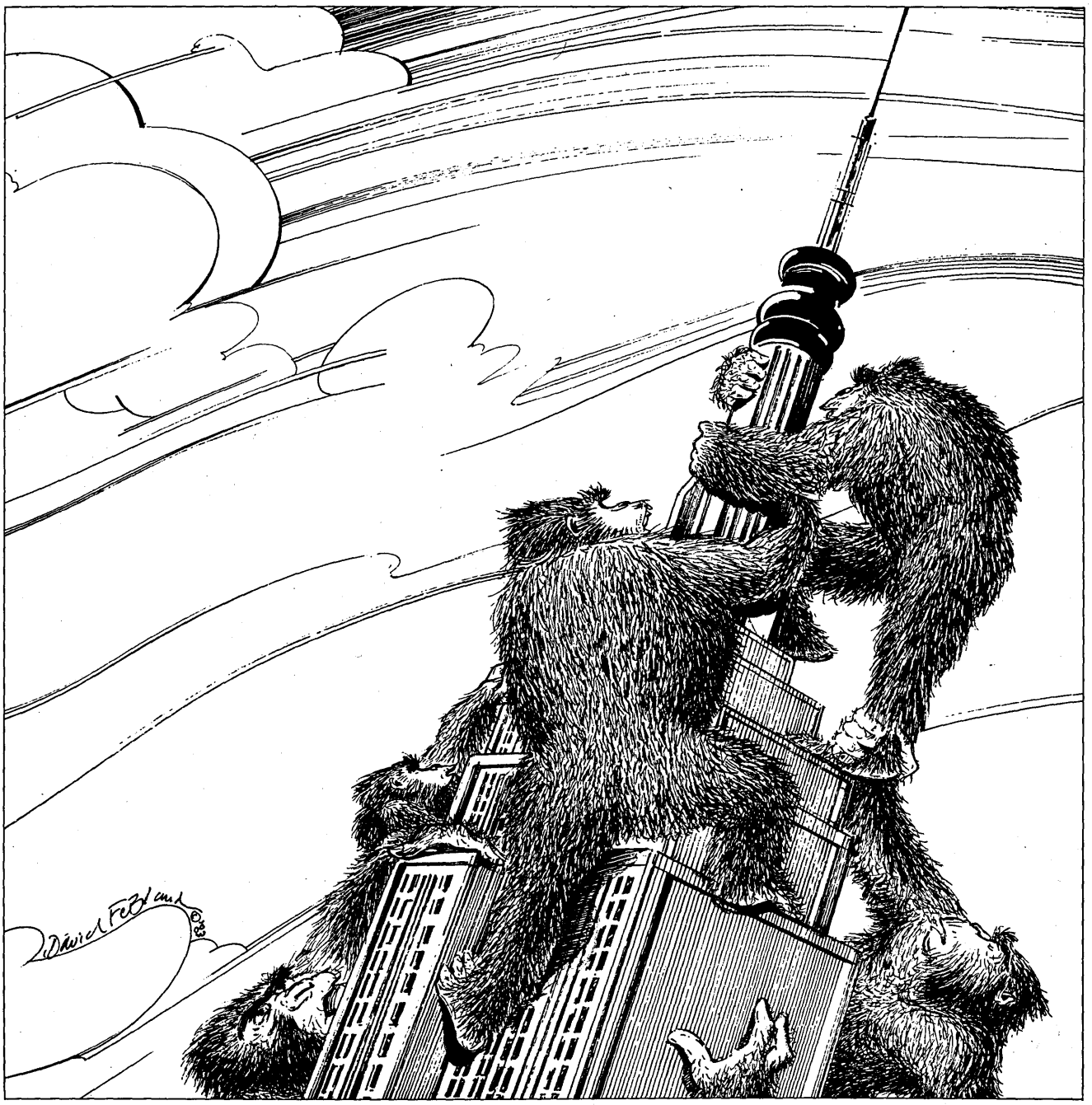

ILLUSTRATION BY DAVID FEBLAND

Callan of Callan Data Systems counters the Unix criticism by pointing to the evolving education of today's computer users and future users. "Not only are the systems becoming much more sophisticated, but so are the people using the machines on which they are based. Today's young people have grown up in a computer and video game environment. They're not stigmatized when it comes to learning and using advanced technologies."

One of Unix's more attractive features is portability, a feature it shares with SofTech Microsystems' p-System. The p-System approach to portability, however, is different. That operating system and its utilities are written in Pascal and translated into the binary machine code of a pseudomachine from which the system gets its name. A p-machine emulator enables the system to be run on a variety of microcomputers. Portability is maintained at the object code level, Softech claims.

The p-System began gaining momentum in the 16-bit operating systems race in 1982 when IBM announced its availability on the P.C. and Displaywriter.

The p-System began gaining momentum in the 16-bit operating system race in 1982.

In fact, IBM is understood to have introduced the p-System for its P.C. as a means of luring Pascal-based applications off the many Apple II computers already installed. Its implementation of the operating system for the Displaywriter, originally introduced as a word processor, is seen as a way of warding off competition from the many companies whose word processors could also run limited data processing applications.

"The p-System's portability meant that IBM could get the Displaywriter into the data processing market fast, much faster than if the company tried to get applications programs written by third parties or its own staff," says John Splavec, president of San Diego-based Softech Microsystems.

He notes that the p-System currently runs on 13 different processors, ranging from the Intel 8080 to Digital Equipment's

VAX minicomputer. The system's extreme portability does result in some degradation in operating performance, he concedes, but the advantages of a wide range of compatible applications makes up for lack of speed.

Besides IBM, the p-System is available on systems from DEC, Hewlett-Packard, Osborne Computer Corp., Texas Instruments, Philips Information Systems, Zenith Data Systems, Commodore Business Machines, Sage Computer Technology, Nixdorf Computer Corp., and NEC Information Systems.

The p-System could be moving into the mini world. It is said to be running internally at the Softech Microsystems plant near San Diego, on DEC VAX equipment.

Digital Research is fighting hard to keep its various CP/M derivatives in the race.

Conversely, Unix and the Pick operating system came from the mini world into microland. As a natural result they are both making the greatest inroads into high-end micros, and some doubt they will ever make it in the low end.

Bill Walsh, Pick Systems' vice president, marketing, is the first to concede that Pick isn't at the low end yet but says the company "absolutely" will be. "We're working on a PC implementation down to a single-user, personal basis that should be ready by this summer."

Could Pick be working with IBM? No announcements have been made but Jean Yates said IBM representatives were "all over" a Pick user meeting held earlier this year.

Walsh estimates there are some 15,000 installations of Pick systems worldwide but notes that, "these are larger installations. To get to how many crt users there are you have to multiply this by eight or 10."

Digital Research, Pacific Grove, Calif., is fighting hard to keep its various CP/M derivatives in the race and consultant Gold believes they'll "be around forever but not with significant market share."

Under extreme pressure from Microsoft, Digital Research last January slashed the price of the CP/M-86 it sells for IBM's P.C. Previously, that CP/M-86 version was sold by IBM for about five times the price of Microsoft's MS-DOS, a clear indication of which operating system IBM was throwing its weight behind. Digital Research at the time of the price cut declined to specify how much market share its operating system had gained among P.C.s or among IBM Displaywriters, but industry observers generally agree that CP/M has not done half as well in the 16-bit arena as it has done in the 8-bit world.

Nevertheless, Digital Research is pushing its Concurrent CP/M for the P.C. as a system that enables the machine to handle two jobs at once. It is also striving to maintain its market position with a wealth of new languages such as Logo, for teaching purposes, and C, for portable applications programming.

If Gold's prediction that MS-DOS and Unix will emerge as the big two comes true, Bellevue, Wash.-based Microsoft is in something of a catbird seat. It's in both worlds, with MS-DOS for the low end and Xenix, its version of Unix, for the high end.

Digital Research is getting into both worlds too with a portability strategy embodied in its CP/M-68K operating system, announced last January. It is written in the C language and designed to broaden the base of computers capable of using CP/M and to provide a bridge for transporting applications written in C between Unix and CP/M systems.

Digital Research said major oems who have expressed interest in CP/M-68K include DEC, Xerox, IBM, NCR, and Tandy. It already has signed up Hitachi.

Digital Research also has signed oem agreements for its Concurrent CP/M-86 with DEC, Fujitsu, NCR, Xerox, NEC, and Texas Instruments.

And just as OS suppliers are trying to move applications from other systems to theirs, so are outsiders. Torrance, Calif.-based Sunset MicroSystems has developed translators for Oasis-to-Unix converstion and for CP/M-to-Unix conversions.

Future chips are not escaping notice of operating systems purveyors. Digital Research is working with Intel on a multiuser, multitasking operating system for use with the iAPX 286.

National Semiconductor announced its SYS16 development system featuring Genix—its enhanced version of Unix—at the NCC, and Pick Systems is implementing its operating system on National's NS 16032, a 16/32-bit microprocessor.

Creative Strategies' report says competition will become increasingly fierce, with penalties for poorly conceived market strategies becoming more severe.

Creative Strategies, in its microprocessor operating systems report, says competition will become increasingly fierce with penalties for poorly conceived market strategies becoming more severe.

"In the past, the skyrocketing growth of the market compensated for flaws in product strategies concerning operating sytems," according to the report. "The inevitable industry shakeout, which is being hastened by the current recessionary economic conditions, willl not be so forgiving. A company will have to be sell positioned in all areas of microcomputer strategy to remain viable." Or to catch that brass ring.

—Edith Myers

MAINFRAMES

FISHING FOR TROUT

IBM has stimulated demand for mainframe MIPS but may not be able to satisfy users' new hunger.

IBM is expected to introduce a new high-end computer family late next year. The new machines—once known within IBM as the Sierra series and more recently as GTS (the Great Trout Series)—will be the first from the industry leader to feature the fast ECL chip technology adopted by IBM's plug-compatible rivals, sources reveal.

One well-placed source describes the Trout processors as a "technology map" of the current 308X family: "They have the same circuit and logic designs and the same thermo conduction module [TCM] packaging for the logic chips."

IBM has already intimated that TCM will be its medium- and large-scale system building block through the 1980s. "They are simply inserting higher performance ECL chips into TCM to make Trout a faster machine," the source explained.

Currently, IBM uses a TTL circuit logic that has a density of 704 gates per chip. Insiders point out that denser versions of 1,500 gates and 5,000 gates have been developed for inclusion in the TCM packaging. It is believed that the 1,500 gate version is being used in a 4300 series replacement family known as Glendale, which is due next year, and that its big brother is being used in Trout.

The key to the current 308X line is that, unlike former mainframe generations running MVS, it is built from just one processor engine: the 7.5 MIPS 3083 (model J). This "base" processor is offered in degraded form, as well as in dual and four-way combinations.

"With just one processor engine to worry about," suggested one source, "IBM is in a much better position to move software routines out of MVS and into microcode, something they started to do in 1974, but now can do at an accelerated rate to keep the competition off balance.

"This is one major reason," he added, "why the one-processor engine philosophy has been maintained on the upcoming series. Only this time," he ventured, "the base processor has grown to some 13 MIPS on Trout."

The prevailing feeling among insiders is that IBM expects to take 30 months to

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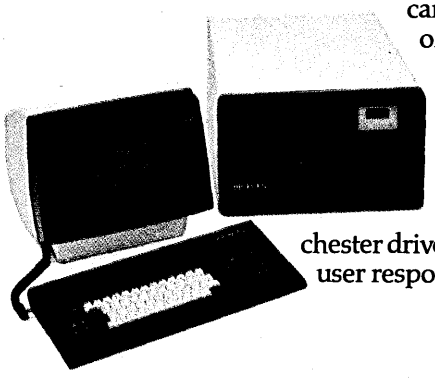

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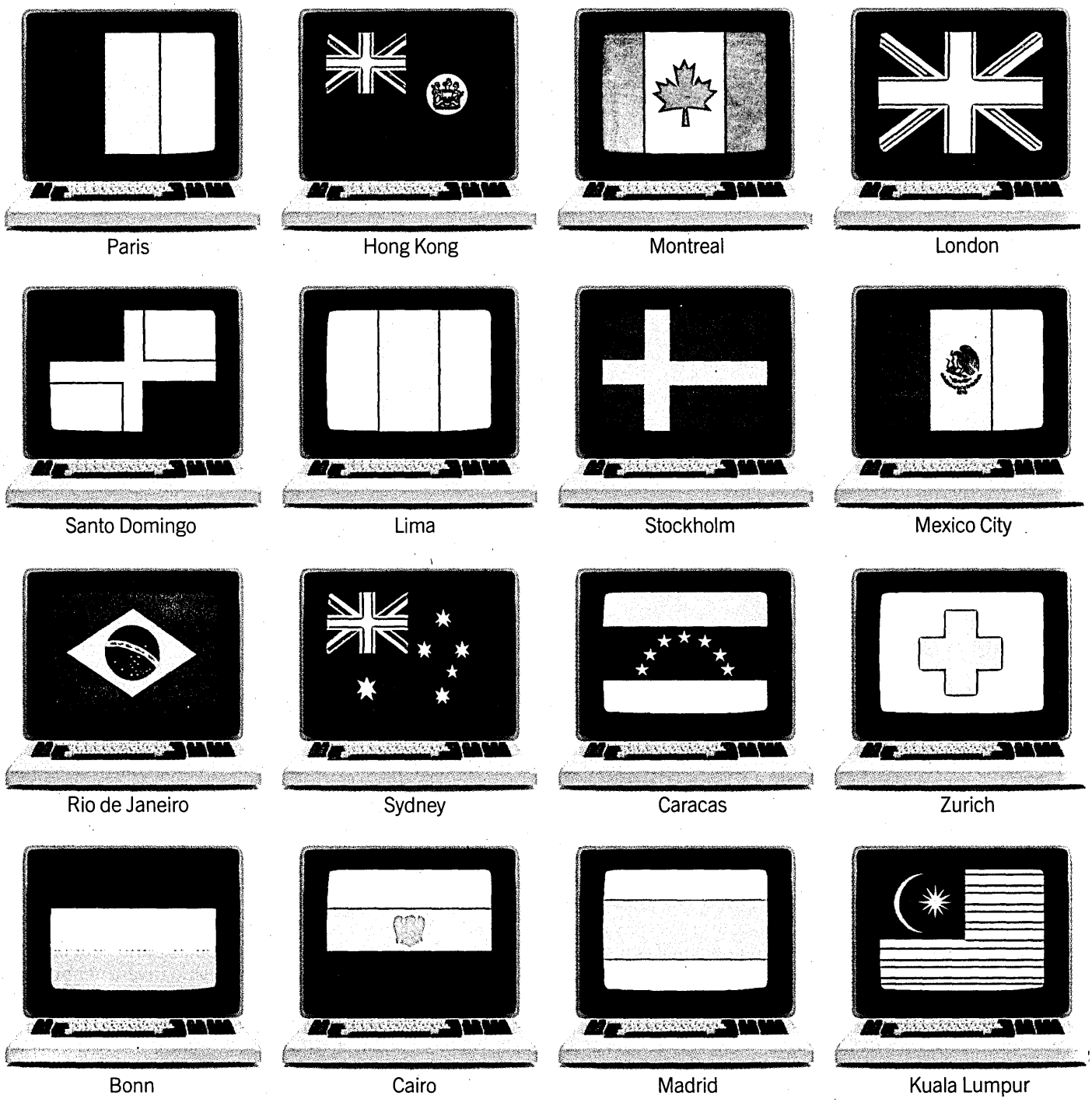

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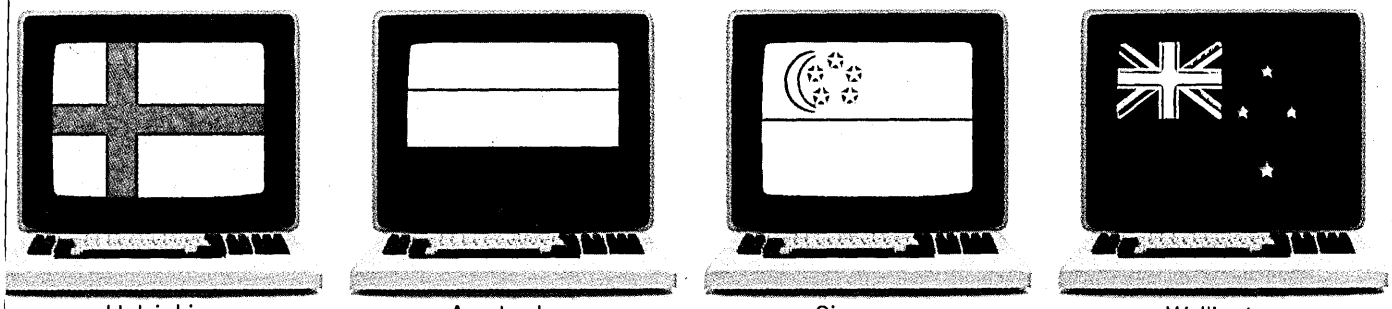

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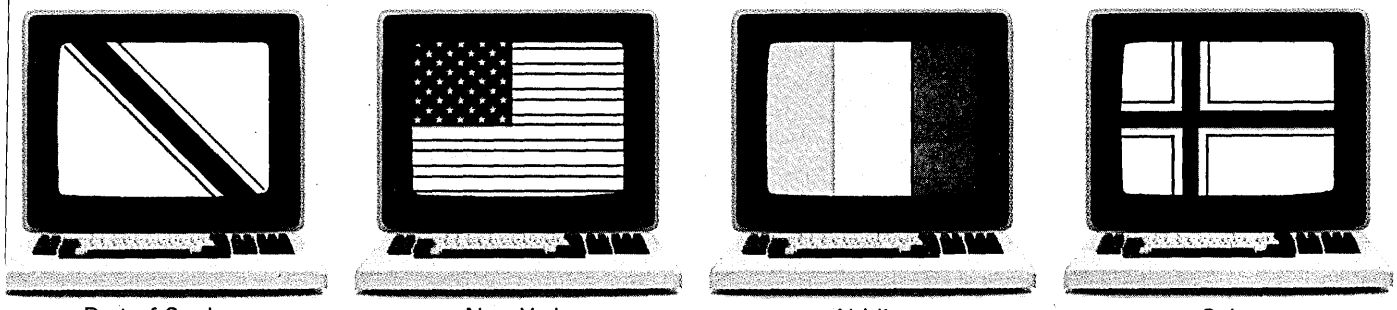

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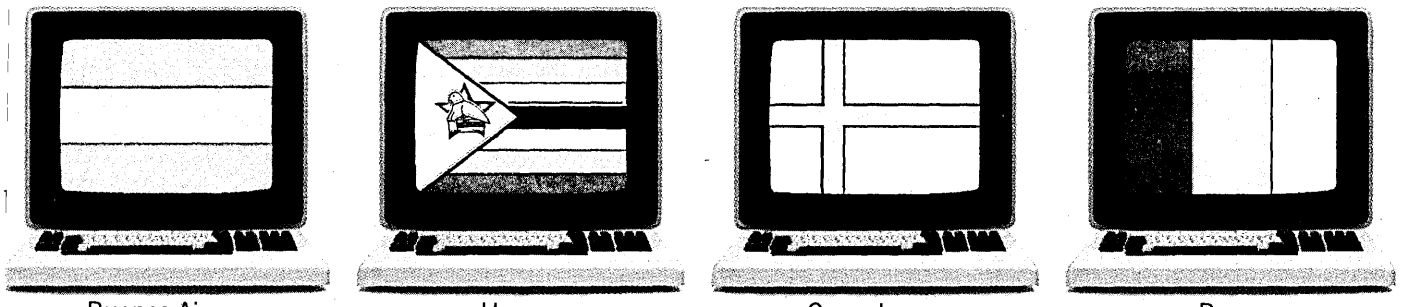

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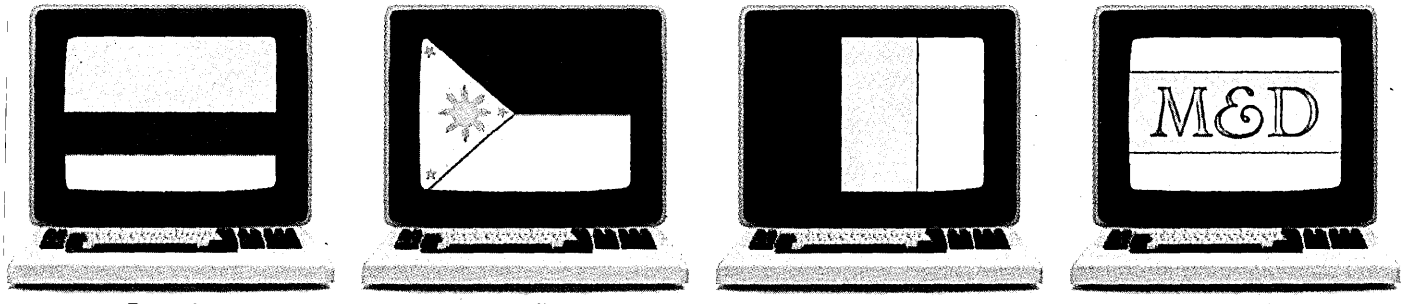

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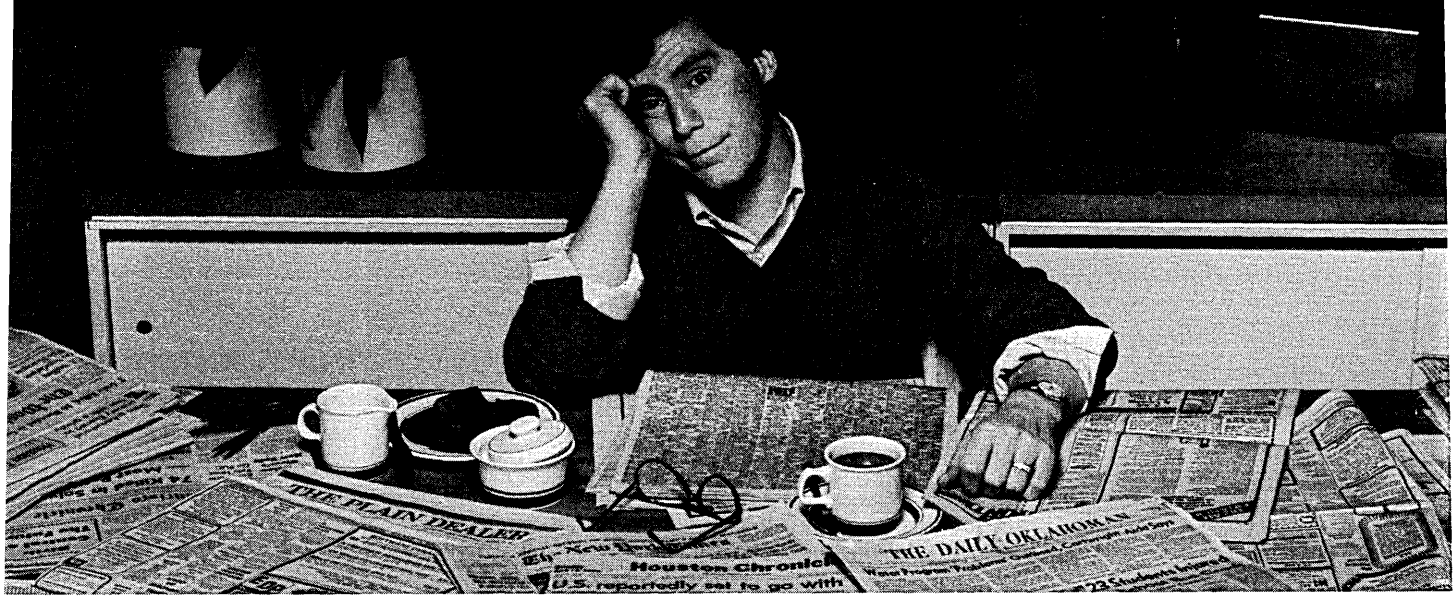

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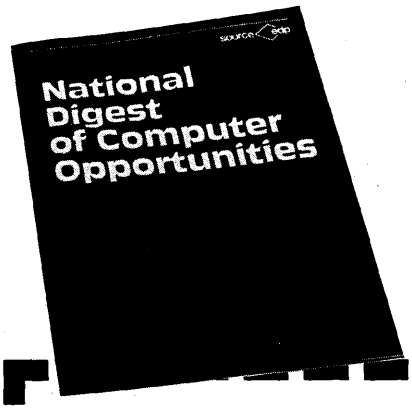

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swing the 308X base processor from lease to purchase. The end of this cycle marks the approximate date that IBM will begin shipping its 13 MIPS successor, in other words, late 1985 or early 1986.

"But IBM seems to be also going by another assumption that could necessitate the shipment of a new machine before this time, namely, that its big customers will start to run out of processing power in earnest during 1985," one source intimated. "So, for the present, the company is working with the idea of shipping a dyadic Trout at some 23 MIPS and $5.5 million *before* it ships the base processor—and most definitely in 1985." He added that IBM planned to sell its basic 13 MIPS engine for around $3 million.

The assumptions of a probable "MIPS shortage" at large IBM customer sites coinciding with 1985-'86 shipments of the new processor family appear to be borne

The industry leader's planned line of high-end machines has been developed under the code name Trout.

out by a recent Cowen & Co/DATAMATION survey of 3,636 IBM user sites throughout the U.S. and Canada. The survey revealed that installations of IBM's seven-model 308X family will peak this year, and unit shipments will begin to fall off in 1984. "Yet, no signs of excess installed capacity are anywhere in sight," Cowen & Co. analyst Barry Rosenberg explained. He said all signs seem to presage a post-308X series introduction "sooner rather than later."

"Some 14% of the sampling even expect the new machines next year," said Rosenberg, "but the majority are plumping for 1985 and beyond."

It's perhaps significant that as 308X installed power is cresting, IBM is introducing a number of offerings—one might almost call them "MIPS sponges"—designed to ensure that this fresh processing capacity is soaked up quickly, leaving the customer yearning for more.

King of the sponges is the company's new MVS extended 31-bit architecture, MVS/XA. XA will increasingly free-up extra virtual storage (an additional 2 megabytes on the first release) that can then be used by the customer to mount new interactive applications on terminals, personal computers, and workstations. As these new applications proliferate they will in turn demand more processing MIPS from the large central mainframes. This trend was spotlighted in the Cowen/DATAMATION survey, even before the delivery of XA. Almost 30% of all IBM sites said that a proliferation of small systems had led to greater demand for host mainframe power, twice the number claiming the reverse.

Another MIPS sponge with enormous potential is currently being field-tested in Europe, according to insiders. The product is a rewrite of IBM's relational database software, SQL, which runs with IMS and provides a relational DBMS for MVS/XA. So far, a version of SQL has only been offered on medium-scale 4300s running in batch mode. Many large-scale users have been dreaming of an interactive and relational version on their mainframes for the past few years; but the virtual/relational view of their systems that they crave will only be achieved by adding enormous chunks of processing power to run SQL/XA. It's interesting to note that IBM's leading U.S. customers will probably get their hands on the new relational software in the latter half of next year, sometime close to the predicted announcement of the new processors.

All in all, these and other MIPS-sapping products that are expected in the office automation, local network, and timesharing sectors seem to ensure an enthusiastic reception for Trout. But even without them, IBM believes it is in for a period of explosive demand at large customer sites. "We estimate that installed computing power at our large sites is now growing in excess of 50% a year," says William L. Wilson, director of data systems marketing and planning at IBM National Accounts Division. "A little over five years ago the growth rate was less than 20% a year, on average."

Wilson admits to a tendency on IBM's part to underestimate the growth potential of its large customers. "As recently as late 1980 their installed computing power was growing in the 35% to 40% a year range; yet the uniprocessor architecture we offered them [the 303X series] had only a 20% to 25% performance growth limit."

Wilson believes that the 308X series, with its multiprocessor architecture, has corrected that error and brought back a

By all accounts, IBM is readying itself for a period of explosive demand for large-scale computing power.

balance. "The processor curve now matches the current explosive demand," he says. But what about two years from now? Will this still be the case, or will IBM have created a "MIPS hunger" that it can't possibly hope to satisfy? An estimate from one of IBM's pcm competitors predicts a large-scale mainframe market in excess of 2,000 units in 1985. How will Trout's performance line stack up?

The only thing known for sure is that IBM won't get all this business from its customers. Amdahl Corp., which claims around 13% of the current large systems business (defined as the market from 3.5 MIPS upwards), will be bidding and, according to chairman Eugene White, expects to "at least hold its share." The ever present "Club Japan," including such notables as

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Fujitsu, Hitachi, and Mitsubishi, will also be taking a crack, of course.

But perhaps the most spectacular bid, and certainly the biggest gamble, comes from the new California venture, Trilogy Systems, the brainchild of the near-legendary founder of Amdahl Corp., Gene Amdahl. With his son, Carlton, and a management roster that reads like a Who's Who of former Amdahl Corp luminaries, Trilogy has chosen to launch itself around a reprise of the 1975 business plan by which Amdahl Corp. made its debut. That plan called for 40% better performance than IBM at 10% less cost. Amdahl's objective was 10% of the large systems business after its first two years; the company achieved around 12%.

Trilogy's president, Ted White, revealed that by the end of the fledgling's second year of deliveries (1986) it expects to have soared to a staggering $500 million in revenues and a 10% share of the large 370 systems business.

The company is breaking many rules in its quest for instant riches. Trilogy is leapfrogging the integrated circuit and moving straight to wafer level integration—and into the unknown. The company is developing a logic chip that measures some 2½ inches square, using high-speed ECL technology (May, p.62). In contrast to IBM's efforts to move to 5,000 gates per chip, the Trilogy chip will feature from 20,000 to 40,000 gates per chip.

If Trilogy's gamble pays off, the net result will be a 30 MIPS base processor, a 56 MIPS dyadic, and a 100 MIPS four-way arrangement. "The performance edge over IBM's upcoming series will be so great," says White, "that we'll need to sell greatly degraded versions of our processors."

Industry analysts are closely watching the development of a large-scale mainframe at the well-funded Trilogy Systems.

IBM traditionally has the lowest manufacturing costs in the business because of the high volumes it can achieve. In the past the computer giant has been able to manufacture at around 10% of the price of a machine, though this percentage has risen of late. It is believed that IBM will be able to manufacture the Trout base processor for around 15% of its cost to the customer, or $500,000. The dyadic version, if sold at $5.5 million, will cost around $800,000 to manufacture, sources estimate.

While Amdahl Corp. and other pcms are expected to manufacture their Trout challengers at between 30% and 35% of the total cost to the customer, i.e., more than double IBM's percentage, Trilogy expects to be able to operate at less than one half of IBM's manufacturing cost, according to White.

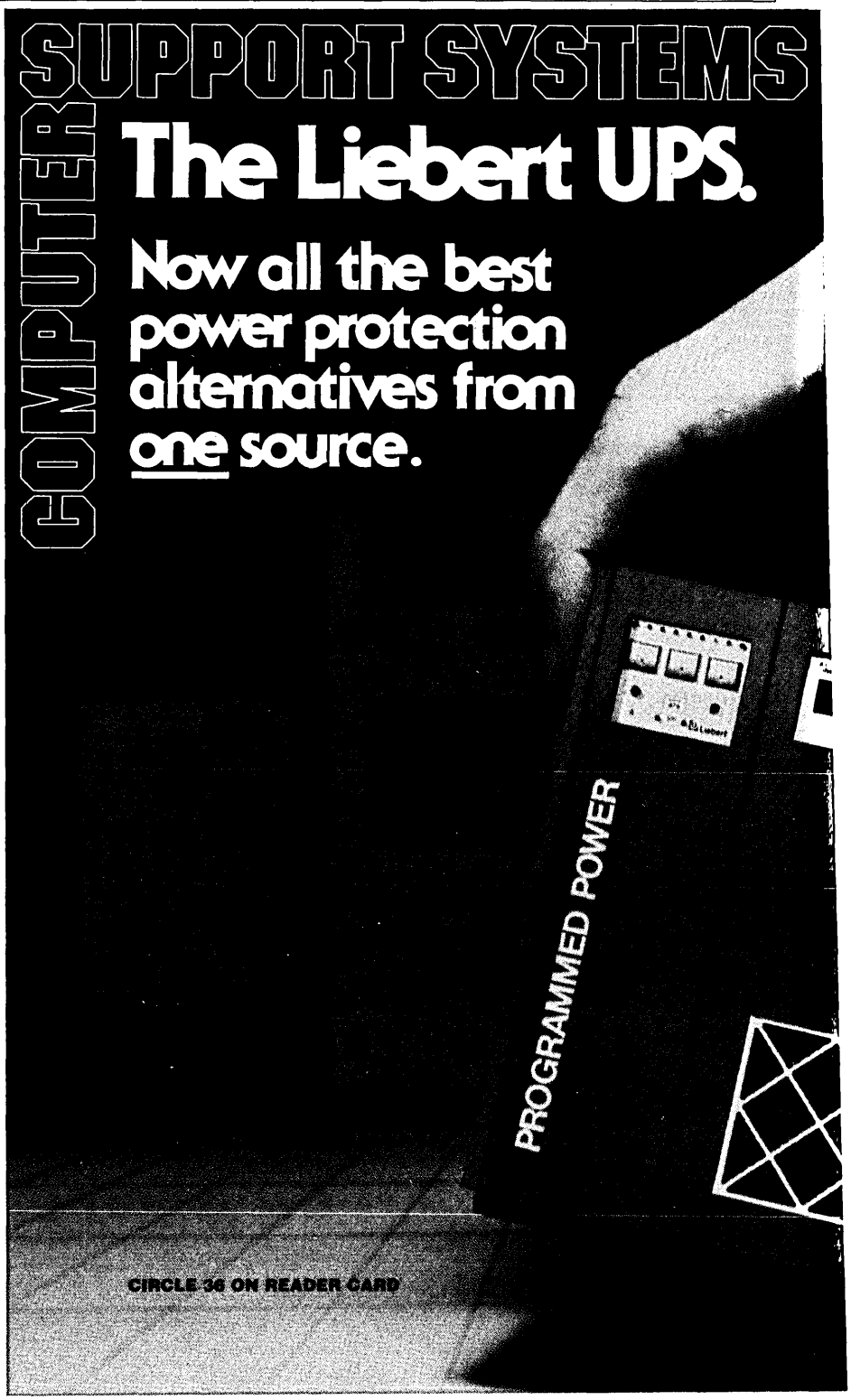
If all this sounds too good to be true, it could just be natural skepticism. On the other hand, it could simply be naiveté on Trilogy's part to believe it can ape Amdahl's achievement and pull off a successful repeat. Many analysts believe the latter.

"It's a huge gamble, whatever way you look at it," reflects Arthur D. Little vice president Ted Withington. "The industry has been toying with the idea of wafer level integration for four years, but keeps backing away because of the risks involved. The amount of power dissipated, and the heat transfer problem from such an approach, is enormous."

Steve Ippolito, president of the medium-scale pcm company IPL, added, "The wafers are so big you have to be careful how you mount them or they will crack." He argued that though the plans sound impressive and ground breaking, "they probably have more problems than real solutions at this stage."

"It's still an open-ended question whether the Trilogy processor will run XA."

Beginning in June 1984, when Trilogy enters its final 40-week debugging phase, some answers will begin to emerge. It's unlikely say experts, that Trilogy will



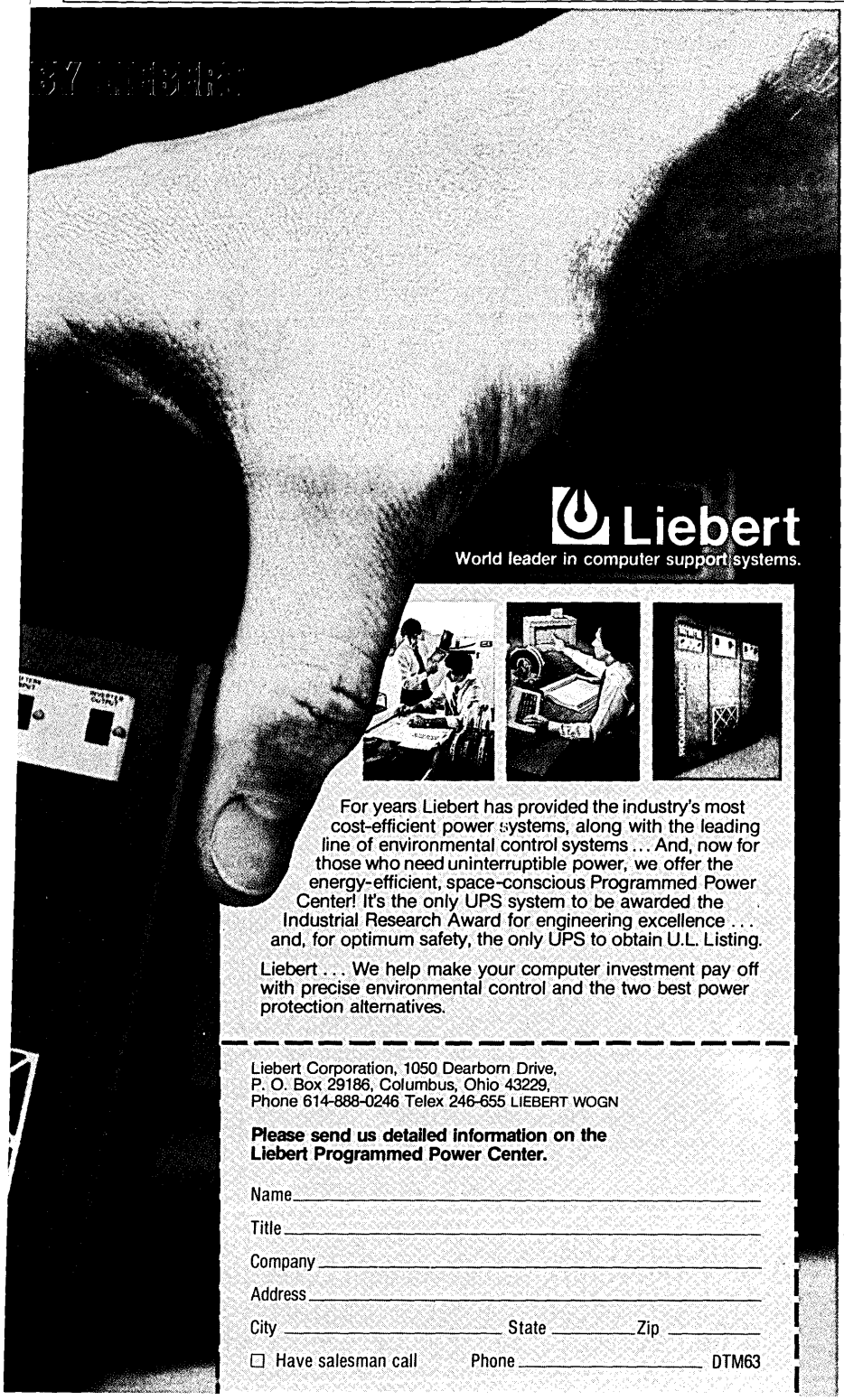
just sail through this countdown period without a hitch and meet its first customer ship date of March 1985. "It's still an open-ended question whether the Trilogy processor will run XA," suggests Yankee Group, Boston, research director Dale Kutnick. "That has yet to be determined."

"A great industry genius . . . gets the chance to come up with the hottest thing around."

Another matter yet to be determined is the question of finance. White says that Trilogy has already received $184 million in venture funding to get this far. He predicts that another $100 million will be required to get to first customer ship, and then a further $35 million will be needed for the immediate postshipment period. Clearly, fishing for Trout is an expensive business these days.

"It's a unique situation," muses Kutnick. "A great industry genius [Gene Amdahl] gets to play with hundreds of millions of dollars and gets the chance to come up with the hottest thing around. If they can do it, they'll pull off the coup of the century."

—Ralph Emmett



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MINICOMPUTERS

HENSON STRIKES BACK

Prime Computer's chief executive gives his side of the story after the shock of an earnings downturn.

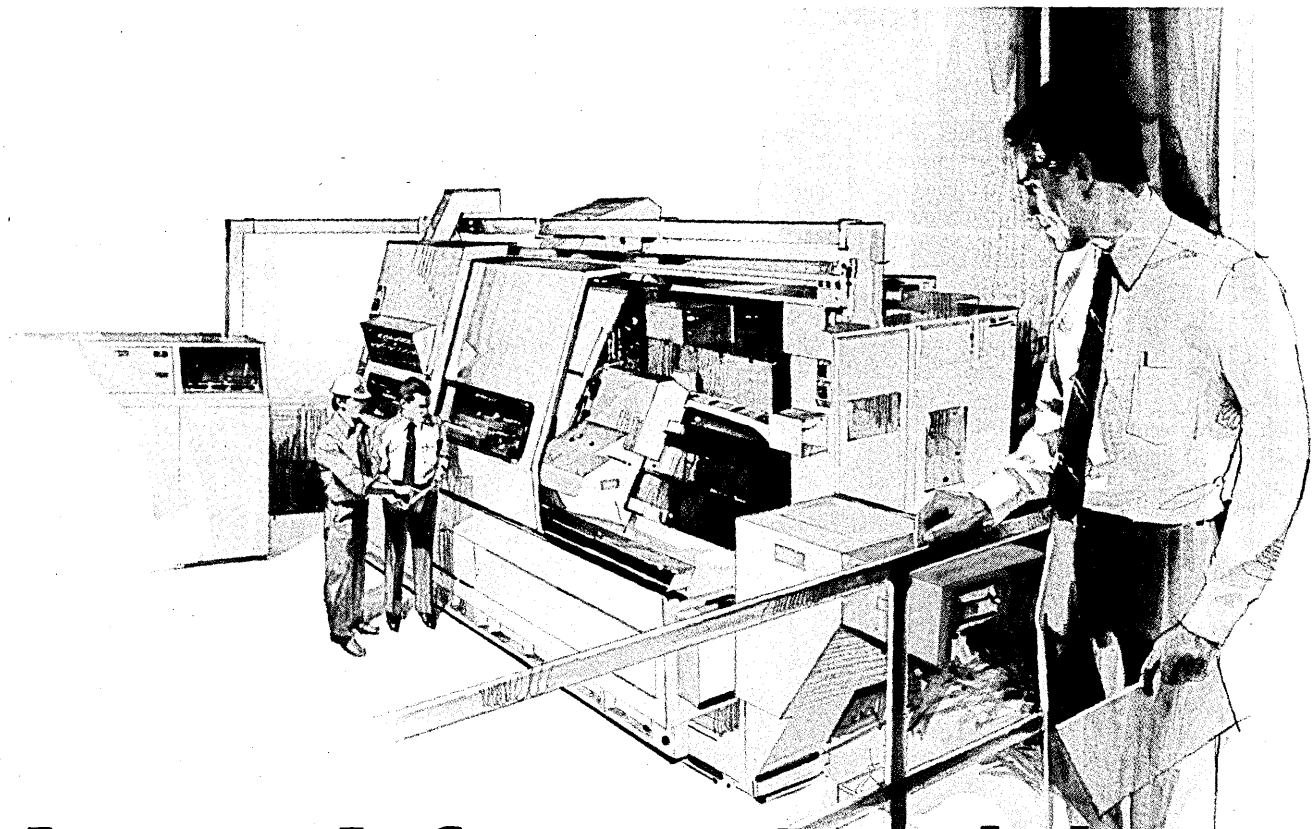
After a meteoric rise at IBM, followed by four quarters of solid success as president of Prime Computer Inc., Joe Henson finds himself on the defensive. His first full year as chief of the Natick, Mass., minicomputer maker, 1982, was one of 19% growth in both revenues and earnings, continuing the firm's high-growth tradition of a decade. But the first quarter of 1983 saw a startling downturn in earnings, bringing Henson, his largely IBM-bred staff, and their new sales tactics under severe attack.

The April announcement that earnings fell 20% in the first quarter to $8.5 million compared to the year earlier period immediately drew a chorus of criticism of Henson and his "IBM Mafia" from former Prime officials. Security analysts were caught unaware by the announcement. Later reports about the quarter ending this month and prospects for a down year left them badly bruised. In April, the company's stock market value plunged 25%.

"I won't deny there are ill feelings as the company grows and makes changes."

Henson, formerly vice president of management services at IBM's old General Products Division, was forced to strike back. In an interview with DATAMATION, he minimized the disharmony within the organization, conceded a preference for IBM personnel and practices, and voiced a determination to stick with his long-term plan despite the short-term financial weakness. "I won't deny there are ill feelings as the company grows and makes changes," Henson, 49, says in the slow, measured speech that retains just a trace of his native Arkansas twang. "There are always some growing pains."

The decentralized management structure installed by Prime president Kenneth Fisher before his abrupt departure in 1981 was significantly altered last year by Henson. New programs for national accounts and 50% discounts to universities were adopted. Wholesale discounting at the field level was discontinued. Research and development spending soared 35%. The



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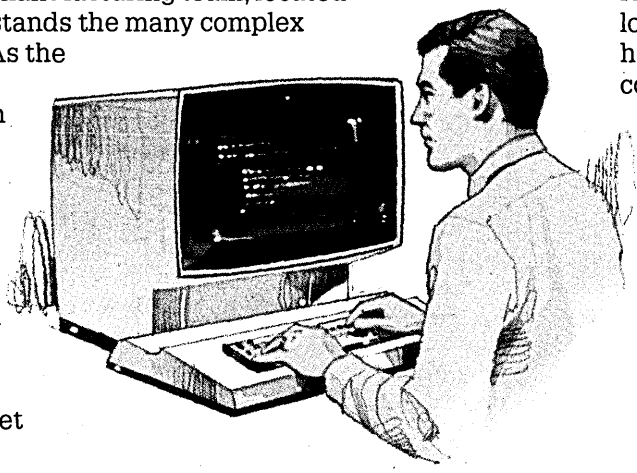

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field service organization swelled by 300 new technicians. Spare parts inventories ballooned 66%. A squad of vps wearing the white shirt and blue suit uniform of IBM moved into the executive suites.

"We needed to strengthen for the long-term future," Henson explains. Expatriates do not disagree with Henson's philosophy so much as his timing. "Most of the programs were good," says a recent departee, "but we didn't have the money to do all of them at once." Adds a more critical former employee, "They are trying the IBM tactics of the '70s, but those may not be the tactics for success in the '80s."

The 50% discount for university purchases of computers, critical to the success of IBM and Digital Equipment Corp. over the past two decades, is one of the new Henson programs most questioned by critics. "Why should a little company try to give machines away to universities, which are notoriously unfaithful to suppliers?" asks an analyst with especially close ties to the company. "It was folly because IBM and DEC have those accounts locked up."

Henson's rejoinder: "All companies have a program to further penetrate the educational market. It will enhance the presence of Prime on college campuses. It is still valid strategy, and valid today for Prime." While it is true that other companies offer discounts, the extent and strings attached to their deals are less onerous. Systems Engineering Laboratories, the Gould Inc. subsidiary competing against Prime in the 32-bit mini market, recently announced a 30% discount for those universities that will develop applications software for SEL.

"They are trying the IBM tactics of the '70s, but those may not be the tactics for success in the '80s."

The discount program will pay off in the long term, Henson claims, and he insists that the expensive startup costs of the national accounts program and the high level of R&D will continue regardless of short-term financial consequences.

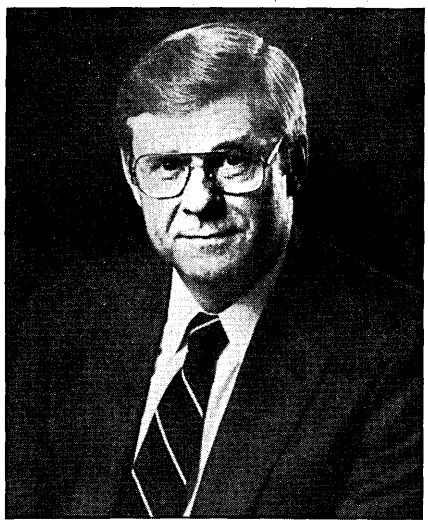
More painful to Prime employees, and perhaps more important than moving iron to colleges, are Prime personnel policies and practices. Former Prime executives report that the previously autonomous field managers are now little more than overpaid salesmen. Henson first responds by explaining that authority and responsibility were decentralized for support functions such as legal and credit checks on proposed sales contracts, but later admits that more substantive changes were made.

"I don't deny a natural tendency for people to feel that tighter coordination equals centralization," he says. The widespread discounting of the past was ended, he notes, because it was not equitable for certain Prime customers to receive larger discounts for end-of-the-quarter purchases than for orders earlier in the cycle. A standardized discount policy was adopted with little leeway for the field managers, he admits. "We did reduce the discount authority to achieve consistency and equity."

The defections as a result of the changes in authority will be especially painful for the company in the near future, claim those close to the situation. Star salesmen like Robert Claussen, once vice president for domestic sales; Jim Stafford, West Coast vice president; and Michael Simon, East Coast regional manager, are critical losses. "Bob Claussen was instrumental when they had to make a quota," says another former Prime official. "Somehow, some way, he always pulled in the orders."

Henson feels otherwise about the parade of departures. "Is is unfair to say there's been a mass exodus of people," he avers. "The attrition is no different than at any other time in Prime's history, or from general industry practice. I'm distressed by the misconception of what has happened . . . . We needed a strengthening of management."

To the dozens of employees who have left Prime over the past 19 months of the Henson regime, "strengthening of management" has meant importing IBM personnel. "They left others with a feeling that the best people at Prime were almost good enough to work for IBM," says an embittered former executive, not one of the "involuntary" resignations that Henson mentions as part of the strengthening process.



JOE M. HENSON, former IBM executive, is struggling to keep Prime Computer on the fast track.

Six former IBM employees are now senior executives on the Prime payroll, along with a handful of old regime personnel elevated to officer positions in the legal and financial areas. "I know there is con-

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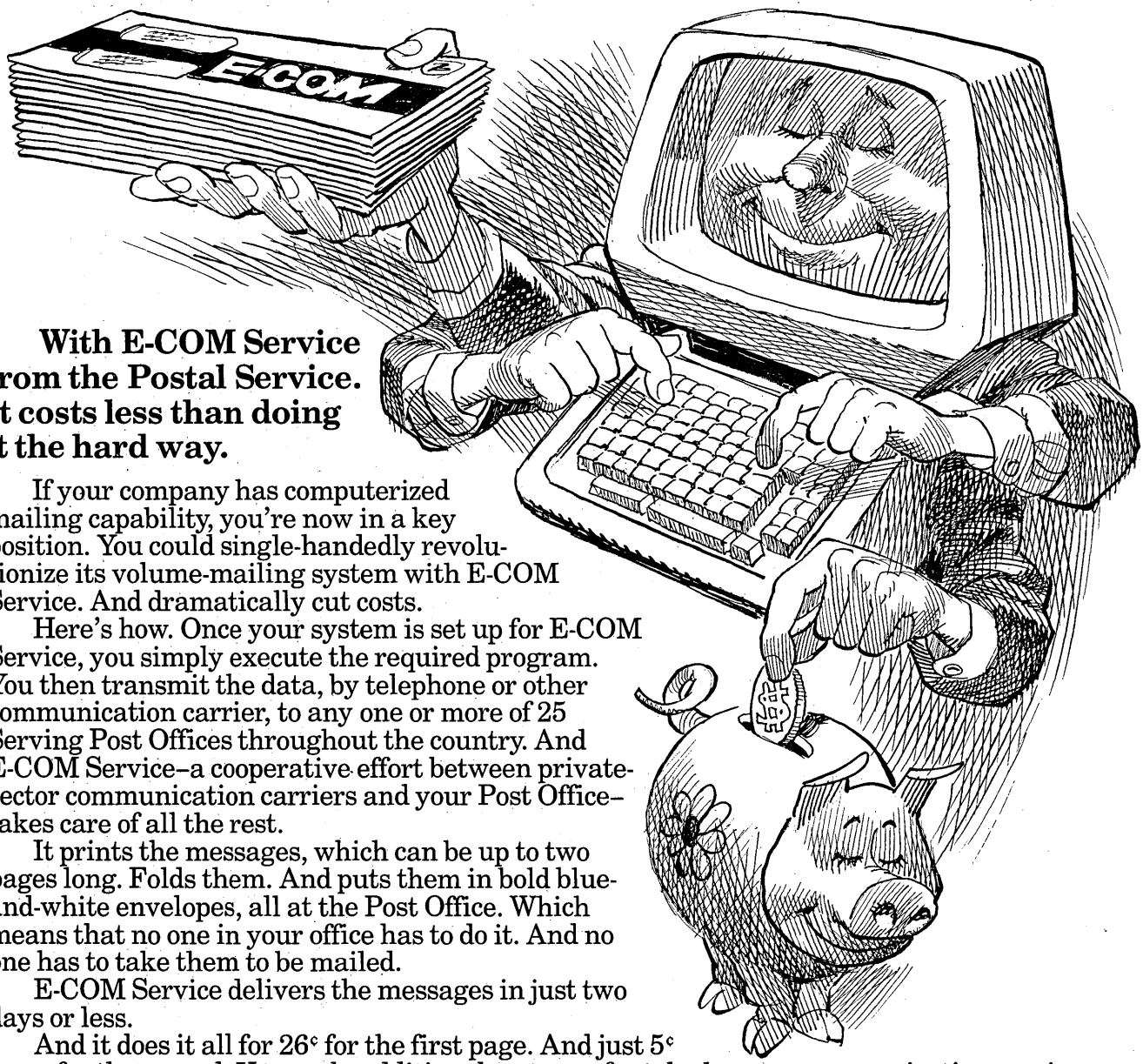

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cern about [the fact that] I am interested in people whom I have closely observed," Henson concedes. "I believe that there is a risk if you hire from the outside. While I do believe in hiring from within, it is better to fill jobs with people I have observed."

The defections from the marketing ranks in part led to the unpleasant earnings report last spring, contends one former Prime executive, echoing a view widely held along Route 128. Henson explains that the 20% decline was due to external factors. "While there was a strong order rate, we began to encounter difficulty in closing sales agreements for larger systems at the end of the quarter," he says, adding that the delayed deals were a "surprise" to him and other senior managers. As for the sniping that the defections damaged the highly regarded internal financial controls and information network, Henson heatedly replies, "That statement has no resemblance to reality. We continue to have excellent management and controls."

Any more surprises this year? In the DATAMATION interview, Henson initially said that 1983 "could be a very good year, possibly an increase over 1982, but it would take a strong second half." Later he conceded that revenues and earnings for the second quarter would "probably" fall short of last year, making a full year's earnings decline even more likely. He noted that "sales and orders on the books are ahead of last year, but it depends on the economic recovery. I don't see the big increase in capital spending yet, though it is forecast."

After a decade of unblemished growth, Prime Computer has entered a more mature adolescence. The entrepreneurial, shoot-from-the-hip operating style of the past has evolved into a more staid establishment. Sighs one former manager, "Prime was a great company, but it will never be great again. Good, maybe, but never great."

—Larry Marion

COMING BACK TO GROWTH

With a new parent and a new family of systems, Cado is hoping to regain its earlier momentum.

Ranked as one of the country's fastest growing companies in 1979, 1980, and 1981, Cado Systems, Torrance, Calif., lost momentum in 1982.

Now it could be coming back with a little help from a new parent, Continental Telecom Inc. (Contel) of Atlanta, Ga. With Contel's resources and a new family of trilevel microprocessor-based business sytems it introduced in February, Cado is projecting a fourfold increase in sales growth in the next five years.

During 1982, the company lost its founder, George M. Ryan, to retirement. He continues as director of Contel. He was succeeded by William B. Patton Jr., who joined the company in February 1982 as president and chief executive officer. Patton moved to Cado from Ampex; earlier, he had held senior positions at Honeywell and MSI Data.

Patton spent 17 years at Honeywell and his mainframe background shows when he talks of how he wants Cado to be perceived. "We're in the computer business and we want the world to know what our capabilities are," he says of a company that initially concentrated on selling to small businesses.

"We have a customer in the plumbing business who asked when we were going to come out with a 16-bit machine. It's an aberrated market. We've got to tout capabilities."

In terms of capabilities, he claims a number of firsts for Cado, among them the recognition that the microprocessor was really a computer and not just a logic element and that the floppy disk was a viable permanent computer storage medium. "And we've had an electronic mail package and integrated financials since 1979."

Cado was founded by Ryan in 1974 as Cado Computer Associates, a partnership that developed its first product, a computer *a*ssisted *d*ocument *o*riginator. Cado Systems became active in 1976 and since then has sold more than 11,000 small business systems. The company got into the desktop market in 1980 with its C.A.T. I (computer aided tutor), a self-teaching desktop system, which was followed in 1981 by the C.A.T. II and in 1982 by the C.A.T. III. During 1982, the firm developed the modular 16-bit Tiger ATS family it introduced in February.

"We will support any socially acceptable operating system."

"The principal innovation of the Tiger," said Patton, "is architectural. One or more microprocessors at each of three levels perform preallocated system functions and operate interactively with microprocessors at the other levels. There are no interrupts to add to system overhead and degrade response. System efficiency is ensured by maintaining an optimal workload for each processor. As terminals or other devices are added, additional processors are simply plugged in to maintain performance levels."

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There are three types of processors in the system: the transaction processor, the intranet processor, and the control biprocessor. Each has its own dedicated private Random Access Memory (RAM) and each also shares a global memory ranging from 256KB to 1MB of addressable RAM.

Each transaction processor incorporates a 16-bit Intel 8086 to handle transactions for up to eight terminal devices, each operating at up to 19,200bps. The transaction processors also support concurrent asynchronous or bisynchronous communications with a full dataset interface.

The internet processor also is based on an Intel 8086 and serves as a system resource manager and resource scheduler. The control biprocessor uses a 16-bit Intel 8089 dual channel processor that interfaces to the storage devices.

The Tiger family uses a proprietary operating system that supports Cadal (a Cado language) and COBOL. Patton said the company is working on a Unix implementation and will then look at MS-DOS, the p-System, CP/M-86 and others. "We will support any socially acceptable operating system."

—Edith Myers

GOVERNMENT

A TAXING ISSUE

How to tax software development fairly has the industry up in arms against the Internal Revenue Service.

It would be just one paragraph among the millions of incomprehensible words in the Internal Revenue Code. Seven seemingly innocuous sentences that appear no more harmful than all the others that govern who pays how much to the government.

But just try to tell that to the computer and electronics industries. Go ahead. They dare you. To these two and numerous other groups, the seven deadly sentences represent nothing less than the potential end of U.S. technological leadership on this planet.

"Burdensome, gratuitous obstacles in the way of U.S. firms" was one of the kinder industry descriptions at a recent IRS hearing on the proposed amendments to Sec. 1.174-2 of the income tax regulations. Thirty-three companies and trade associations appeared to tell the IRS where it could stick its proposal. Whether the IRS will heed that advice, or any other, remains a mystery. The proposal has sat immobile since it first appeared in the Federal Register on Jan. 21. The service has three choices: write off the whole affair as a bad idea whose time never came, add a modified version of the proposal to the regulations, or let the current version see the light of the code. For the myriad complainants, two of those three are bad. Only the first one counts. But it's the second that's going to happen.

At issue is Sec. 221 of the Economic Recovery Tax Act of 1981, which provided a tax credit for incremental research and development expenditures. Under the credit, a taxpayer may directly reduce his income tax liability by 25% of the amount by which his current year's research expense exceeds the average of the previous three years. In drafting the credit, Congress adopted, with some limitations, the definition of research used in Code Section 174, the section which since 1954 has allowed a taxpayer at his option to take an immediate deduction for research expense or to write it off over a period of up to five years.

The treatment of software development was resolved in a 1969 IRS ruling that determined that software development expense may be given treatment "similar to" expenses under Sec. 174. Because software was relatively new and different, the IRS, as is its wont, was not thrilled about issuing a blank check that would allow software development the same treatment as research. You never know where there may be an extra dollar or two to be collected down the line.

All concerned believed, with good reason, that the "similar to" ruling had settled the issue. All concerned save one. Now that a credit could be claimed, the IRS suddenly became interested again. There's gold in that software, and we want to get us some, the service said.

Thus cometh proposed regulation 1.174-2(a)(3), which gets to the point immediately. "Generally, the costs of developing computer software are not research and development costs within the meaning of Section 174." Boom. No research, no development, no tax credit. It's enough to drive a man to hardware.

But do not abandon all hope, ye who would create new programs. There are a few glimmers of light within the darkness of the deadly seven. "Research or experimental expenditures" does include the programming costs paid or incurred for new or significantly improved software. But the term excludes costs paid or incurred for the development of software the "operational feasibility of which is not seriously in doubt," as well as the costs of modifying previously developed software programs, such as adapting an existing program to specific customer needs or translating an existing program for use with other equipment.

Whether software is "new or significantly improved" will be determined with regard to the computer programs itself rather than the end use of the program. Thus the costs of developing a program to perform economic analysis that involves only standard or well-known programming techniques are not research or experimental expenditures, even if the economic principles embodied in the program are novel. If the programming itself, however, involves a significant risk so that it cannot be written, the costs of developing the program are research or experimental expenditures, regardless of whether the economic principles or formulas embodied in the program are novel.

"It came as a complete surprise to the business community when the proposed regulation took the position that generally software development expense does not qualify under Section 174, and that only certain limited programming expense qualifies for the credit," says Bill Modahl, manager of tax affairs for DEC and chairman of the tax committee of the Computer and Business Equipment Manufacturers Association (CBEMA), one of the groups spearheading opposition to the regulation. "This not only jeopardized the tax credit, but raised the possibility that software development expense might not even be deductible—a position taken by no other industrial nation."

The question of software taxation revolves around the notion of risk, according to the IRS.

That's not the way it's supposed to be, according to the men and women who make the laws. Letters signed by 37 representatives and 16 members of the Senate Finance Committee have been forwarded to Treasury Secretary Donald Regan. Both contain the same message: the IRS can't read Congress' mind.

"The narrow scope of the regulations does not accurately reflect the intent of Congress in enacting the credit and would prevent the credit from fully serving the purpose for which it was created," wrote the representatives, led by Jim Shannon (D-Mass.) and Ed Zschau (R-Calif.), who is founder and chairman of System Industries, a Milpitas, Calif., producer of disk and tape storage systems. "Section 1.174-2(a) does not adequately allow for the product evolution and modification that are necessary to maintain competitiveness in many technological fields. The high-technology companies that are most likely to utilize Section 174 must have the widest possible latitude for the development and continued modification of both hardware and software products in order to remain competitive in the world market."

"We strongly believe that the regulations as proposed do not accurately reflect the intent of Congress when it enacted the R&D credit," the Finance Committee wrote. "This exclusion is directly contrary to the

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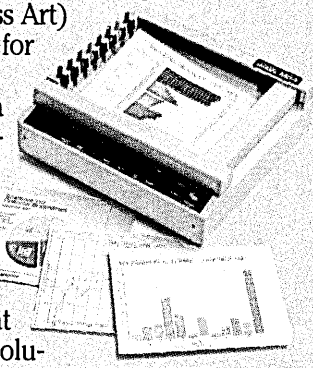

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clear intent of the Senate as well as the intent of the [House] Ways and Means Committee that software development costs generally are to be eligible for the R&D credit. The exclusion, combined with the treatment of these costs as not currently deductible, is not merely a technical tax policy issue, but is an issue that could have a potentially devastating impact on the international competitiveness of U.S. high-technology companies. If finalized, these regulations would undermine the whole purpose for which the R&D credit was enacted."

The hue and cry has resounded to the other end of Pennsylvania Avenue. The Administration, newly awakened to the economic benefits and political capital to be derived from putting its money where its mouth is regarding R&D, is giving the software problem high-level attention. The Cabinet Council on Economic Affairs is well aware of what's happening. What to do about it is another question altogether.

"It's no big secret that the service is concerned that the credit achieves its goals," explains a source very close to the situation. "People think there's this great intergalactic IRS conspiracy. The government isn't out to screw anyone. It does have to distinguish good R&D from bad R&D. There are no easy answers to that. In fact, there may be no answer at all.

"There are no tests that are enforceable. Theoretically the correct test is that if someone makes a computer do things better from the computer's point of view, it deserves the credit. If you're thinking about improving the computer, that's good. If you're thinking about Pac-Man, that's bad. But that's impossible to enforce. And industry hasn't been much of a help. Every test they've come up with has been 'we win, the IRS loses.' "

The computer industry clearly feels itself a loser under the current proposal. According to CBEMA attorney Paul Oosterhuis, his clients, who spend anywhere from 30% to 60% of their R&D budgets on software, would lose about $50 million. IBM counsel John Jones told the IRS that for Japanese companies the cost of incremental software development is 23 cents on the dollar. If the IRS followed congressional intent as to the R&D credit, software development would cost U.S. companies 40 cents on the dollar. Under the proposed regulation, the cost would be 54 cents.

"The IRS' reasoning completely ignores Congress's clear concentration on the end product of software development and focuses instead on the method by which the software is produced," contends CBEMA president Vico Henriques. CBEMA claims that under the proposed regulation, a financial package implementing new accounting techniques would not be eligible for the tax credit if the product had been encoded in a standard programming language like COBOL. But it might be eligible if the coding were done in a new and unproven programming language.

The White House, newly interested in high-tech development, is giving the software tax issue strong attention.

"The IRS has based its eligibility requirements on whether the operational feasibility of the software is seriously in doubt," Henriques says. "It does not apply that standard to other products, nor should it. Business does not undertake projects that its own analysts predict will fail. This is clearly not what Congress intended."

The intent of Congress seems to depend upon whose brain is being picked. Zschau would have the IRS comprehend that hardware development, for which a tax credit is no problem, is inextricably linked to software development and the two are inseparable. If software is excluded from the R&D credit, he told IRS, "a major error" will have been made in the implementation of the legislation. He also told the tax men that if the controversy is over when software standing by itself qualifies for the credit, the answer should be "always."

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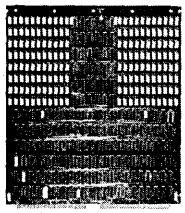

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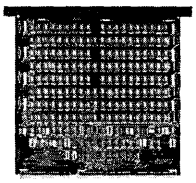

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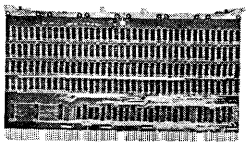

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The congressman contends that standalone software is becoming the industry standard.

"It [the regulation] makes you reflect again on anything but the most market-driven forces of action," says Lawrence Schoenberg, chief executive officer of AGS Computers and the 1982 chairman of the Association of Data Processing Service Organizations (ADAPSO). Schoenberg credited the 1981 law as a major reason why AGS' revenues leaped from $15 million in 1981 to an estimated $130 million this year. In one year, AGS spent $8 million to acquire a software product base and $3 million more developing new and enhanced products.

Now, because of the proposed regulation, AGS spent one third as much on R&D in its first quarter this fiscal year as it had in its last quarter the preceding fiscal year. MicroPro, a major software developer, estimates that its tax liability will increase by $500,000 as a result of the proposed regulation. The company will also have to reduce R&D expenditures by about $1 million (30% of present development expenditures).

"This will be a setback across the industry from which it may never recover," MicroPro attorney Ric Giardina told the hearing. "We need every incentive we can to produce software. This proposed regulation was made with the intent not to let us do that. I hate to say this, but out in the provinces [California, in this case], it looks like Washington is out to get us again."

"We definitely feel put upon," Schoenberg says. He got an ovation at the hearing when he pronounced the proposal "negative in tone, discriminatory, retroactively and preemptively punitive, and opportunistically revenue grabbing." He also accused the IRS of "gaminess and coy sophistry."

"Sophistry or solipsism was not the goal," countered George Mundstock, an attorney in the Treasury Department's Office of Tax Legislative Counsel. "All we want to do is ensure the credit is properly targeted. We want to assist only high-tech innovation. Having said that, it's very, very difficult to draw the line. We want to make sure that only those who deserve the credit get it."

Aye, there's the rub. It's hard enough to decide who gets one break. It may be impossible to decide who gets the greatest break for the greatest number. If an architectural firm buys a package, then spends $100,000 upgrading and modifying it to suit its particular needs, is that R&D deserving of a tax credit? Logic would say yes. The IRS would say no.

So the beat goes on. The IRS has no timetable for implementing the final version of the regulations. When they do appear, you can bet next year's refund they won't look like they do now. Seeking maximum input, industry groups have forsaken their individual fiefdoms and put their collective heads together for the common good. CBEMA, the Semiconductor Industry Association (SIA), the American Electronics Association (AEA), and the Scientific Apparatus Makers Association (SAMA) have formed a coalition to tell the IRS how they think the regulation ought to read. With the tax credit expiring in 1985, "I'm sure the IRS wants to get the regulation out by 1984," an informed source says. "Don't laugh. They may not make it."

The IRS proposal is "negative in tone, discriminatory, retroactively and preemptively punitive . . ." accused Lawrence Schoenberg of AGS Computers and ADAPSO.

"We recognize completely the importance of software," Mundstock admits. "But all software development is clearly not R&D. How do we distinguish a smart typewriter and VisiCalc from real R&D? We have to target the credit.

"We don't want to turn this into an across-the-board gift to the high-tech industry. That may be a good idea, but it's not what Congress intended."

Isn't this where we came in?

—Willie Schatz

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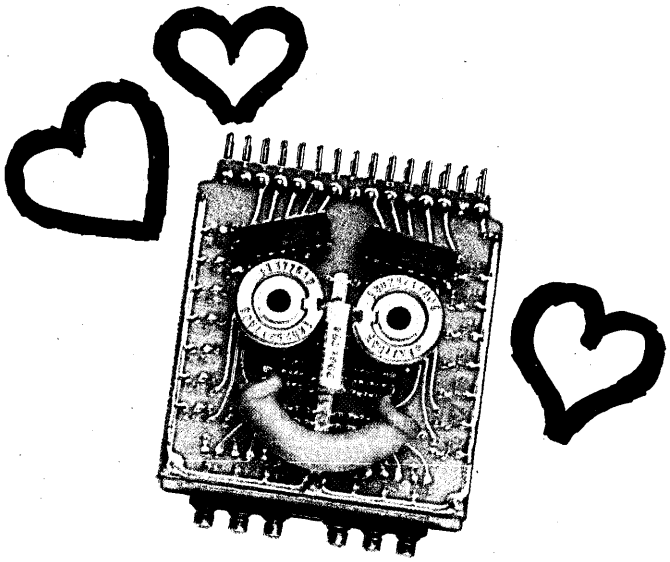

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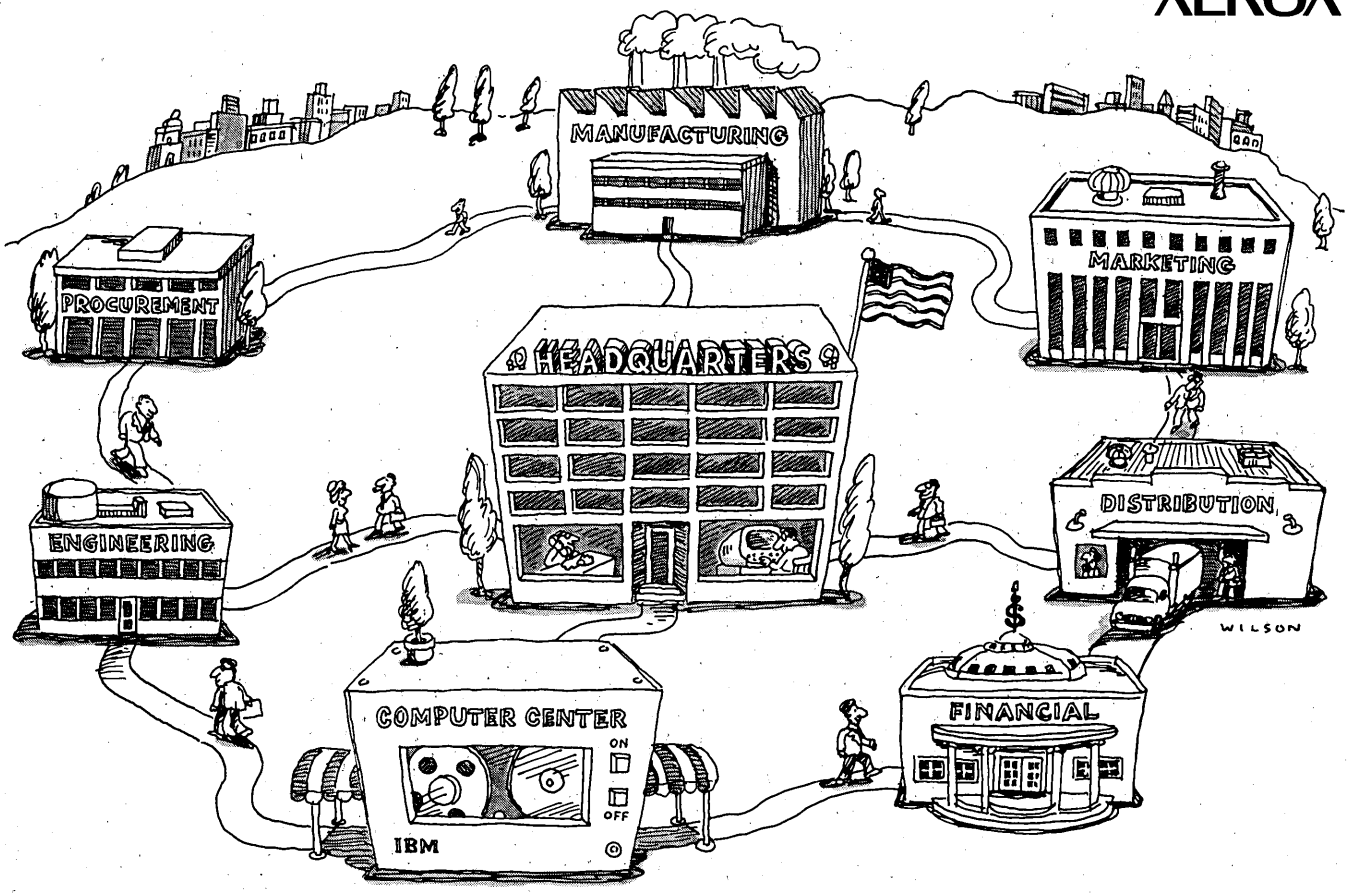

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TOO MANY DRUMMERS

Recent federal government reports spotlight the country's lack of information industry policy.

The Commerce Department has recently put into print what much of the information industry has been talking about for some time. The old U.S., she ain't what she used to be. And unless she gets it together in a hurry, she never will be.

"Long Range Goals in International Telecommunications and Information: An Outline for U.S. Policy," a product of the National Telecommunications and Information Administration (NTIA), confirms that the U.S. government "is not functioning effectively in response to increasing international [telecommunications and information] challenges." "An Assessment of U.S. Competitiveness in High Technology Industries," brought to you by the International Trade Administration, like NTIA, a part of Commerce, says that "if present trends continue, an array of factors could contribute to a further decline in the competitive position of U.S. high-technology industries."

NTIA made its intentions known last November in the *Federal Register*. Asking for comments from the public, it received 44 submissions in 30 days. Most said the same thing: there is no U.S. telecommunications policy, there is no place to go to get help when you need it, and something had better be done about it pretty damn quickly.

"The U.S. government has undertaken false starts in seeking to prepare itself to respond to international telecommunications and information problems," NTIA contended. "Policy has evolved in piecemeal fashion. Problems have been aggravated by inadequate high-level attention and insufficient coordination among the diverse departments and agencies involved. The net result too often has been confusion, needless jurisdictional disputes, and consequent lack of adequate preparation—all of which place the United States at a serious disadvantage.

"Reexamination of our strategy and government organization for pursuing U.S. telecommunications and information is required," the report continued. "The interests at stake demand high-level attention and serious political commitment to ensure that U.S. interests are not compromised by default."

This is not the first time this subject has been broached. But historically there has been much more talk than action. Now there are those who hope this time will be different.

"I think NTIA has a fairly good handle on it now," says Jerry Dreyer, president of the Association of Data Processing Service Organizations (ADAPSO). "But I've been around long enough to know things don't happen overnight. This may be the report to do the job. If not, it will be the next one or the next one after that. The constant pressure has to cascade into something."

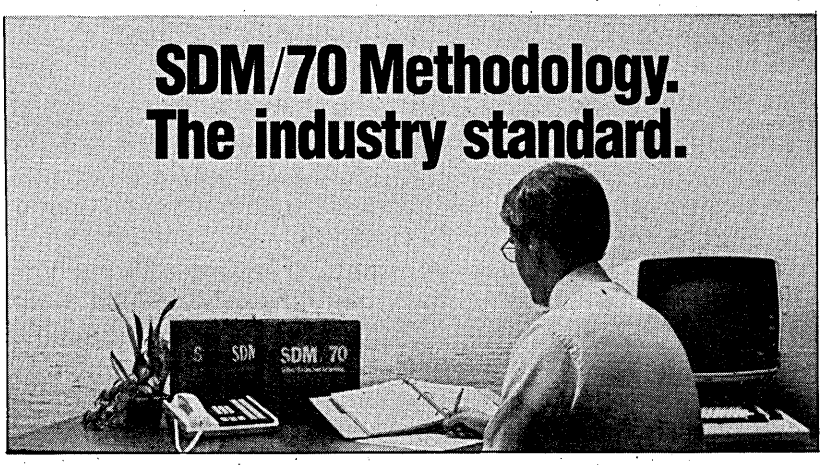
ADAPSO would like the result to burst forth as a centralized policy person or office within the White House sphere of influence, if not the building itself. With the Departments of State, Defense, and Commerce guarding their respective fiefdoms—all of which impact on international communications—like feudal lords, the chances of one office, one policy, are remote. ADAPSO described to the House Subcommittee on Government Information and Individual Rights what it is like for an American computer company to enter the international arena: "The United States enters discussions, debates, and participates in other fora involving international computer services with no real coordinated national policy and with many disjointed representations. As a result, independent American firms do not have the support of a unified national policy when they negotiate with foreign governments."

"You can't blame State, Commerce, and Defense for not wanting to give up any territory over telecommunications."

The Computer and Business Equipment Manufacturers Association (CBEMA) told NTIA much the same story, accusing the executive branch agencies of lacking the experience and background requisite to cope with issues of contemporary technology involving international channels of information.

"You can't blame State, Commerce, and Defense for not wanting to give up any territory over telecommunications," Dreyer admits. "They've got other things to worry about besides telecommunications. It hasn't been a high enough priority for them to get together. They probably won't, either."

But following publication of the report, Commerce Secretary Malcolm Baldrige for the first time deigned to appear before the House telecommunications subcommittee. He stressed the Administration's understanding of the issue to chairman Tim Wirth (D-Colo.) and colleagues. Whether they were convinced of his sincerity only they know for sure. Moreover, the State Department recently created the posi-



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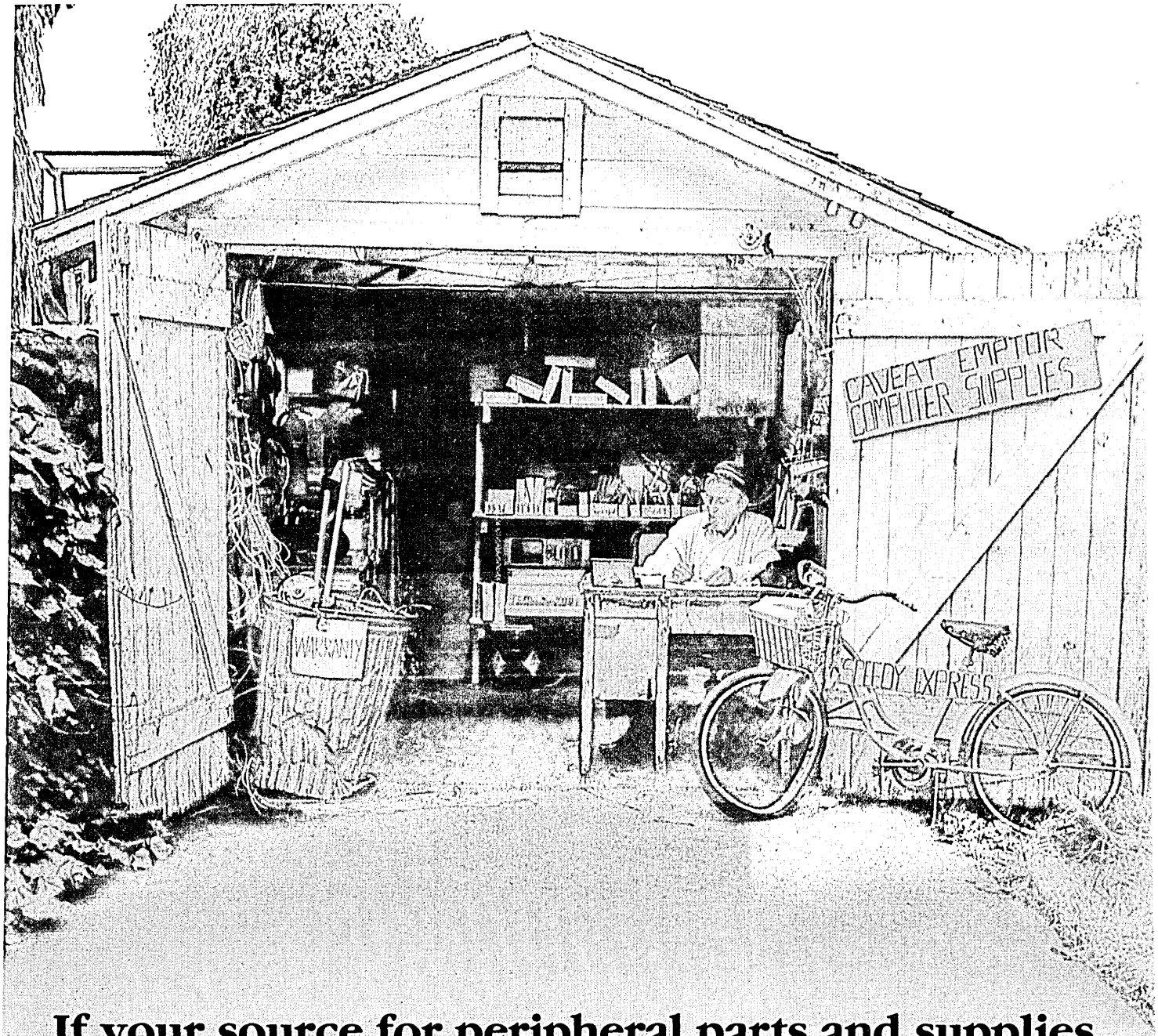

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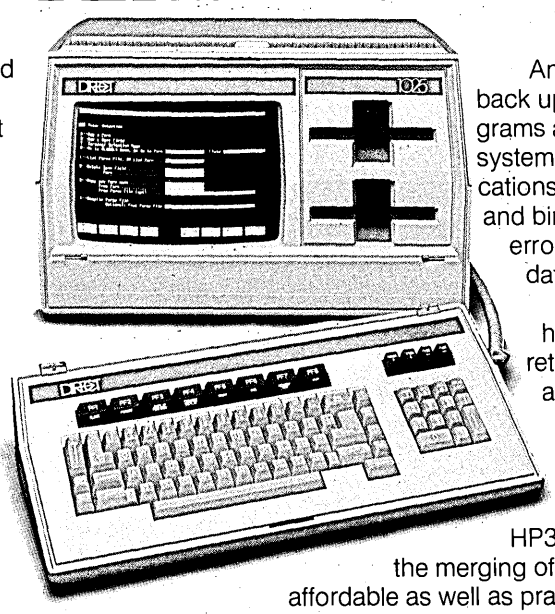

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tion of coordinator for international communication and information policy. The appointee, Diana Lady Dougan, will carry the rank of ambassador. That, according to her special advisor, Kenneth Leeson, who while at NTIA directed the development of the aforementioned report, should settle the jurisdictional squabbles once and for all.

According to the Congress, however, nothing of the sort will happen. Heeding NTIA's basic message that somebody—anybody—in the U.S. government should be in charge of these areas, whether in the White House or the Commerce Department, both the Senate and House have come up with ideas of how the U.S. ought to comport itself in the international telecommunications world. The Senate bill, S. 999, calls for a "special representative for telecommunications and information." That seems to be exactly why Dougan was hired, but sponsors Baker (R-Tenn.), Pressler (R-S.D.), Goldwater (R-Ariz.), and Hollings (D-S.C.) can worry about that. The House bill, H.R. 2527 (English, D-Okla.), would establish a special committee for the job, chaired by the U.S. trade representative. Baldrige's paeans aside, the Reagan Administration apparently wants no part of this or any other congressional creation in the field.

If Dougan's duties are in fact worth the paper on which they're printed, those seeking one voice, one policy, may have found it. Dougan will coordinate responsibility within the government for policy formulation and oversight, work with Congress, represent the U.S. to foreign governments and organizations, and serve as principal liaison with the private sector.

"Who's she going to coordinate? Herself?" asks a knowledgeable source

"Who's she going to coordinate? Herself?" asks one government official about the State Department's new information "ambassador."

from another agency. "If she coordinates State that will be a major accomplishment. Her appointment and the release of the report are coincidental. State would like people to believe it's assumed the leadership in this area. But there's no way it can be in charge when 60% of the world market is in the U.S."

"Dougan's job is to coordinate the executive branch in this area," Leeson explains. "Her appointment is a response to a clearly seen need on the part of the community. The potential is there to improve the situation. One way to determine if that will happen is the degree of cooperation she gets from Commerce and Defense."

That won't come easily. Commerce doesn't want to hear from State on trade issues, and Defense doesn't want to know from anybody on national security questions. So, after more than 300 pages, there's still a question begging for an answer: who's in charge here?

"To get anything done, the internecine warfare between Commerce, Defense, and State has got to stop," ADAPSO's Dreyer says. "This report has made them all realize there's a problem. And every meeting I've gone to has been getting better. If we don't get it in the first one, maybe we'll get it in the fifth, or the tenth. We'll make the rounds as long as we have to do to get a single policy office on this. This report's going to pay off because it's right in what it's saying."

What it's saying is that things are so bad that even the government, never mind the private sector or foreign governments, is not clear on which part of the government deals with international communication and information and has the authority to express the views of the U.S., whatever they may be.

"What's missing is not coordination, but coordinated decision-making, the development of a single executive branch position on an issue which is then accepted and followed throughout the Administration," NTIA writes. "This requires not only a person charged with obtaining various agency views and drawing an agency expertise, but also with the specific authority to arbitrate differences and finally determine the Administration's policy, a policy which individual agencies are not free to contradict, ignore, or undermine."

"This will not be one of those reports that everyone puts in the shredder," the agency source says confidently. "Look what's already happened with Baldrige's testimony and the House and Senate bills. Baldrige is very sensitive to this topic. It's the only reason everyone's talking about the establishment of a new Department of Trade.

"If the average person has no interest in this subject, why has [John] Naisbitt's book [*Megatrends*] been on the best-seller

"What's missing is not coordination, but coordinated decision-making."

list for so long? People know high-tech means jobs. The politicians know it, too. This is not a neglect the Republicans want to add to their list. The Democrats won't let it go, either. It's an affirmative kind of campaign issue. It's the lynchpin of the future. I can't believe it's going to go away."

"The opportunity is here," says Leeson, referring to Dougan's appointment. "Let's see how many people take advantage of it."

The counting has already begun.

—Willie Schatz

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NEWS IN PERSPECTIVE

APPLICATIONS

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Sperry Univac's Mapper software is finding acceptance as the company enters the timesharing business.

In the populous borough of Brooklyn, N.Y., firefighters have a new tool. Now, when they arrive at a burning building they already know if there is heavy equipment on any floor, whether the roof is steelplated, if dangerous chemicals are stored in the basement, and any other potentially dangerous characteristics of the fire's location. As a result, lives are being saved.

The new tool? A computer system calls AIDS (for automatic information dispatch system) that maintains a database of high-risk buildings.

AIDS is based on a Univac software package called Mapper that, according to Ernest Owens, director of the fire department's Bureau of Information and Computer Services, is helping all but one of the dozen or so departmental bureaus bring computing power to the hands of non-dp personnel. So far, a total of some 50 users in the department are running Mapper databases, he says.

Owen's department simply sets up and maintains Mapper; the users develop their own applications. Working with a staff of only three, Owen's right-hand man, Albert Alias, computer systems manager, trains and services the 50-plus Mapper users. They offer a three-day training program, but after that, the user is on his or her own. Alias encourages users to be independent—he wants them to solve their own problems—although there is a hot line for truly desperate users.

Among other things, Mapper is used for payroll, alarm assignment, inventory, requisition logs, fire investigation paperwork, and by the bureau of operations to track the number and types of fires that occur in New York City. Using Mapper, Owens keeps track of how much use the system gets—by whom, when, and what type of work is being done. When a user wants to expand, he must contact the bureau of information and computer services.

Owens predicts that "within 18 months to two years, 60% of the fire department will be 'Mappertized,' " leading to about 600 terminals citywide. To illustrate how fast Mapper use grows, Owens told of one fire department branch that was given a

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CIRCLE 55 ON READER CARD

terminal and one mode (mode refers to the largest unit of storage). Within four months this branch had expanded to four modes and six terminals.

In spite of Mapper, New York is still an IBM town, with most city organizations running Big Blue's equipment. Owens says, "We're not the best-loved people; we're known as *that* computing center." With some effort (and knowledge of data processing), Mapper can interface with IBM and also with the fire department's DEC Starfire system. This DEC software runs the department's computer assisted dispatch system.

Regardless of DEC or IBM, Owens is happy with Mapper, and calls it "the best thing since sliced bread," although the system is somewhat younger than carbohydrates. Developed in the mid-'70s by Sperry Univac, Mapper was designed for internal use in manufacturing operations control. It runs only on the Series 1100 Univac computers.

Mapper cannot be bought outright but is available through leasing contracts with Sperry. Running on the 1100/60, Mapper is priced at $978 per month, with a minimum 12-month contract. Most often, users take five-year contracts. The price is the same on the 1100/80 or 90, but there is an additional $196 a month charge for optional extended support service.

The first generally available version of Mapper was level 28. Most have been upgraded to level 29, the current product. Some sites are using level 30, which has not been officially released, but is still in the beta test-site category. This new level has the additional capabilities of word processing and graphics, but there is a catch—Sperry offers no documentation yet, and support is sporadic at best, so users are on their own. Displaying true Yankee ingenuity, some level 30 users are developing their own user networks to discuss and solve their problems, independent of Sperry.

How does Mapper work? The online system has an integrated relational database. It is organized as a filing cabinet might be. The mode contains types that correspond to filing cabinet drawers. Each type holds reports or data. A system can maintain hundreds of modes, each of which contains up to eight types. A type can hold thousands of reports that usually consist of up to 500 lines.

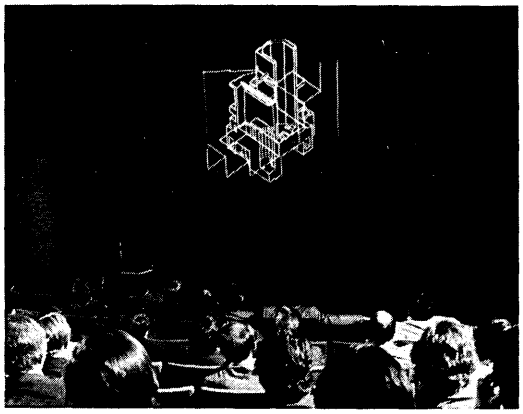
Fire departments, railroads, and metals companies are among Mapper's many users.

Every user has his own ID and is privy to certain modes, depending on assigned status and privileges. Just a few of Mapper's basic functions are display, add, delete, duplicate, search, update, match, reformat, and append report. There is also message switching, totalize, batch file retrieve, and the run functions, which allow entire applications to be done with a single command.

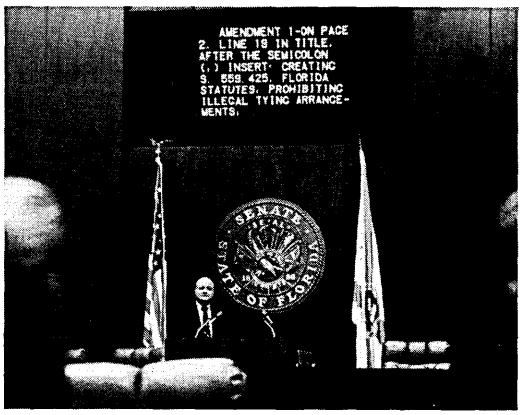
Users can also hit a Help button, and the system will explain step by step what the user needs to review. The commands to operate Mapper are in English, which is partly why users require only two or three days of training on the system. If a user wants to learn the run function, another couple of days of training are necessary.

Although Sperry developed Mapper for its own use, word of the new tool spread quickly to users. The first leasor was Santa Fe Railway in Topeka, Kans. In 1976, Santa Fe had problems in some of its big train yards. It got wind of the success Sperry was having with Mapper in its Twin Cities manufacturing facility. Santa Fe dp people went to observe Mapper in action, and then brought it into their own Information Systems Department (ISD) for closer evaluation. They decided to go with it. ISD introduces and maintains the systems; users create their own applications.

Some of those users are train operators. Some 68,000 freight cars are tracked by Mapper, providing information on each car's weight and arrival times. Since 1976, applications have spread to management,



COMPUTER-AIDED DESIGN displayed by General Electric projector is viewed by Engineering Society of Detroit.



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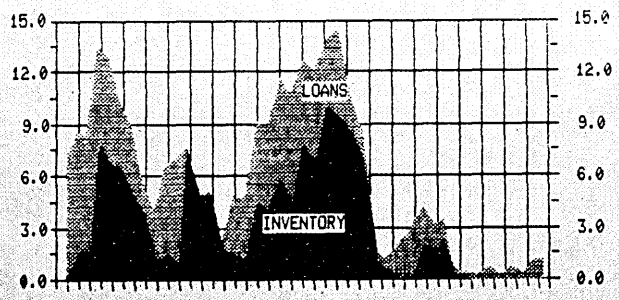

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accounting, communications, freight car routing, and end-yard management, which account for only part of the approximately 2,400 terminals that now use Mapper at Santa Fe. About 99% of these applications are end-user developed. Santa Fe runs its computers 24 hours a day, 365 days a year. The company guarantees its users 98.6% uptime, and the numbers have not yet fallen below that. The railway has six Mapper systems running live and five backups for development and testing. To date, it is Sperry's largest user.

Sperry has apparently not pushed the marketing of Mapper very heavily, but the program has gained an enthusiastic following.

Sperry has kept Mapper promotion rather low-key so far, but the system's popularity keeps growing. Another very large Mapper user is the Pennsylvania Department of Welfare, in Harrisburg, Pa. Janet Legore, assistant director of the Mapper unit, says about 200 different applications have been developed in-house by end users. The department has 800 terminals that regularly use Mapper. Because several people share each terminal, Legore estimates there are about 3,000 Mapper users.

Like Santa Fe, this organization, too, began small. In June '81, the Welfare Department started an internal training program for executives and middle managers on management development. They needed a system, quickly, to keep track of the program and its enrolled membership. They talked to dp within the department, but it couldn't deliver fast enough. Since the department already has an 1100 mainframe, they went to Sperry and invited in a couple of Sperry's programmers, who then designed a tracking system using the software. The first large project they put up with Sperry's help was a program that distributes almost $100 million in energy assistance funds to needy Pennsylvanians. Mapper was tested to see if it could handle the project's needs. Development began in May '82 and implementation took place in September. Legor said the plan was "if Mapper can handle this, we'll open the floodgates. It did, and we did."

Another program running on Mapper is a child abuse hot line. This contains 30,000 records and used to be a manual system. Now, instead of having a mass of "little yellow cards," the department has on-line access to all abuse cases and their status.

The Department of Welfare is using an 1100/84, running Mapper level 29, and an 1100/82, testing level 30. Until January, the department had two Sperry programmers working with it full time. Now there's only one, and he'll be leaving shortly, says John Gibbons, director of office information systems. He adds that users love Mapper, but, he notes, before implementing jobs "you must make sure the application matches the software. We do a lot of large batch processing on COBOL, using the back end of the processor. Mapper provides real productivity gains when used for on-line processing."

The system can be found in many other businesses and organizations, including FTD (Florist Transworld Delivery Association), where it is used in the main office to monitor 9,000 members across the U.S.

Sperry says some users bought Series 1100 computers just to run Mapper, but new users needn't go that far.

At the Florida State Department of Game and Freshwater Fish Commission, Mapper is used for maintaining arrest and confiscation records, as well as financial planning and several other applications.

The Tasty Baking Company, Philadephia, Pa., uses the system to help keep its distributors supplied with adequate quantities of baked goods. In London, England, the Abbey National Building Society is running Mapper as a personnel management

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information system to provide data such as salaries, pensions, and education on 8,000 staffers. It also maintains a customer information file, and plans more applications in the financial, purchasing and local management area.

Sperry says some users bought Series 1100 computers just to run Mapper, but new users needn't go that far. Mapper can now be leased through a new timesharing service. The Mapper Executive Information Service, officially announced and promoted last month, began leasing operations in January.

It is typical timesharing, providing the Mapper service as a low-cost vehicle to begin using the system. The host computer is in Blue Bell, and a national network is being installed. All the user needs is a terminal, printer, and telephone. Sperry rents the first two items to users, and they can receive them within a couple of days.

So far, the service offers only Mapper, but in the future other packages, such as "financial simulation for improved management productivity," will be available. (It is touted as a great problem solver for those who don't wish to invest heavily in hardware at the present time.) Sperry has customers already; as of early April, 30 companies were committed to the service, 20 were on-line, and about 150 more prospects were lined up.

Customers must sign up for a minimum 90-day contract. The charges, based on I/Os, are $7 per 1,000 I/Os processed and 7 cents per 1,000 lines stored each day. There is also a $250 per month license fee, and a one-time charge of $20 per terminal for registration. For those renting a terminal and printer from sperry, the cost is about $480. The minimum monthly fee is $500—

The Welfare Department needed a system, quickly, to keep track of a training program and its enrolled membership.

which includes the above $250, but not the equipment rental fee. Monthly bills usually average between $1,500 and $2,000.

Mapper service users have also designed their own applications. One, the U.S. Air Force Logistics Command at Patterson Air Force Base in Dayton, Ohio, is renting a printer and terminal to do real-time interrogations. Right now, that is the sole application, but the command may develop more in the future. The Air Force entered its contract on Feb. 1. It runs until Sept. 30. Carol Artley, an Air Force computer programmer, says Mapper is expensive, perhaps too expensive. But the Air Force there has tried other systems that profess to do what Mapper does, and hasn't found any satisfactory.

The Logistic Commands' database is approximately 3 billion characters, mostly stock numbers. Mapper is the first system that has quickly handled this load. Again, the users are not dpers, and they've found the system easy to use. Artley adds that the timesharing has been reliable.

Another user, Titanium Industries, in Fairfield, N.J., started using Mapper as a result of calling Sperry to buy a mainframe.

Jamie Chesman, foreign trade consultant with Titanium, a metal fabrication and resale firm, described the company's two main Mapper uses: "In the metal industry, you must retain records on every piece of metal obtained. Lots of data, immediate access to them, and printed reports on the stock are necessary, quickly. We used to use about 70 notebooks, which led to numerous errors, and was very slow. Secondly, the materials department in Fairfield is responsible for all purchasing at that facility and others worldwide.

"Status reports are necessary for salespeople, production people, et al. Using Mapper, we have an on-line purchasing records, with all the details of whom we bought from, what was purchased, when, and what became of it," she says. A third, long-term possibility to put production at Mapper.

—Deborah Sojka

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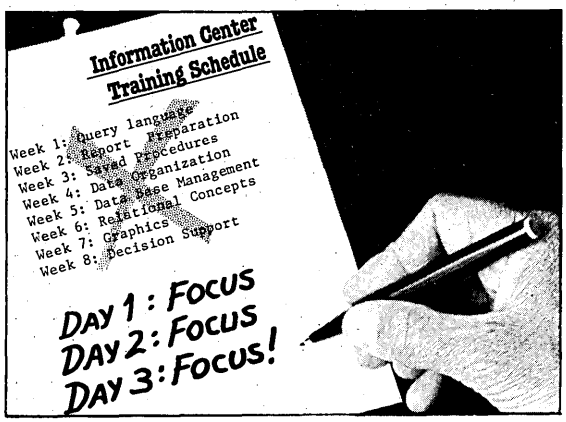

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NEWS IN PERSPECTIVE

BENCHMARKS

ENTRANCE: LM Ericsson, the Swedish telecommunications manufacturer, began a heavy marketing push into the U.S. PBX, computer terminal, and banking systems markets last month. The company, which has been quietly marketing wire and cable, some data processing equipment, and an unsuccessful office system purchased from Citibank, has renamed its U.S. systems marketing arm Ericsson Inc. The company takes over from the Anaconda-Ericsson Communications division, which is a 50-50 joint venture between the Swedish manufacturer and Atlantic Richfield's Anaconda copper subsidiary. The Greenwich, Conn., subsidiary's premier product is the MD 110 PBX, which handles data and voice in digital fashion. The system has been sold in Europe for four years and is already finding use by MCI in this country. The firm's Alfascope 41 is a 3270-compatible terminal featuring personal computing options and a number of ergonomic features Ericsson hopes will appeal to U.S. users. The firm expects to sell the terminals for between 5% and 15% less than IBM's comparable machines. A new terminal, designed to compete with IBM's 3178 device (price: $1,700), is to be introduced in the U.S. by the end of the year, an Ericsson spokesman said. Finally, the model 2100 banking systems will be aimed at branch office automation situations at commercial banks. The company said it is currently investing some $3 million in software development to adapt the banking system to U.S. markets. Ericsson last year purchased Facit, an office equipment maker, which it hopes will help it in the office systems market. Meanwhile, the firm expects to sell some 3.5 million new shares in a U.S. offering, which would bring the total U.S. ownership of its shares to about 30%, according to Hakan Ledin, executive vice president of LM Ericsson, Stockholm.

NEW BOOK: The folks that brought you the *Whole Earth Catalog* plan to bring out a guide to software available for personal computers. Point Foundation and Doubleday and Co. have signed an agreement for the publication of a *Whole Earth Software Catalog* and a *Whole Earth Software Review* quarterly. The two publications, backed by a $1.3 million advance from Doubleday, will accept no advertising and will feature primarily software package reviews by users across the nation. It is understood that contributors will be able to submit their reviews over a public network to Point's Sausalito, Calif., headquarters. Says editor in chief and Point founder Stewart Brand, "We believe that existing software directories and magazine product reviews are not much help to the typical personal computer owner. Directories just list what's available and product reviews focus on software features. What people keep wondering is: what can I do with a program and how will it make my work or personal life better?" The advance from Doubleday is claimed to be the largest one ever offered for a trade paperback. The money will be used to develop the network of reviewers and editors, Brand said.

HARDBALL: That's what William C. Norris, chairman of Control Data, thinks the U.S. should begin playing in its conflict with the Japanese over sagging U.S. leadership in technology and Japan's trade restrictions. Norris, addressing his company's shareholders in early May, proposed that Japanese graduate students be kept out of U.S. graduate engineering programs until the Japanese electronics industry lifts trade restrictions. Norris, known for his free-trade stance, denied that he was racist or "an imbecile" for suggesting that students from a particular country be prevented from gaining skills and knowledge at U.S universities. Norris has not formally proposed his plan to the federal government, which he criticized as "paralyzed and unable to respond aggressively to the Japanese threat." Control Data has had direct experience with the restrictive Japanese trade laws in its attempt to open a timesharing services office in Japan, an exercise that took nine years to complete. Norris also took the opportunity at his annual meeting to encourage cooperative R&D among U.S. corporations.

ADA LINE: After seven months of wondering when a hardware manufacturer would learn to speak its language, the Department of Defense has found its firm. The winner is Data General, which with Rolm Corp. last month announced a new family of Ada development systems using Rolm Ada software and DG's full line of 32-bit Eclipse computers. Ada is designed to be the programming standard for all DoD weapons systems. Using the new language will save the DoD a reported $24 billion in software costs by the year 2000. DG, which becomes the first major computer vendor offering a complete range of Ada development tools, will also offer the Rolm Ada Compiler and Ada Development Environment (ADE) on the Eclipse line. The compiler has passed all available tests and is expected to undergo formal validation by DoD's Ada Joint Program Office some time in the second quarter of this year. The two companies will offer the new systems under a joint marketing agreement. "By using the Ada Work Centers, users not only create Ada application programs, but also generate executable Ada programs for Rolm deployable 16- and 32-bit military computers," said Dennis Paboojian, vice president and general manager of Rolm's Mil-Spec Computer Division. "With this announcement, the DoD now has capability previously not anticipated before late 1984 or early 1985." The question is how soon DoD will use that capacity. "We can't announce any new projects because of this announcement, but it does give us the opportunity to do some things," a DoD spokesman said. It also gives DG and Rolm, which last October announced the first complete Ada solution, the drop on their competitors. The Army and Air Force are working on Ada systems, but they are at least 18 months away from becoming operational. The only private sector vendor reportedly close to a working Ada system is Western Digital, and it's rumored to be at best six months from completion.

Other vendors, including IBM, are working on Ada. But none can speak it yet. "We could take an order for this tomorrow," said Bruce Noel, manager of new business planning and development for Rolm. "We have had a number of inquiries from the private sector. We think we can sell it even outside DoD. Prime contractors, like Lockheed and Boeing, are going to have to deal in Ada if they want DoD's business. Right now we're the only place to get it." So when DG and Rolm talk, they expect everybody to listen.

ADMITS: Paradyne Corp., Largo, Fla., accused by the SEC of using "fraud and deceit" to win a $100 million Social Security Administration contract, acknowledged that it had indeed displayed to SSA officials a "mock-up" of a proposed data encryptor included in the contract bid. The SEC has said in court documents that Paradyne showed "an empty box with blinking lights" in place of a working encryptor. Paradyne chairman and president said in a letter to company shareholders that the nonfunctional box was never portrayed as a working system but rather displayed for its "aesthetic value." A true encryptor was provided to SSA for evaluation within 30 days of the mock-up being shown, he added. Paradyne denies all the SEC's charges and has filed a motion for dismissal of the case. Meanwhile, seven stockholders have filed suit against Paradyne as a result of the much-publicized SEC case.

GIGAFLOPS: NEC Corp., the Japanese computer maker, threw its hat into the supercomputer arena with the introduction of a machine it claims will perform 1.3 billion floating point instructions per second (FLOPS) when it is delivered two years from now. The so-called SX-2 will be joined by a 570 megaFLOPS SX-1 computer, the firm said. No plans have been made for U.S. marketing. NEC's introduction follows closely the entrance of rivals Fujitsu and Hitachi into the supercomputer market with machines they expect to deliver around the end of this year. NEC's machines are to be composed of liquid-cooled processors that, boasting 6-nanosecond cycle times, use a pipelined architecture.

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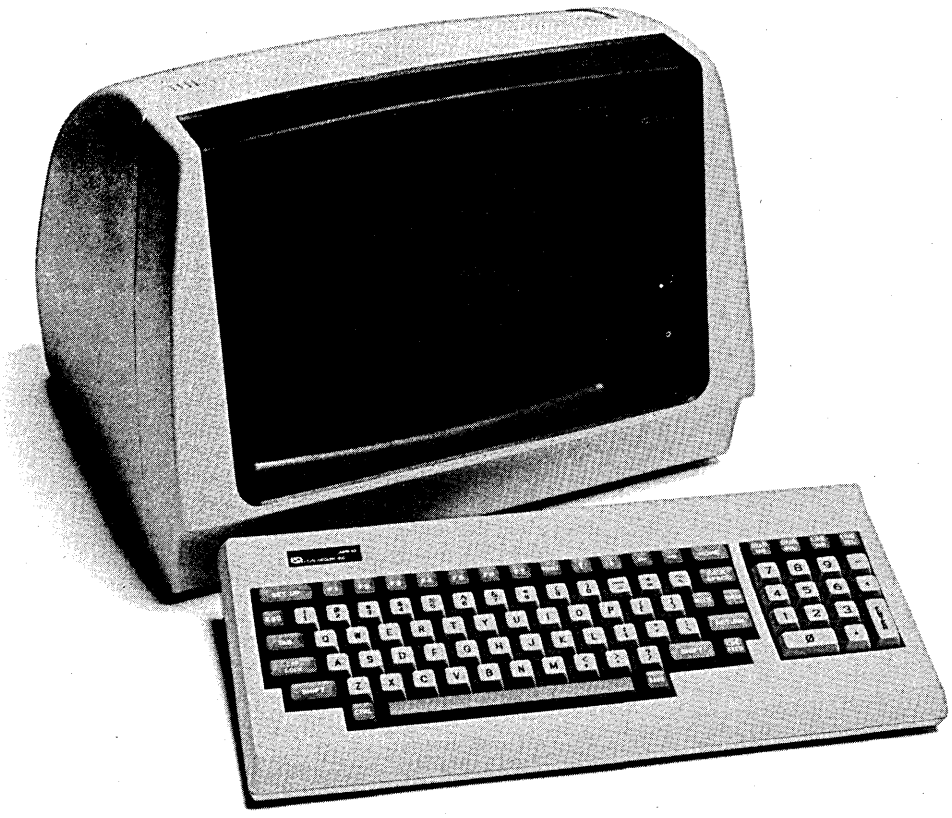

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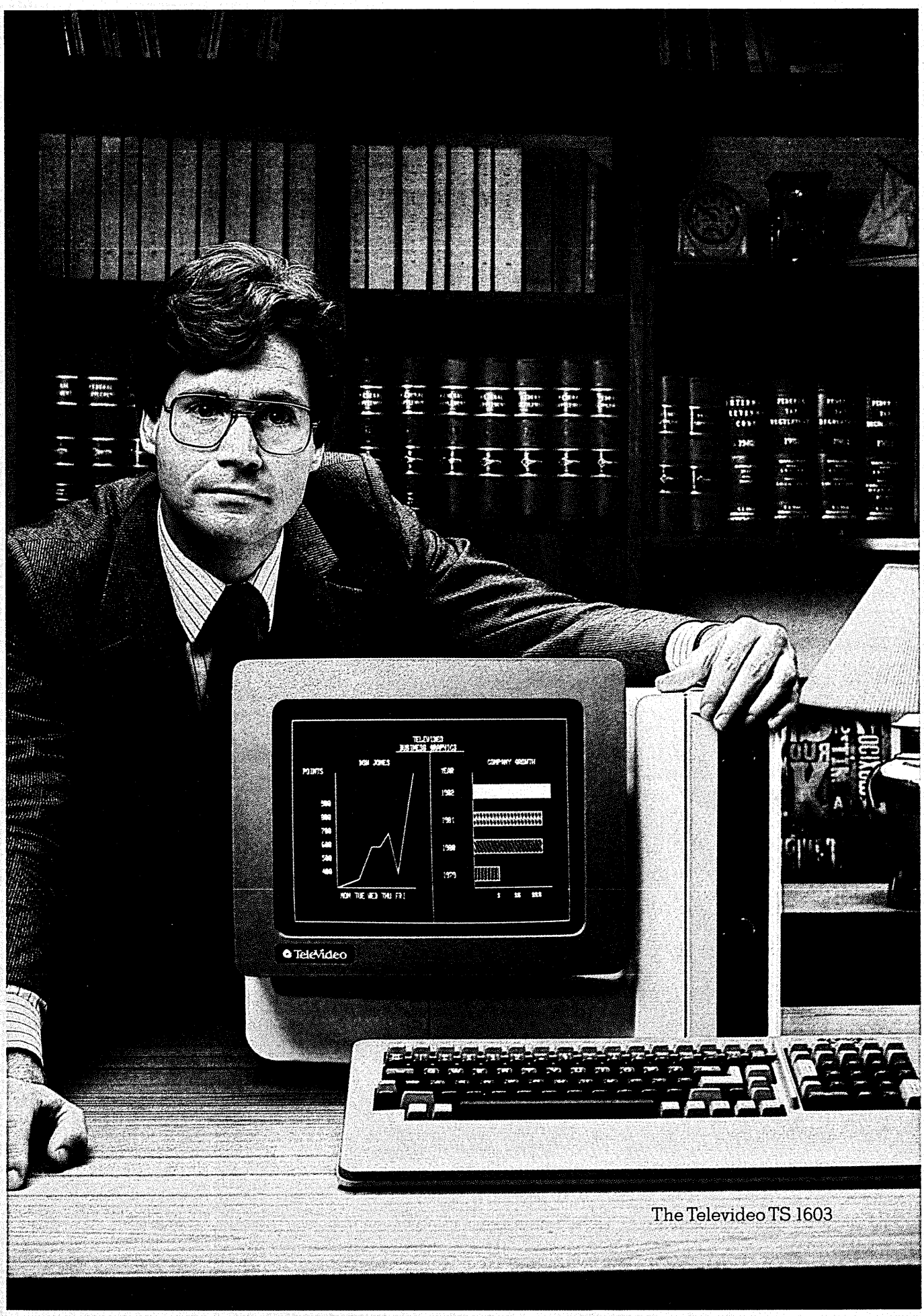

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CIRCLE 62 ON READER CARD

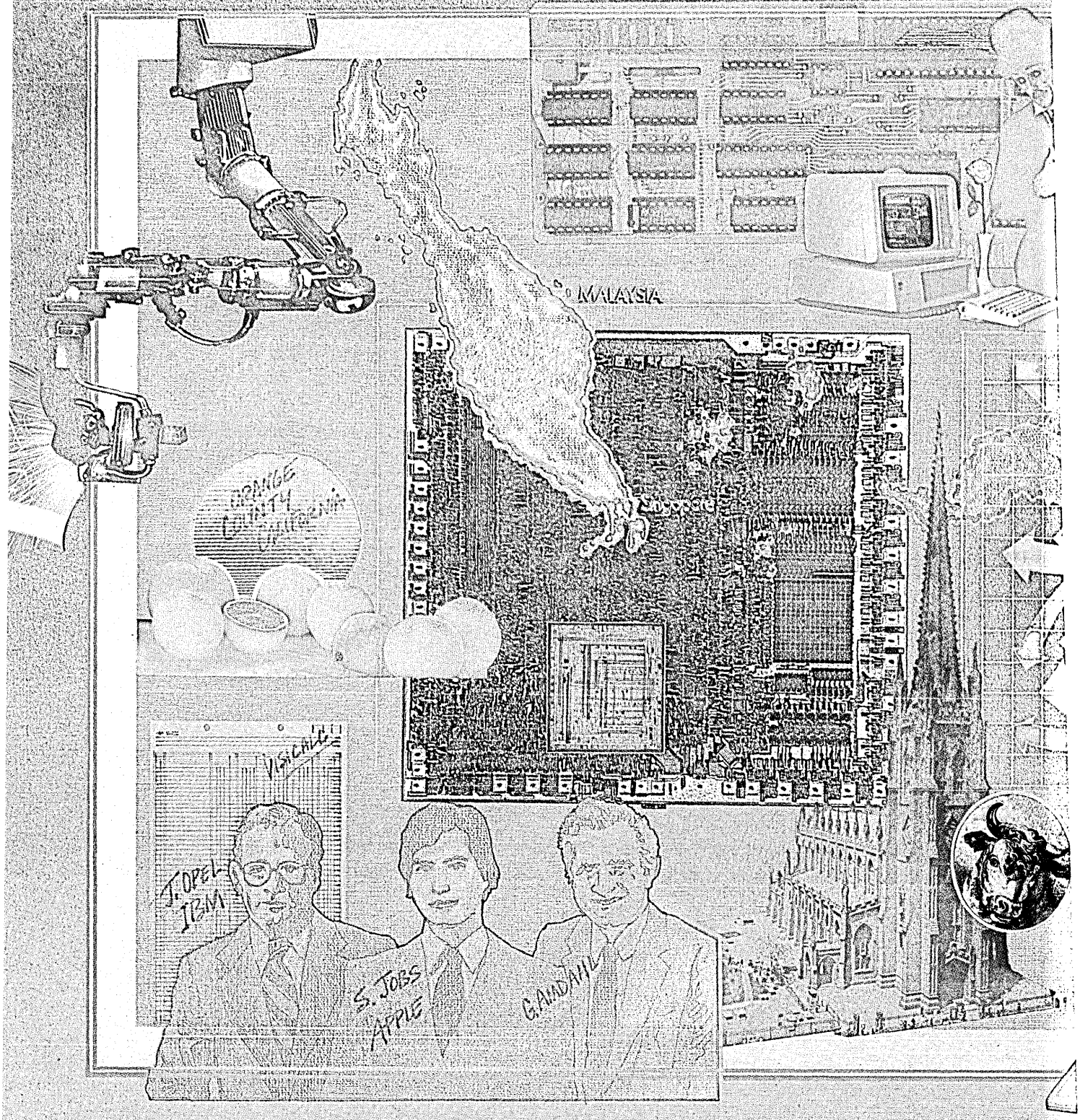
Stocks soared, but 1982 also saw the dp industry wracked by layoffs and plummeting profits.

A YEAR OF LIVING DANGEROUSLY

by Laton McCartney

A well-known Texas-born novelist was once asked why he was rearing his children in New York City rather than in the suburbs. "Because," he responded, his tongue only partly implanted in his cheek, "if they can survive New York, they can survive anything."

The same might be said of the



computer companies that made it through 1982, a year in which the economy faltered more severely than at any time since the Great Depression, and the daily litany of layoffs, bankruptcies, plummeting revenues, and plant shutdowns dominated the financial pages of the newspapers.

It was a watershed year for the computer industry. It was a year Charlie Darwin would have liked—a time when the weak got weaker and the strong added even more muscle.

Logic had no place in the scheme of things. With many dp companies, profits were either off sharply or nonexistent. Yet 1982 saw the take-off of a record-breaking stock market rally fueled largely by fervent investor interest in high-tech issues. The prime rate dropped precipitously last year, and still a number of established companies were hard pressed to come up with the additional capital needed to stay the erosive effects of the economy and to continue growing. Even IBM had to seek outside working capital with a convertible debt offering that was ultimately withdrawn. Meanwhile, venture capital once again flowed in abundance. To keep track of the startup companies you needed a daily scorecard.

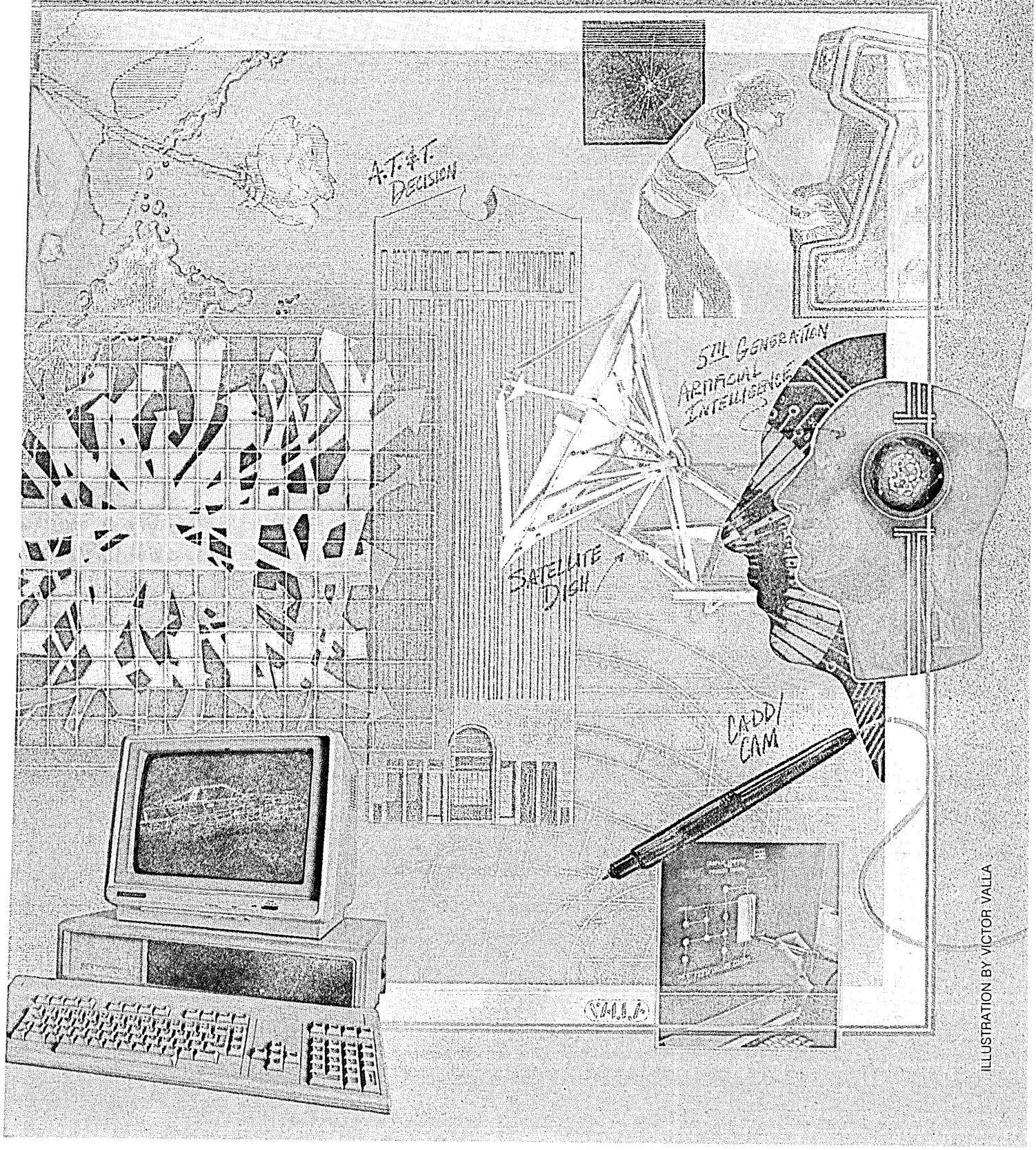


ILLUSTRATION BY VICTOR VALLA

The Wall Street analysts who have pretty much taken dp companies at their word about earnings projections are going to be extra cautious.

For the first time, the industry—traditionally a source of seemingly unbounded growth, with new jobs and new plants—began in large segments to implode. Layoffs and dismissals of dp-related workers numbered in the tens of thousands. But then, there had been large-scale layoffs before at times when the economy stumbled. More ominous was the mass exodus offshore. Lured by low wages and attractive tax incentives, American computer and semiconductor companies by the dozens moved their manufacturing and assembly operations to places like Singapore, Barbados, Taiwan, and Korea. In order to remain competitive, the computer business was becoming largely an expatriate industry.

At the same time, many of the traditional industry definitions and benchmarks were breaking down or becoming increasingly blurred. You could no longer draw a line and say, for example, that the minicomputer market included processors priced between $10,000 and $250,000. High-end minis were suddenly as powerful as many of the mainframes. Conversely, full-blown micros could now match the processing power of low-end minis. And how did you measure the price-performance of a micro with one user against the "bang for the buck" of a mini with a dozen users or a mainframe with 100? Not that it really mattered. The cpu itself was no longer the center of the universe. It was the network that counted, the system.

You sold systems with Madison Avenue buzzwords, not arcane technical specs. User friendliness and ergonomics and local area network capabilities and productivity enhancements were what mattered. Never mind whether the system was powered by a Cray supercomputer or an Osborne portable.

The year had its share of scandals as well as corporate obituaries, marriages, and divorces. The boys who brought us OPM Leasing were sentenced to jail terms after it was determined in their trial they had perpetuated one of the biggest swindles in history.

While hardly in the "scandal" category, a lesson was learned by the financial types at companies such as Datapoint, Tymshare, and Tandem. These firms introduced the industry to "midnight accounting," a bookkeeping practice by which orders are logged as final sales and are so reflected in quarterly earnings statements. Unfortunately, as a number of these firms learned the hard way, orders have a way of being canceled or delayed—especially during a recession. This, of course, means that the company's financial statements are misleadingly weighted on the profit side and have to be revised after the fact. At this point it's too early to assess the long-term impact of these shenanigans, but one thing at least is certain: the Wall Street analysts who have pretty much taken dp companies at their word in the past when it came to earnings projections are going to be extra cautious in the future.

Last year saw the romance between TRW and Fujitsu sour. Ultimately the two firms announced they were terminating their joint agreement in the mini, peripherals, and office systems business. Although the merger and acquisition fever that had swept the industry a few years ago cooled off as corporate cash reserves dwindled, there were still more than 100 mergers or acquisitions in the dp field in 1982. Meanwhile, the most visible demise was that of Magnuson Systems, which filed for Chapter XI status.

TOUGH TIMES ALL OVER

For the industry as a whole, times were tough. True, revenues were up slightly across the board, but profits as a whole were down. The bottom dropped out of some markets into which dp companies sell—the automotive industry, the government market (with the exception of defense spending), and education, among them.

At the same time, major pockets of industry were evincing extraordinary vitality. Some market segments seemed immune from the erosive effects of the economy. The computer graphics business, for one, generated about $3 billion in revenues. The 5¼-inch Winchester disk drive market took off with such velocity that participants who'd hardly been heard of a few years back emerged as market leaders. Seagate Technology, a case in point, generated close to $50 million in sales last year.

Freed of its antitrust restraints once the government's suit was finally dropped, IBM emerged like a samurai warrior on a tear, slashing prices of everything from 3033s to add-on memory, suing former employees who left the company to set up competitive businesses, and working in tandem with the FBI to ensnare the Japanese for buying IBM trade secrets.

This was a far more aggressive IBM than the marketplace had seen in years, one that strengthened its position across the board with the phenomenal success of its Personal Computer at the low end and solid systems shipments at the high end. After years of seeing its market share slip, the computer giant reversed the trend, moving from 38.8% of the action in 1981 to 42.1% last year. It was clearly IBM's year, despite the fact that this was the first time in recent memory the computer giant did not come out with a major product introduction.

It was also the year in which the trend towards so-called end-user applications continued to burgeon. The major focus of the growth centered around the micro market, and competition was so heated that a number of vendors slashed prices almost every month. Moreover, on the heels of IBM's commitment to 16-bit architecture, a whole subindustry of Personal Computer-compatible hardware and software sprang up.

As the use of computing continued to expand beyond the traditional dp shop, sales of packaged software for new aplications also soared. Micro software was especially hot, with the more established companies such as VisiCorp, Peachtree, and Microsoft racking up impressive gains. In the wake of VisiCalc's extraordinary success, 1982 witnessed the birth of a host of new micro software firms putting out second generation spreadsheet packages that were often combined with database management, word processing, and graphics capabilities. One such second generation house, Lotus Development, claims to have sold 10,000 copies of its 1-2-3 system within a few weeks of the product's introduction.

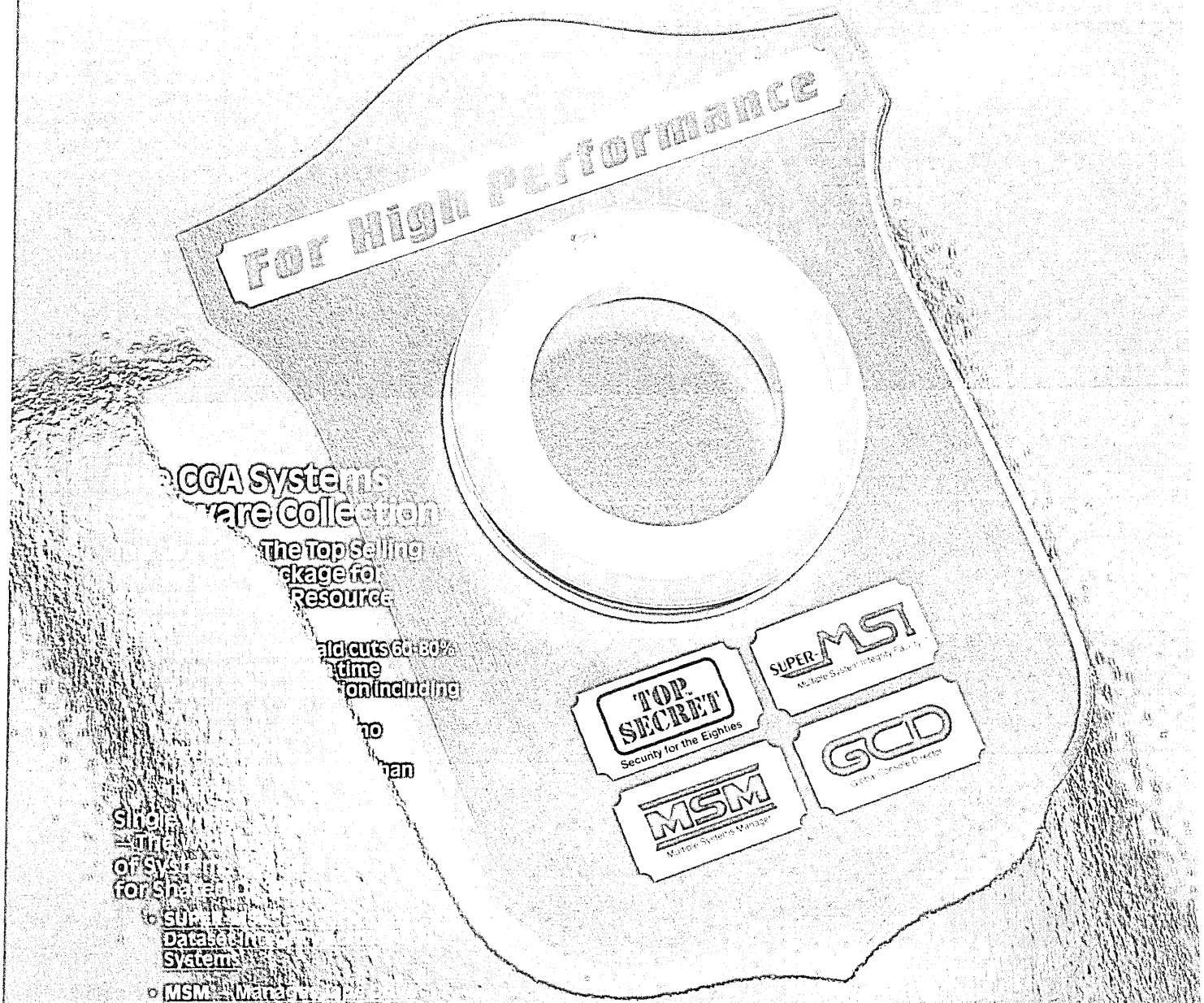
The micro software vendors weren't alone in their success. Sales of minicomputer applications packages also increased by around 50% overall, with DEC retaining the largest market share.

Coupled with the demand for end-user computing capabilities, another trend became evident in 1982. Heretofore, micros had popped up in many organizations with the profusion and randomness of weeds in an untended garden. You might find four or five different brands of desktop hardware or a half a dozen different spreadsheet packages being run within the same organization. But in 1982 a number of big users began attempts to control and standardize end-user dp activity. This effort was manifested almost immediately in the marketplace by sharply increased distributed data processing activity.

IBM proved a big winner in this field, but other mainframers such as Burroughs, Sperry, and Honeywell saw increased activity in the ddp market as well. In addition, Wang and DEC gained significant ground here, while Datapoint, which had a big piece of this market in 1981, backpedaled.

TELECOM MARKET SCRAMBLE

The glue that holds distributed or dispersed processing together, of course, is communications. The breakup of AT&T set off a scramble in this market the likes of which haven't been seen since the great Oklahoma land rush. Everybody wanted to get into the action. Previously staid, fuddy-duddy phone companies were suddenly portraying themselves as high-tech swingers. Southern New England Telephone for example, bought into the national, high-speed data transmission business. Continental Telephone acquired Cado. Now that AT&T



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CIRCLE 63 ON READER CARD

The gap between the top four or five firms and the rest of the field was widening perceptibly.

was no longer AT&T, it was offering processing as part of its communications package while IBM was providing communications wrapped up with its computer products.

Each vendor seemed to have an individual approach to the market, offering various local area networks, PBXs, combined voice/data capabilities, dedicated switching, value-added features such as fail-safe computing, intelligent phones, electronic mail, modems, and many combinations thereof. Rolm was probably as successful as anyone in this market, although Xerox scored a major victory last year when Ethernet finally gained wide acceptance as an industry LAN standard. However, Xerox's hoped for windfall from Ethernet will come not from Ethernet itself but from sales of the Xerox gear that's ultimately tied to the network. Consequently, its big communications payday is farther down the road.

Now that all these wonderful communications capabilities were being made available, the vendors decided users should have some way to take full advantage of them. A new generation of intelligent terminals perhaps? Forget it. Terminal has become an antediluvian term, in case you hadn't noticed. By 1982, we're talking workstations.

Now don't press too hard here for a clear-cut definition of workstation because just about everybody in this rapidly emerging subindustry has his own. Thousand-dollar electronic typewriters are being touted as workstations, as are big, full-blown micros that cost 20 times as much.

Suffice it to say that last year Xerox didn't get the hoped-for acceptance of its Star 8010, the first workstation and the standard against which the rest of the industry has to measure itself, for two main reasons. With a price tag of over $15,000, Star was considered far too expensive. Second, everyone was waiting for the other shoe to drop in the form of Apple's workstation entry, Lisa.

After the raves that greeted Lisa's introduction, AT&T announced it was coming out with a workstation in 1983, while somewhere on the drawing boards IBM surely has at least half a dozen workstation projects. The workstation is clearly a concept whose time has come.

The industry that engendered it, however—office automation—had some problems last year. True, users were buying office systems and word processing gear, but on a selective basis that reflected the uncertain state of the economy and the users' own caution in approaching a market in which the staying power of the major players is still far from certain.

Wang Labs emerged as a clear winner and several smaller companies that focus exclusively on this market—CPT Corp. and NBI—prospered. But big companies with other interests that have diversified into office systems have done so with mixed results. The office, of course, is one of the cornerstones of IBM's growth, but Burroughs's OFIS 1 was greeted with distinct disinterest among the company's user base. Sperry had better luck with the introduction of Sperrylink, while Honeywell's office automation efforts finally began to return some dividends. Meanwhile, one of the major industry outsiders to enter the office sweepstakes, Exxon, had yet to give the office market the push it had originally promised. After all, oil prices were dropping and the company was no longer cash-rich as it was when it ventured into the OA field. Meanwhile, Xerox hedged its bets against the vicissitudes of the office market by acquiring a cash-rich insurance company, Crum & Forster, in 1982.

PCM MARKET SOFTENED

The pcm market also softened. Just to stay in the game some pcm manufacturers were offering 20% to 25% discounts against already discounted IBM gear, a costly strategy that limited revenue growth and cut sharply into earnings. Amdahl, the largest of the pcmers, was further hurt when it slipped on the delivery of the 5860 and IBM tried to move in quickly to woo away customers.

With the exception of IBM and Burroughs, the traditional mainframers didn't fare much better, either losing money or just breaking even. With minis, the trend toward 32-bit architecture cushioned manufacturers from what otherwise might have been a disastrous year. Here too, timing was critical. Data General's tardiness with its 32-bit Eclipse MV/8000 gave Prime and DEC an unobstructed shot at the marbles. Even so, DEC's revenue increases were nowhere near the standard it had set in the past, and in terms of overall units shipped—151,000 in 1982 as opposed to 149,000 in 1981—the increase was negligible.

The computer services industry, in turn, moved to diversify. In 1982, a number of services companies that had concentrated on a single market or industry (Reynolds & Reynolds in the automotive field, for instance) found out how dangerous specialization can be in a down economy. The whole micro explosion also appeared to have disrupted the industry. Timesharing companies such as Comshare were suddenly trying to position themselves in the micro market, offering spreadsheet software and the like. Even General Electric got into act, announcing this year it was getting into the personal computer rental business.

The year 1982 was one of extremes. It brought about surprise moves, not the least of which was IBM acquiring a major share of Intel, and inspired an unusual degree of risk-taking. A single roll of the dice could make all the difference, as it did when both Sperry and Electronic Data Systems gambled on getting defense-related business and ended up winning two of the biggest contracts of 1982 or of any other year. Had it lost out, Sperry, which is a year away from bringing out its next product cycle and needs revenues to fill the interim gap, might have had to hitchhike back from Washington.

Strategy and timing were everything. Storage Tech wagered that the world was clamoring for thin film disk technology. It wasn't, not in 1982 anyway. IBM decided that the manufacturing market, depressed though it was, was ripe for a big play. IBM was right on the money and scored extremely well here with 4300 and 308X sales.

Computervision approached the same market from the CAD/CAM side with the strategy that it could produce the entire system from hardware to artificial intelligence itself. It couldn't, not effectively, and orders dropped as a result. Competitor Intergraph, in turn, decided to buy its hardware from DEC and focus exclusively on the software that drives CAD/CAM. Its earnings soared.

While all this was going on, the oem/systems house market was quietly selling close to 200,000 computers with a total value of nearly $4 billion in 1982. Here, too, the big news was micros and applications software. According to a recent survey conducted by Sentry Database Publishing, a DATAMATION sister company, software houses bolstered their revenues between 12% and 17% and value-added micro sales were up nearly 70% over 1981.

It's been said that the oem/systems house market is a good indication of future directions, charting a course that in three to six months will be followed by the end-user market. If that's true, maybe we can all sit back, loosen the belt a notch, and congratulate ourselves on being survivors. ✻

Laton McCartney, a former managing editor of DATAMATION, is currently a free-lance writer in New York and a regular contributor to this magazine.

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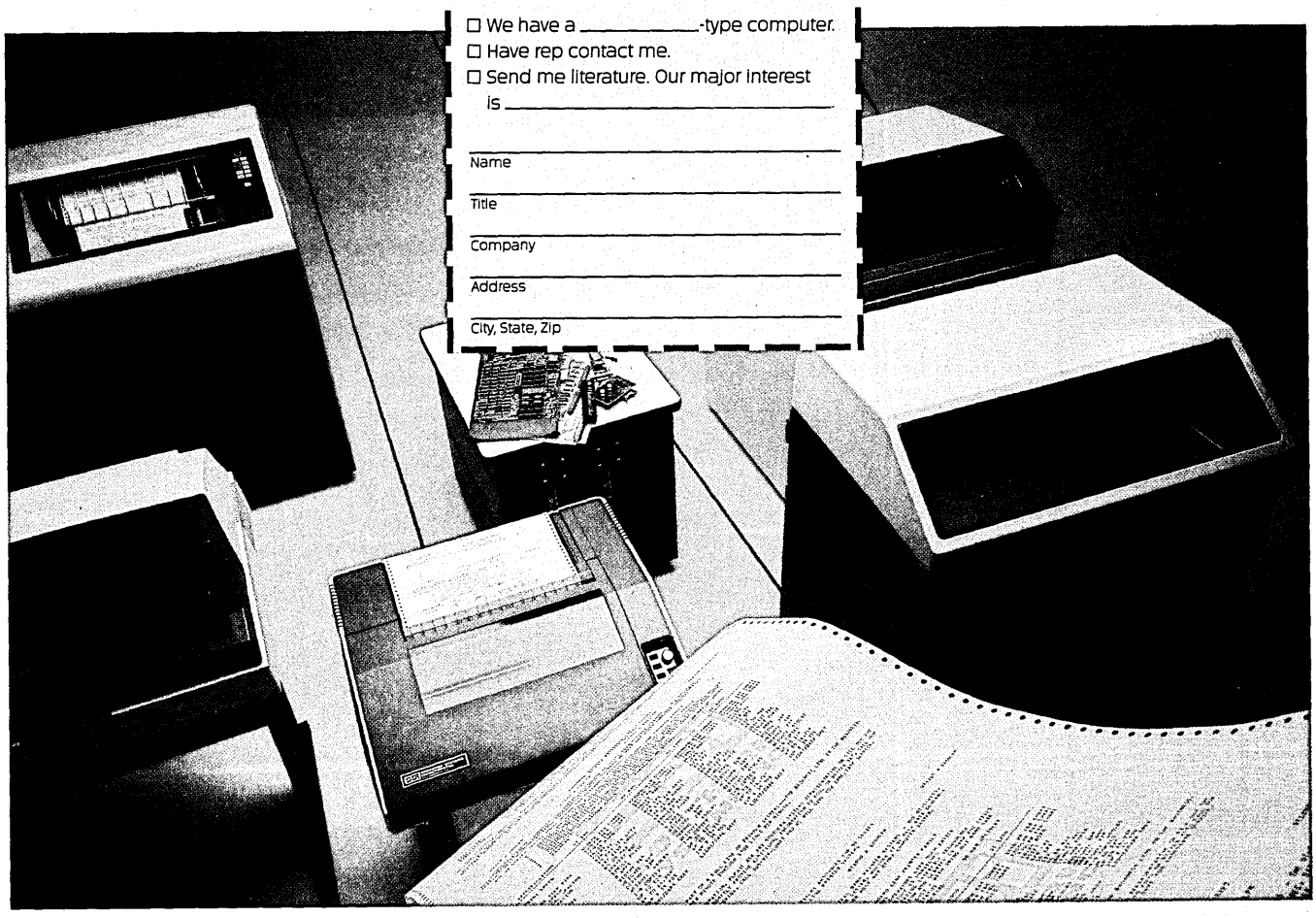

CIRCLE 64 ON READER CARD

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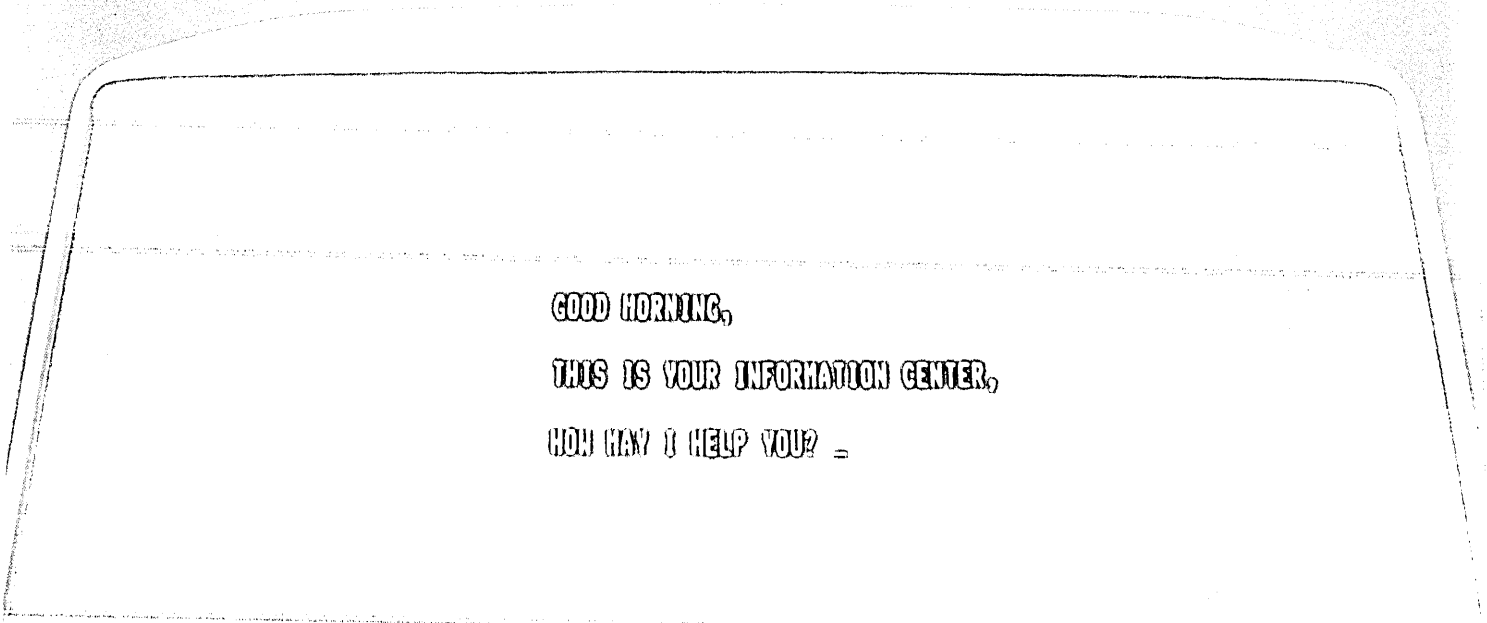

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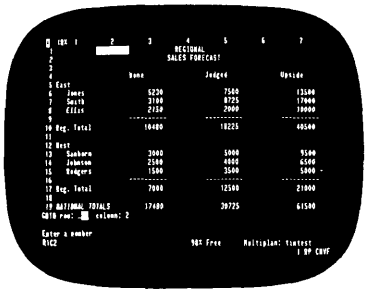

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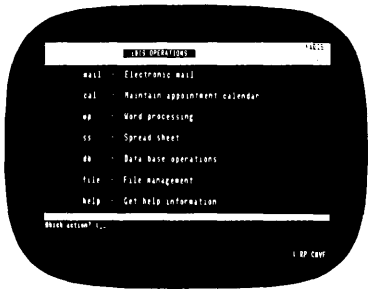

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PHOTOGRAPH BY STEVE COOPER

Twelve new companies joined the upper crust of the information processing industry this year.

THE DATAMATION 100: WELCOME TO THE CLUB

by Pamela Archbold

The year 1982 will go down on the financial records as the worst yet for the information processing industry. To be sure, revenues of the DATAMATION 100 increased 17% over 1981 to reach $79.4 billion last year, but cumulative earnings of those companies plummeted. Of the industry's top 100 dp revenue producers, 40 reported

earnings declines for calendar 1982. Among those 40, seven reported huge losses. The once recession-proof industry found itself suffering in ways never imagined.

It appears as though many participants in the industry failed to recognize soon enough that the recession was going to have such a devastating effect on them, and they were unable to make the necessary shifts in time to salvage that all-important bottom line. No longer could a company introduce a product one day and have customers lining up at the door the next. During 1982 vendors saw their cost of sales soar as competition increased and customers got downright picky.

There were, of course, exceptions, and some companies exhibited the spectacular growth for which the dp industry has become known. The largest growth rates in 1982 came from companies that were seemingly overnight successes. They did, however, have a little help from friends in high places.

Convergent Technologies of Santa Clara, Calif., leaped into the DATAMATION 100 as number 89 with a growth rate of 636% over its 1981 report. This young company got a big shot in the arm from Burroughs's large oem contract for Convergent's multifunction workstations. These purchases accounted for 48% of Convergent's $96.5 million in 1982 dp sales.

The second overnight success was Huntsville, Ala.-based SCI Systems Inc., which had dp revenues in 1981 of a mere $15 million. Then IBM chose SCI to manufacture the guts of its Personal Computer, and SCI skyrocketed. Dp revenues during 1982 increased to $80 million, a 433% increase over the prior year, with IBM's business generating a good portion of those sales.

Sales are one thing, but earnings quite another. The list of last year's earnings losers is packed solid with Blue Chips of the industry—Burroughs down 21.1%, Amdahl down 74.7%, Control Data off 9.4%, Sperry down 36.8%, DEC down 14.4%, Data General off 75.1%, and M/A-Com down 27.2%. Even the big conglomerates, which have only a small portion of their business in information processing, had a hard time generating profits. Allied Corp., Boeing, Exxon, Harris, Lear Siegler, Martin Marietta, Raytheon, Signal Co., and TRW all reported lower earnings in 1982.

SEVEN SUFFERED SETBACKS

For seven of the DATAMATION 100 companies, an "earnings decline" is putting it mildly. They actually went into the red. Datapoint lost $17.4 million; National Semiconductor lost $15.4 million; Wyly racked up losses of $7.8 mil-

FIG. 1

THE GAINERS AND THE LAGGARDS

THE TOP 10 DP REVENUE WINNERS

COMPANY	% GROWTH	1982 DP REVENUES ($ MILLIONS)	1982 RANK
1. Convergent Tech.	636.6	95.6	89
2. SCI Systems	433.0	80.0	95
3. TeleVideo Systems	175.0	98.5	88
4. Tandon	151.0	177.1	54
5. Commodore	99.4	367.8	29
6. Intergraph	70.8	155.6	63
7. Apple Computer	65.5	664.0	19
8. Tandy	57.6	725.0	16
9. NBI	55.6	119.6	81
10. Micom Systems	49.1	78.0	97

THE TOP 10 DP REVENUE LOSERS

COMPANY	% DECLINE	1982 DP REVENUES ($ MILLIONS)	1982 RANK
1. General Automation	−27.2	84.1	93
2. Northern Telecom	−15.8	184.8	53
3. Lear Siegler	−13.3	130.0	76
4. Recognition Equip.	−12.1	110.0	83
5. Nixdorf Computer	−12.1	140.0	71
6. Signal	− 8.0	163.1	59
7. United Telecom.	− 6.0	150.0	65
8. Honeywell	− 5.0	1,684.7	8
9. Tektronix	− 2.8	300.0	38
10. Dun & Bradstreet	− 1.2	132.4	75

FIG. 2

CUTTING BACK AND STAFFING UP

EMPLOYMENT DECREASES

COMPANY	1982 EMPLOYMENT	1981 EMPLOYMENT	% CHANGE
1. Gerber Scientific	1,300	1,700	−23.5
2. Recognition Equip.	1,924	2,500	−23.0
3. General Automation	1,428	1,830	−21.9
4. Northern Telecom	3,300	4,001	−17.5
5. Dun & Bradstreet	1,614	1,872	−13.7
6. Sperry	78,027	89,541	−12.8
7. ITT	283,000	324,000	−12.6
8. Bradford National	3,000	3,400	−11.7
9. Signal	53,200	59,700	−10.8
10. Tymshare	3,600	3,975	− 9.4

EMPLOYMENT INCREASES

COMPANY	1982 EMPLOYMENT	1981 EMPLOYMENT	% CHANGE
1. Convergent Tech.	450	90	400.0
2. TeleVideo Systems	560	261	114.5
3. Tandon	2,500	1,400	78.5
4. NEC Info. Systems	400	250	60.0
5. Wang Labs	19,700	13,800	42.7
6. Intergraph	1,800	1,275	41.1
7. Micom Systems	915	652	40.3
8. SCI Systems	2,920	2,085	40.0
9. Apple Computer	3,400	2,500	36.0
10. Management Sci. Am.	1,348	1,002	34.5

FIG. 3

PERSONAL COMPUTERS COME OF AGE

COMPANY	1982 PC REVENUES ($ MILLIONS)	1981 PC REVENUES ($ MILLIONS)	% INCREASE
1. Apple Computer	664.0	401.1	65.5
2. IBM	500.0	N/A	N/A
3. Tandy	466.2	293.0	59.1
4. Commodore	367.8	184.4	99.4
5. Hewlett-Packard	235.2	195.0	20.6
6. Texas Instruments	233.0	144.3	61.4
7. Digital Equipment	200.0	N/A	N/A
		AVERAGE GROWTH: 61.2%	

FIG. 4

OFFICE SYSTEMS: THE DYNAMIC DOZEN

COMPANY	1982 OFFICE REVENUES ($ MILLIONS)	1981 OFFICE REVENUES ($ MILLIONS)	% CHANGE
1. IBM	1,800.0	1,600.0	12.5
2. Wang Labs	584.8	456.3	28.1
3. Motorola	274.9	232.0	18.4
4. Lanier	241.2	228.0	5.7
5. Burroughs	200.0	50.0	300.0
6. Xerox	200.0	132.0	51.5
7. Philips Info. Sys.	176.0	123.5	42.5
8. Exxon	165.0	165.0	N/A
9. Northern Telecom	133.8	162.2	– 17.5
10. CPT	126.9	102.8	23.4
11. NBI	119.6	76.7	55.9
12. Digital Equipment	100.0	N/A	N/A
		AVERAGE GROWTH: 52.1%	

FIG. 5

THE MAINFRAME MAKERS

COMPANY	1982 MAINFRAME REVENUES ($ MILLIONS)	1981 MAINFRAME REVENUES ($ MILLIONS)	% CHANGE
1. IBM	14,500.0	12,000.0	20.8
2. Sperry	1,765.0	1,880.0	– 6.1
3. Burroughs	1,300.0	1,255.0	3.5
4. NCR	900.0	900.0	N/A
5. Control Data	705.0	624.0	12.9
6. Honeywell	550.0	551.0	– 0.1
7. Amdahl	312.0	334.0	– 6.7
8. National Semi.	175.0	175.0	N/A
9. Cray Research	126.1	91.8	37.3
		AVERAGE GROWTH 6.84%	

lion; General Automation lost $5 million; Nashua was down $40.5 million; Recognition Equipment lost $9.6 million; and Centronics lost $32.3 million. (Recognition Equipment and Centronics had both shown losses in 1981.)

There were, of course, some notable exceptions to the trend toward plummeting profits. Here, too, Convergent Technologies leads the pack on the positive side, posting a whopping 1,387.5% profit increase to $11.9 million. Verbatim rebounded from a bad year in 1981, reporting a 945% earnings increase to $11.5 million last year. Bradford National also experienced a turnaround, with earnings up 125%. Planning Research saw profits climb 290%, and Tandon came in with a 206.4% jump. Commodore reported with pride its profits boost of 107.8%. But unfortunately for the industry as a whole, these earnings winners were the exception rather than the norm.

What happened? Many companies had ramped up production, their warehouses were bulging with new and exciting gear, and fattened sales forces were busting a gut to meet their quotas. But the economy just wouldn't cooperate. Customers were experiencing a severe budget crunch, and they either put off buying or opted for the lower-ticket items such as micros. By the time vendors realized sales were becoming hard to get and costly to come by, quarterly reports were already indicating pinched profits. At that point, the belt-tightening began in earnest. Heads rolled as companies started slashing the work force left and right.

For instance, Gerber Scientific, Recognition Equipment, and General Automation all made personnel cutbacks of over 20% during the year. (Ironically, National Semiconductor, which had made the news periodically throughout the year for big layoffs, actually had an expanded staff by year-end.) Along with personnel cuts came mandatory days off without pay, as well as an almost unheard of ploy in this industry—executives taking pay cuts. Sperry, for example, reduced compensation at the senior executive level by 17.5%.

In an incredibly short time, data processing went from the industry everyone wanted a piece of to the industry in which everyone was "repositioning." New names for old niches, new marketing strategies, realigned divisions, new management, the discarding of marginal operations—all these were tricks of the trade for selling into a changed economy, a changed market.

Especially apparent last year was the shedding of unprofitable operations. Many companies simply sold off or shut down their businesses that weren't apparent winners. Wyly is a good example: it found the hardware brokerage business so difficult that it took an $11.9 million loss just to get out of it. National Semiconductor, which was losing money all year, threw in the towel on the manufacture of mainframes, while Perkin-Elmer sold its money-losing memory products division. TRW had a falling out with its partner Fujitsu, reporting to DATAMATION that its dp-related revenues are now derived mainly from its software operations (which many consider credit reporting agencies). Bradford National, Recognition Equipment, and Comshare are examples of companies that had begun their repositioning back in 1981 and continued the trend toward streamlining operations in 1982.

Burroughs, number five in last year's listing, managed to creep past NCR and Control Data to become the third largest dp company.

Another effort at combating the recession was the notion of reorganizing what was already in place. IBM, DEC, Xerox, Honeywell, Perkin-Elmer, Burroughs, and Texas Instruments are a few of the many companies that reorganized their dp operations. A popular move was to shift marketing direction, a tack taken by both DEC and Data General.

Even more drastic measures were taken at some companies, as the boards of directors began getting annoyed with lackluster performance. A number of corporate presidents and chairmen were replaced. Bradford National, M/A-Com, Recognition Equipment, Tandem, Datapoint, and many others experienced top management shakeups during the year.

Despite all the cost-cutting schemes, the cloud still hovers over industry profits. For the first quarter of calendar 1983, Digital Equipment's earnings dropped 25.8% from calendar '82 first-quarter levels; Prime Computer's profits declined 19.8% from the comparable year-earlier quarter; and Storage Technology reported a staggering 93.8% earnings decline. Hopes for an economic recovery early in '83 were dashed; companies began pinning their hopes on a midyear turnaround.

As always, the DATAMATION 100 shows a number of companies shifting places during 1982. Near the top of the list, Burroughs, number five in last year's listing, managed to creep past NCR and Control Data to become the third largest dp revenue producer. Wang also had a good year, evidenced by its move up one notch to number nine, ahead of Xerox. Motorola, which had made two major dp acquisitions in 1981, saw the fruits of its labors last year as the company moved up from number 47 to number 23.

FIG. 6

MINICOMPUTERS: MIXED RESULTS

COMPANY	1982 MINI REVENUES ($ MILLIONS)	1981 MINI REVENUES ($ MILLIONS)	% CHANGE
1. IBM	3,000.0	3,000.0	N/A
2. Digital Equipment	1,680.0	2,068.1	−18.7
3. Burroughs	800.0	575.0	39.1
4. Data General	603.8	573.2	5.3
5. Hewlett-Packard	588.0	429.4	36.9
6. Wang Labs	584.7	456.4	28.1
7. Prime Computer	351.0	309.0	13.5
8. Honeywell	330.0	300.0	10.0
9. Gould	325.0	270.0	20.3
10. Texas Instruments	300.0	316.0	− 5.0
11. Tandem Computers	295.0	212.4	38.8
12. Perkin-Elmer	218.1	186.6	16.8
13. Management Assist.	201.5	222.5	− 9.4
14. Datapoint	160.0	160.0	N/A
15. Mohawk Data Sci.	149.0	137.0	8.7
		AVERAGE GROWTH:	14.18%

MICROS IN THE MILLIONS

The most noticeable movement in ranks came from the makers of microcomputers. These ubiquitous little powerhouses were installed by the millions, as indicated by revenue growth of the pc makers. Tandy managed to move up to 16th place from its 21st slot a year earlier, as the company's dp revenues increased 57.6% to $725 million. Also coming on strong was Apple, which moved from number 23 to number 19 on its revenues increase of 65.5% to $664 million. The biggest jump of all, however, came from Commodore, which joined the big boys in the Top 50 by jumping from number 51 to number 29 on its 99.4% increase in sales to $367.8 million.

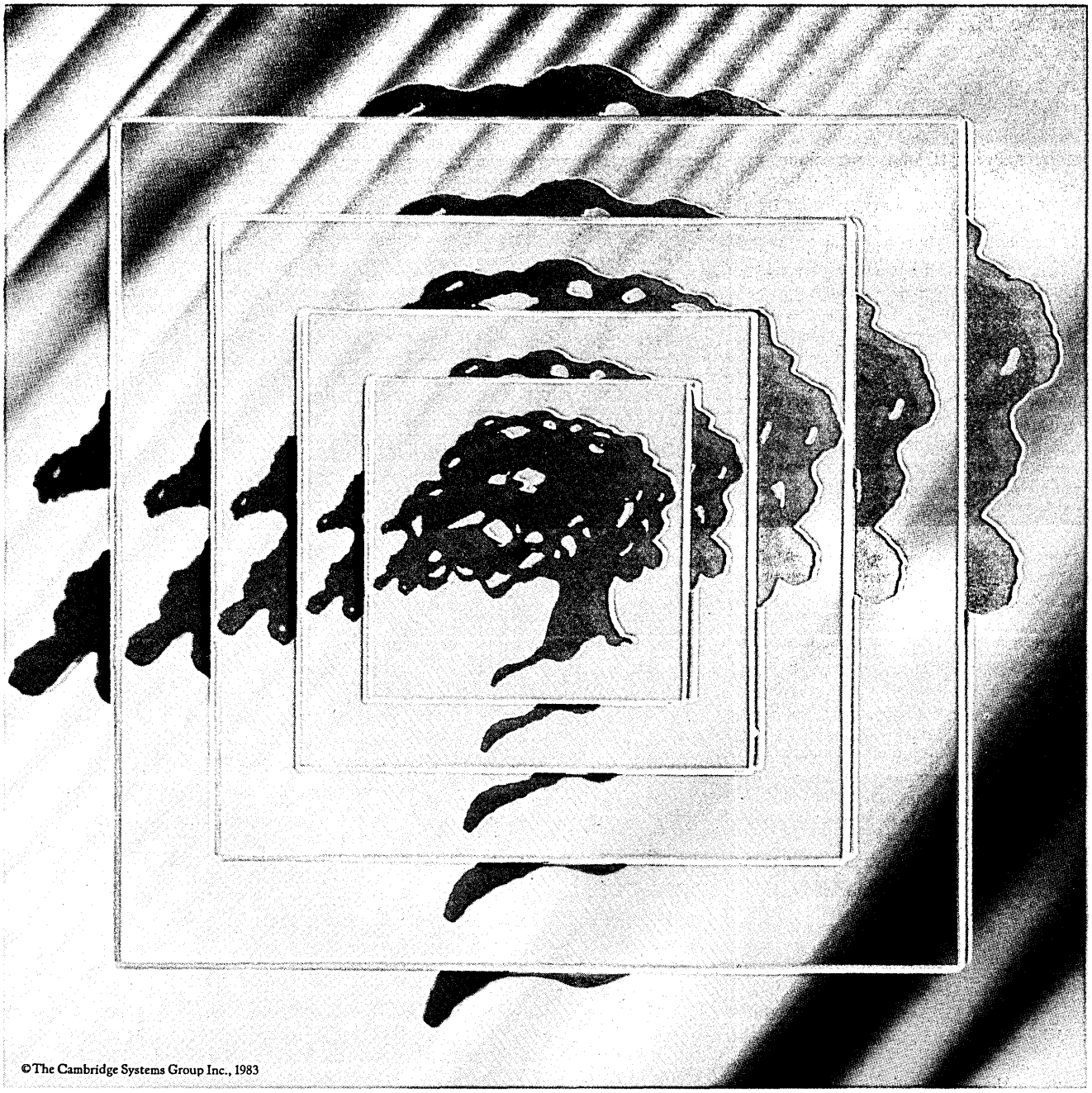
Last year also saw computer peripheral sales soar, as supplies such as tape and disk drives were gobbled up in large quantities. Among the DATAMATION 100, three companies stand out as top performers in this category. Dysan had a sales increase of 37% to $142.8 million; Verbatim's revenues rose 43.7% to $98.6 million; and Tandon, as already mentioned, saw revenues top $177 million for a 151% climb. Because this is such a booming business, it's worth noting that two other peripheral makers experienced great growth last year and came close to entering the DATAMATION 100 for the first time. Seagate Technology had a sales increase of 150.1% for a dp-revenues total of $57 million, and Cipher Data Products ended calendar '82 with sales of $70.1 million, up 111.1% over the year earlier total.

As is always the case, smaller companies on a fast track exhibit the greatest percentage increases in revenue growth. It's still interesting to note, however, that only four of the 10 fastest growing companies—Commodore, Apple, Intergraph, and Tandy—were even present on last year's DATAMATION 100 listing. On the other hand, companies that see sales slip from one year to the next are usually those year-after-year members of the Top 100 club. Last year General Automation, Northern Telecom, Lear Siegler, Recognition Equipment, and Nixdorf all reported revenue declines of more than 12%.

Last year saw a number of software and services companies lose rank, either because other participants in the total industry outshone their performance or because they themselves did poorly. Moving down the ladder were Tymshare, which dropped from number 33 to number 40; Wyly, which sank to number 70 from number 57; Dun & Bradstreet, which stepped down to number 75 from number 50; Martin Marietta, which dropped from number 71 to number 77; and Comshare, which moved to number 96 from number 84. Moving up one rung, however, was Automatic Data Processing, which stole the higher slot from Computer Sciences Corp.

12 NEW FIRMS ON TOP 100

Twelve new companies make their debuts on the DATAMATION 100 listing this year, with some of them posting such high growth rates as to make them eligible for the Top 10 fastest-growing companies club. Already mentioned were Convergent Technologies and SCI. Others include TeleVideo Systems, which ranks number 88 on the basis of its 175% increase in sales to $98.5 million, and Tandon, of floppy disk fame, which had an impressive growth year with revenues up 151.5% to $177.1 million. Other newcomers to the listing also had above-industry-average growth rates: Anacomp was up 50.9% to $82.4 million in sales; Micom was up 49.1% to $78 million; and Decision Data was up 48.3% to $74.3 million. With more detailed information this year than we were able to obtain last year, four additional companies are now on the listing. These include NBI, number 81, which had dp revenues of $119.6 million; Exxon Corp., whose office systems unit had an estimated $165 million in revenues, moving that company into number 58; Anaconda-Ericsson, which reports dp revenue of $208 million, giving it the rank of number 47; and BASF, number 65, which had dp revenues of an estimated $150 million. Another newcom-



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CIRCLE 66 ON READER CARD

er, Continental Telephone, joins the DATAMATION 100 by virtue of its acquisition of Cado.

With so many new faces in the DATAMATION 100, goodbyes had to be said to a number of others. The reasons for their exits were varied, but in all cases one hard fact remains: they didn't generate enough dp-related revenues to make the cutoff. Falling into this category are Computer Automation (number 86 last year), American Management Systems (number 91 the prior year), Cromemco (formerly number 95), Nashua (formerly number 90), MSI Data (number 98 last year), Triad Systems (formerly number 99), and General DataComm Industries (number 100 the previous year). Cado and Four-Phase also left the list because they were acquired by Continental Telephone and Motorola, respectively. Also off the list is Data Terminal Systems, which is being acquired by National Semiconductor, and Sun Co., which made a decision that its in-house dp department should no longer engage in outside work and thus last year sold its outside accounts.

Sadly, a few companies each year refuse to cooperate with us on the survey, and rather than guesstimating their calendar year results, we eliminate them altogether from the listing. This year Triumph Adler and its U.S. subisidiary, Pertec, is one such company we feel would have been a DATAMATION 100 contender. We also chose to exclude S.I.A.C., the NYSE and AMEX stock exchanges' processing division, because of its highly specialized nature.

The year 1982 was a challenging one for the dp industry. The difficulties of some companies turned out to be opportunities for others. The key was management's choice of using what they had to position their companies when recovery came. It was encouraging to know that a company could build a better mousetrap and then collect the rewards. In the future, the industry's challenge will be to be nimble, when times change fast.

FIG. 7

THE YEAR OF THE BULL

THE WALL STREET WINNERS

RANK	COMPANY	CLOSING PRICE JAN 1	CLOSING PRICE DEC 31	% CHANGE
1.	IBM	$56.875	$96.250	69.2
2.	Digital Equipment	86.000	99.500	15.6
3.	Burroughs	37.000	41.750	12.8
4.	Control Data	35.250	37.125	5.3
5.	NCR	43.375	86.000	98.2
6.	Sperry	35.375	33.375	−5.6
7.	Hewlett-Packard	39.625	73.000	84.2
8.	Honeywell	69.875	85.375	22.1
9.	Wang Labs	16.750	29.500	76.1
10.	Xerox	40.500	37.375	−7.7

THOSE WHO LOST THE MOST

COMPANY	CLOSING PRICE JAN 1	CLOSING PRICE DEC 31	% CHANGE
Telex	$ 6.500	$22.000	238.4
Decision Data	3.250	10.750	230.7
Verbatim	12.000	28.750	139.5
Bradford National	7.375	17.500	137.2
Tandon	14.250	31.500	121.0
Commodore	30.375	66.250	118.1
SCI Systems	14.250	29.750	108.7
NCR	43.375	86.000	98.2
Comdisco	17.500	34.500	97.1
Quotron Systems	17.875	33.750	88.8

HOW THE TOP 10 FARED

COMPANY	CLOSING PRICE JAN 1	CLOSING PRICE DEC 31	% CHANGE
Datapoint	$51.250	$18.375	−64.1
Storage Technology	35.000	21.250	−39.2
Tymshare	28.625	18.000	−37.1
Allied	43.875	32.375	−26.2
Data General	53.000	39.750	−25.0
Informatics	26.000	20.750	−20.1
Schlumberger	55.750	46.625	−16.3
General Automation	6.625	5.875	−11.3
Harris	41.125	37.000	−10.0
Tandem Computers	27.750	25.375	− 8.5

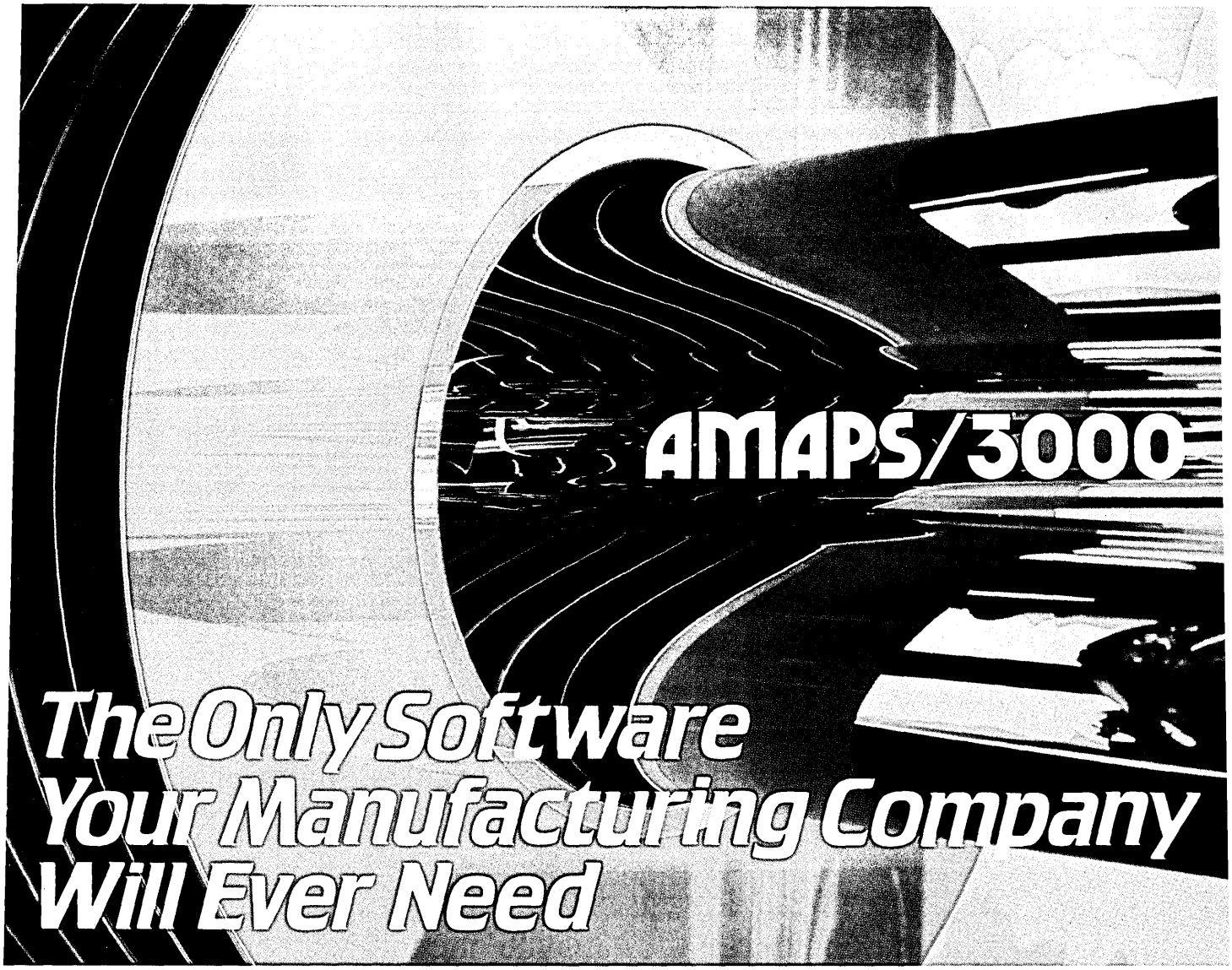
Methodology

Throughout the year, DATAMATION tracks over 175 companies on a worldwide basis. Our survey is meant to be used as a comparative analysis, and therefore all revenues and earnings figures have been adjusted to calendar year calculations. Because over half of the companies covered operate on a fiscal year that does not coincide with the calendar year, their revenues and earnings for purposes of this survey have been derived from quarterly reports. Numbers relating to R&D expenditures and total number of employees, however, are reported as of each company's fiscal year-end.

During 1982, a large number of Top 100 companies restated their performance figures, whether to reflect changed accounting methods, mergers, spinoffs, or just plain errors in earlier reports. While each chart and table within the survey incorporates the restated numbers, we do not alter the prior year's ranking for the companies concerned even though in some cases the restatements would have moved a company up or down a few notches.

Also, please note that a company's internal sales, or sales made to other divisions or units within the company, are excluded from the year's total dp revenues, as they are considered captive and not commercial sales.

For purposes of the survey, dp-related revenue is defined as general purpose dp products and services generated by one or more of the following categories of equipment: mainframes, minicomputers, microcomputers, office systems, data communications, peripherals and terminals, software and services, and maintenance and repair. Explicitly excluded are data transmission or "basic" services revenues from specialized common carriers; standalone electronic and mag card typewriters and standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; and dp supplies, with the exception of magnetic media for disk and tape drives. All peripherals that attach to a system are included. For computer-based manufacturing systems, such as computer-controlled machine tools, only the computer and hard-copy output devices are included and not the machine tool itself.



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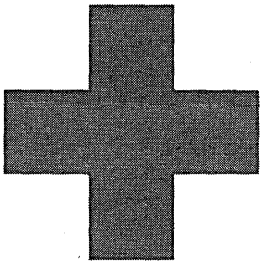

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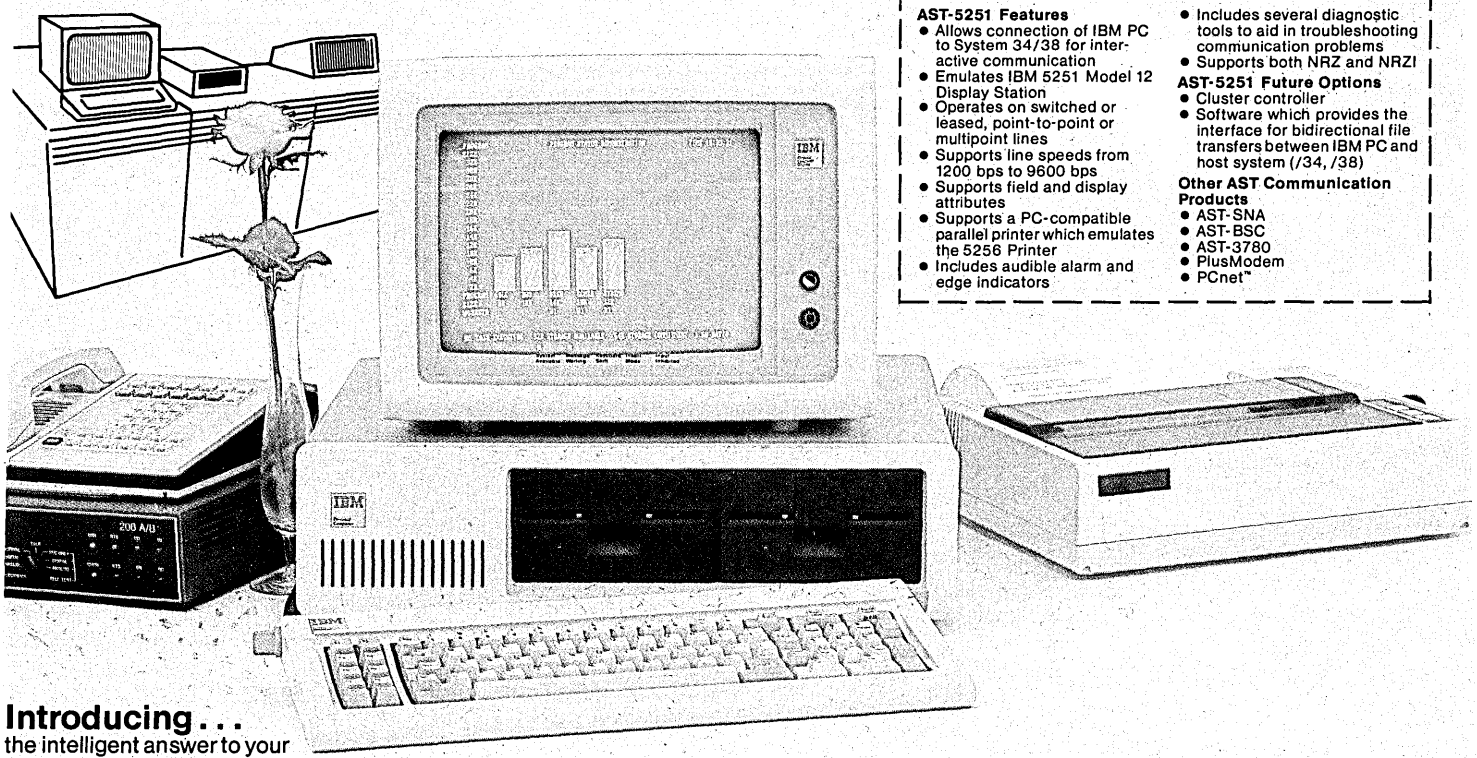

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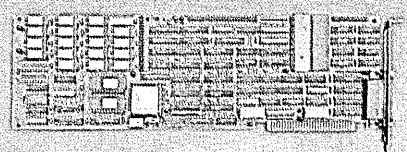

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THE LEADING U.S. DP COMPANIES

THE DATAMATION 100

1982 RANK	1981 RANK	COMPANY	1982 TOTAL REVENUE	1982 DP REVENUE	1981 DP REVENUE	DP REV % GROWTH	DP REV AS % OF TOTAL
1	1	International Business Machines*	$34,364.0	$31,500.0	$26,340.0	19.5%	91.6%
2	2	Digital Equipment Corp.	4,018.8	4,018.8	3,586.6	12.0	100.0
3	5	Burroughs Corp.*	4,186.3	3,848.0	3,102.0	24.0	91.9
4	3	Control Data Corp.*	4,292.0	3,301.0	3,120.0	5.8	76.9
5	4	NCR Corp.	3,526.2	3,173.4	3,071.8	3.3	89.9
6	6	Sperry Corp.	5,242.7	2,800.5	2,781.0	0.7	53.4
7	7	Hewlett-Packard Co.*	4,335.0	2,164.8	1,837.5	17.8	49.9
8	8	Honeywell Inc.	5,490.4	1,684.7	1,773.7	−5.0	30.6
9	10	Wang Laboratories Inc.	1,321.5	1,321.5	1,008.5	31.0	100.0
10	9	Xerox Corp.	8,455.6	1,300.0	1,100.0	18.1	15.3
11	11	Storage Technology	1,079.2	1,079.2	922.0	17.0	100.0
12	15	Texas Instruments Inc.*	4,372.0	900.0	800.0	12.5	20.7
13	14	General Electric Co.	26,500.0	862.0	750.0	14.9	3.2
14	12	TRW Inc.*	5,131.9	825.0	620.0	33.0	16.0
15	13	Data General Corp.	803.8	803.8	764.4	5.1	100.0
16	21	Tandy Corp.	2,264.5	725.0	460.0	57.6	32.0
17	17	Automatic Data Processing	704.0	704.0	613.0	14.8	100.0
18	16	Computer Sciences Corp.	683.4	683.4	624.7	9.3	100.0
19	23	Apple Computer Inc.	664.0	664.0	401.1	65.5	100.0
20	18	ITT*	21,921.0	600.0	460.0	30.4	2.7
21	19	Electronic Data Systems	562.5	555.6	480.6	15.6	98.7
22	20	Datapoint Corp.*	506.4	506.4	506.2	N/A	100.0
23	47	Motorola Inc.	3,785.8	484.9	412.1	17.6	12.8
24	24	McDonnell Douglas Corp.*	7,331.3	476.4	347.2	37.2	6.4
25	27	Comdisco Inc.	464.8	464.8	343.9	35.1	100.0
26	22	Amdahl Corp.*	462.0	462.0	442.8	4.3	100.0
27	28	Rolm Corp.	447.7	447.7	331.5	35.0	100.0
28	25	Prime Computer Inc.	436.0	436.0	365.0	19.4	100.0
29	51	Commodore*	459.8	367.8	184.4	99.4	79.9
30	29	National Semiconductor	1,151.4	365.0	330.0	10.6	31.7
31	26	Management Assistance Inc.	354.2	354.2	349.1	1.4	100.0
32	30	Mohawk Data Sciences Corp.*	361.3	348.9	314.0	11.1	96.5
33	38	Tandem Computers Inc.*	335.2	335.2	238.7	40.4	100.0
34	31	Harris Corp.*	1,818.0	332.5	297.4	11.8	18.2
35	34	Computervision Corp.	325.2	325.2	270.7	20.1	100.0
36	36	Gould, Inc.	1,561.0	325.0	270.0	20.3	20.8
37	39	Racal Corp.	300.0	300.0	240.0	25.0	100.0
	32	Tektronix Inc.	1,200.6	300.0	308.9	−2.8	24.9
39	35	Dataproducts Corp.	297.6	297.6	270.0	10.2	100.0
40	33	Tymshare Inc.	297.0	297.0	289.7	2.5	100.0
41	45	C. Itoh Electronics, Inc.	326.4	290.6	213.0	36.4	89.0
42	37	Raytheon Corp.*	5,513.0	283.0	258.0	9.6	5.1
43	43	Lanier Business Products Inc.	365.4	241.2	228.0	5.7	66.0
44	44	3M	6,601.0	225.0	225.0		3.4
45	41	Perkin-Elmer Corp.*	1,010.9	218.1	186.6	16.8	21.5
46	49	Sanders Associates Inc.*	487.8	215.7	153.9	40.1	44.2
47		Anaconda-Ericsson Inc.	3,600.0	208.0	175.0	18.8	5.7
48	62	Paradyne Corp.*	207.3	207.3	139.0	49.1	100.0
49	60	Philips Information Systems	203.0	203.0	140.0	45.0	100.0
50	55	M/A-Com Inc.*	610.9	200.0	140.0	42.8	32.7

Ranking is by dp revenue in millions of dollars except where noted. *Restated figures N/A = not available

1982 EMPL	1981 EMPL	DP REV PER EMP (DOLLARS)	R & D 1982 ($MILLION)	R & D % OF TOT REV	EARNINGS PER SHARE	RETURN ON EQUITY	% DP REV FROM FOREIGN SOURCES	FISCAL YEAR END
364,796	354.936	86.3	2,053	5.9	7.39	23.4	45.0	Dec.
68,000	63,000	59.1	408	10.1	7.47	14.3	38.0	June
62,000	66,900	62.0	220	5.2	2.80	5.7	40.0	Dec.
56,000	60,600	58.9	326	7.5	4.11	11.1	32.0	Dec.
63,000	65,000	50.3	248	7.0	8.75	12.4	49.0	Dec.
78,027	89,541	35.8	409	7.8	3.40	9.2	40.0	Mar.
68,538	64,000	31.5	432	9.9	3.05	16.3	46.0	Oct.
94,100	96,923	17.9	397	7.2	12.16	13.2	27.0	Dec.
19,700	13,800	67.0	86	6.5	1.00	20.6	33.0	June
109,940	117,930	11.8	565	6.6	4.34	N/A	42.0	Dec.
N/A	15,197	N/A	N/A	N/A	1.88	N/A	N/A	Dec.
80,007	83,714	11.2	236	5.4	6.10	8.9	30.7	Dec.
367,000	404,000	2.3	1,600	6.0	8.00	18.8	40.0	Dec.
85,099	91,941	9.6	109	2.1	5.20	13.4	28.0	Dec.
14,945	14,465	53.7	84	10.5	1.16	5.8	35.0	Sep.
31,000	26,000	23.3	N/A	N/A	2.45	32.3	17.0	June
15,000	15,000	46.9	25	3.5	1.77	16.9	N/A	June
13,700	14,250	49.8	N/A	N/A	1.45	16.0	18.0	April
3,400	2,500	195.2	38	5.7	1.06	28.0	20.0	Sep.
283,000	324,000	2.1	1,080	4.9	4.75	11.5	10.8	Dec.
13,148	11,382	42.2	30	5.4	1.91	23.4	3.0	June
8,822	7,917	57.4	44	8.8	−0.87	0.5	20.0	July
78,800	80,800	6.1	278	7.3	4.64	11.3	33.0	Dec.
7,500	5,890	63.5	N/A	N/A	5.44	11.1	8.0	Dec.
N/A	300	N/A	N/A	N/A	N/A	38.7	17.0	Sep.
5,800	5,100	79.6	81	17.5	0.33	10.5	N/A	Dec.
6,020	4,823	74.3	29	6.4	1.85	21.2	6.0	July
5,000	4,636	87.2	37	8.4	1.48	31.1	43.0	Dec.
4,100	N/A	89.7	27	5.8	4.28	52.9	42.0	June
38,267	35,725	9.5	109	9.4	−0.68	−3.2	N/A	May
5,800	5,629	61.0	15	4.4	0.66	6.2	45.0	Sep.
6,000	5,200	58.1	20	5.6	0.96	9.9	35.0	April
3,600	2,730	93.1	33	10.0	0.76	11.9	31.0	Sep.
26,000	26,000	12.7	92	5.1	1.97	13.1	30.0	June
4,130	3,800	78.7	36	11.1	1.18	18.9	45.5	Dec.
25,175	24,770	12.9	121	7.7	2.10	10.6	12.0	Dec.
4,800	4,300	62.5	N/A	N/A	N/A	N/A	30.0	Mar.
22,924	23,541	13.0	117	9.7	3.78	13.4	39.0	May
4,300	4,700	69.2	20	6.8	1.22	4.2	20.0	Mar.
3,600	3,975	82.5	17	5.8	0.73	10.7	N/A	Dec.
800	600	363.2	N/A	N/A	N/A	N/A	N/A	Dec.
72,000	76,500	3.9	195	3.5	3.78	19.6	22.5	Dec.
5,025	4,036	48.0	8	2.2	1.68	24.1	4.0	May
87,388	91,419	2.5	349	5.2	5.37	20.1	N/A	Dec.
14,100	15,402	15.4	80	7.9	1.18	13.0	44.0	July
7,859	7,171	27.4	22	4.6	3.51	15.1	N/A	July
66,300	69,900	3.1	28	0.8	N/A	N/A	85.0	Dec.
3,072	2,726	67.4	15	7.5	1.24	18.5	N/A	Dec.
1,632	1,538	124.3	N/A	N/A	N/A	N/A	N/A	Dec.
8,739	7,844	22.8	23	3.7	0.79	14.0	N/A	Sep.

Ranking is by dp revenue in millions of dollars except where noted. *Restated figures N/A = not available

THE LEADING U.S. DP COMPANIES

THE DATAMATION 100

1982 RANK	1981 RANK	COMPANY	1982 TOTAL REVENUE	1982 DP REVENUE	1981 DP REVENUE	DP REV % GROWTH	DP REV AS % OF TOTAL
51	58	Telex Corp.	$ 256.1	$ 194.7	$ 142.7	36.4%	76.0%
52	52	Teletype Corp.*	372.9	190.3	175.8	8.2	51.0
53	42	Northern Telecom*	2,468.9	184.8	219.5	−15.8	7.4
54		Tandon Corp.	177.1	177.1	70.4	151.5	100.0
55	46	Boeing Co.*	9,035.0	171.0	144.0	18.7	1.8
56	56	Informatics General Inc.	170.0	170.0	150.3	13.1	100.0
57	63	Shared Medical Systems	165.7	165.7	131.6	25.9	100.0
58		Exxon Corp.	103,600.0	165.0	165.0	N/A	0.1
59	48	Signal Cos.	4,935.6	163.1	177.3	−8.0	3.3
60	53	General Instrument Corp.*	1,002.0	163.0	160.0	1.8	16.2
61	77	NEC Information Systems Inc.	6,000.0	160.0	100.0	60.0	2.6
62	66	CPT Corp.	158.5	158.5	123.8	28.0	100.0
63	80	Intergraph Corp.	155.6	155.6	91.1	70.8	100.0
64	61	United Telecommunications Inc.*	2,419.2	150.8	160.5	−6.0	6.2
65		BASF Systems Corp.	16,000.0	150.0	100.0	50.0	0.9
	81	Diebold Inc.	427.6	150.0	90.0	66.6	35.0
67	50	Allied Corp.*	6,167.0	147.1	128.7	14.2	2.3
68	73	Dysan Corp.	142.8	142.8	104.2	37.0	100.0
69	75	Cray Research Inc.	141.1	141.1	101.7	38.7	100.0
70	57	Wyly Corp.*	140.5	140.5	118.8	18.2	100.0
71	54	Nixdorf Computer Corp.	140.0	140.0	159.3	−12.1	100.0
72		Continental Telephone Inc.	1,817.7	139.3	118.2	17.8	7.6
73	67	Centronics Data Computer Corp.	138.4	138.4	118.9	16.4	100.0
	72	Planning Research	320.7	138.4	106.6	29.8	43.1
75	59	Dun & Bradstreet*	1,461.6	132.4	134.1	−1.2	9.0
76	94	Lear Siegler Inc.	1,459.8	130.0	150.0	−13.3	8.9
77	71	Martin Marietta Corp.	3,526.5	122.0	112.2	11.4	3.5
78	82	Quotron Systems Inc.	120.9	120.9	88.1	37.2	100.0
79	70	Reynolds & Reynolds	224.2	120.5	115.2	4.6	53.7
80	78	National Data Corp.*	120.3	120.3	111.0	8.3	100.0
81		NBI Inc.	119.6	119.6	76.7	55.9	100.0
82	64	Bradford National	134.6	115.4	102.0	13.1	85.7
83	65	Recognition Equipment Inc.*	110.9	110.9	126.1	−12.1	100.0
84	74	Gerber Scientific Inc.	115.8	107.2	101.9	5.2	92.5
85	79	Commerce Clearing House Inc.	350.1	104.5	91.9	13.7	29.8
86	85	Management Science America Inc.	101.2	101.2	73.1	38.4	100.0
87	87	Verbatim Corp.	98.6	98.6	68.6	43.7	100.0
88		TeleVideo Systems Inc.	98.5	98.5	35.8	175.1	100.0
89		Convergent Technologies	96.5	96.5	13.1	636.6	100.0
90	83	Modular Computer Systems Inc.	92.8	92.8	87.2	6.4	100.0
91	97	Floating Point Systems	89.0	89.0	64.0	39.0	100.0
92	76	Mannesmann-Tally	125.5	87.5	78.0	12.1	69.7
93	69	General Automation Inc.	84.1	84.1	115.6	−27.2	100.0
94		Anacomp Inc.	150.8	82.4	54.6	50.9	54.6
95		SCI Systems Inc.	133.0	80.0	15.0	433.3	60.1
96	84	Comshare Inc.	78.6	78.6	82.2	−4.3	100.0
97		Micom Systems, Inc.	78.0	78.0	52.3	49.1	100.0
98	93	Printronix Inc.	77.4	77.4	60.1	28.7	100.0
99	89	Schlumberger	6,283.8	76.2	64.0	19.0	1.2
100		Decision Data	74.3	74.3	50.1	48.3	100.0

Ranking is by dp revenue in millions of dollars except where noted. *Restated figures N/A = not available

1982 EMPL	1981 EMPL	DP REV PER EMP (DOLLARS)	R & D 1982 ($MILLION)	R & D % OF TOT REV	EARNINGS PER SHARE	RETURN ON EQUITY	% DP REV FROM FOREIGN SOURCES	FISCAL YEAR END
3,933	3,806	49.5	10	4.0	1.80	19.3	16.0	Mar.
4,616	4,974	41.2	32	8.6	17.56	N/A	N/A	Dec.
3,300	4,001	56.0	241	9.7	3.31	15.2	N/A	Dec.
2,500	1,400	70.8	7	4.2	0.86	23.7	10.0	Sep.
95,700	101,000	1.7	N/A	N/A	3.02	19.0	2.8	Dec.
2,600	2,470	65.3	5	3.4	1.49	22.4	12.0	Dec.
1,825	1,500	90.7	13	8.2	0.88	14.0	N/A	Dec.
173,000	180,000	0.9	707	0.6	4.82	14.9	N/A	Dec.
53,200	59,700	3.0	210	4.2	1.56	6.7	N/A	Dec.
22,000	22,000	7.4	25	2.4	3.27	19.4	N/A	Feb.
400	250	400.0	N/A	N/A	N/A	N/A	N/A	Mar.
1,458	1,274	108.7	8	5.2	0.99	22.3	33.7	June
1,800	1,275	86.4	19	12.6	1.12	12.7	33.0	Dec.
29,309	29,680	5.1	11	0.4	2.49	N/A	1.0	Dec.
1,200	1,000	125.0	N/A	N/A	N/A	N/A	N/A	Dec.
6,051	6,416	24.7	6	1.4	4.80	22.5	N/A	Dec.
44,337	58,224	3.3	186	3.0	6.22	10.4	N/A	Dec.
2,900	2,300	49.2	25	17.8	0.55	6.8	15.0	Oct.
1,352	1,079	114.0	28	20.0	1.38	18.2	N/A	Dec.
1,850	1,700	75.9	5	3.5	−0.56	6.9	N/A	Dec.
1,700	1,700	82.3	N/A	N/A	N/A	N/A	N/A	Dec.
21,698	21,502	6.4	N/A	N/A	2.32	39.0	N/A	Dec.
2,000	1,900	69.2	N/A	N/A	N/A	N/A	25.0	Jan.
6,200	6,600	22.3	0	0.2	1.13	13.7	18.3	June
1,614	1,872	82.0	6	0.4	5.06	29.5	4.5	Dec.
21,983	23,985	5.9	28	1.9	3.55	17.0	16.0	June
40,900	41,200	3.0	82	2.3	2.92	17.6	19.6	Dec.
1,164	N/A	103.8	7	6.0	1.05	12.5	N/A	Dec.
3,349	3,329	35.9	5	2.4	1.69	9.6	N/A	Sep.
2,458	2,600	48.9	2	1.6	0.95	21.1	2.0	May
1,667	1,349	71.7	6	5.1	1.34	20.4	N/A	June
3,000	3,400	38.4	1	1.4	0.22	3.2	1.0	Dec.
1,924	2,500	57.6	7	6.7	−1.44	N/A	30.0	Oct.
1,300	1,700	82.4	8	7.5	0.55	7.7	N/A	April
5,300	5,109	19.7	N/A	N/A	3.50	55.3	N/A	Dec.
1,348	1,002	75.0	21	21.5	0.62	10.7	23.0	Dec.
1,790	1,487	55.0	6	6.7	1.10	37.6	31.0	July
560	261	175.8	2	2.8	0.36	6.6	24.0	Oct.
450	90	214.4	7	7.4	0.42	N/A	N/A	Dec.
N/A	1,481	N/A	N/A	N/A	0.34	1.8	N/A	Dec.
1,390	1,050	64.0	9	11.0	1.28	18.9	24.0	Oct.
1,600	1,500	54.6	12	9.5	N/A	N/A	75.0	Dec.
1,428	1,830	58.8	4	5.3	−1.90	N/A	39.6	July
2,500	2,000	32.9	N/A	N/A	0.61	9.0	10.0	June
2,920	2,085	27.3	N/A	N/A	1.13	12.2	N/A	June
1,280	1,400	61.4	7	8.9	0.18	−1.8	33.0	June
915	652	85.2	5	7.0	1.70	26.6	23.0	Mar.
1,097	1,071	70.5	2	2.9	1.50	16.7	19.0	Mar.
N/A	N/A	N/A	N/A	N/A	4.60	28.0	N/A	April
1,000	950	74.3	3	4.1	0.57	8.1	N/A	Nov.

Ranking is by dp revenue in millions of dollars except where noted. *Restated figures N/A = not available

Honeywell announces help for companies besieged by an army of personal computers.

"Overrun."
"Invaded."
"Swamped."

DP managers use a variety of terms to describe the arrival of so many different personal computers on the business scene. But the feeling is always the same.

After all, most managers have spent *years* developing well-controlled information systems. Now, almost overnight, they are losing control.

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The cost-efficient microSystem 6/10 is a multi-personality workstation that provides an impressive range of functions – including networking.

Besides personal computing, the system handles data processing and word processing. It can function as a network end-point and a terminal emulator. What's more, power and flexibility make the microSystem 6/10 perfect for adaptation to industry-specific applications.

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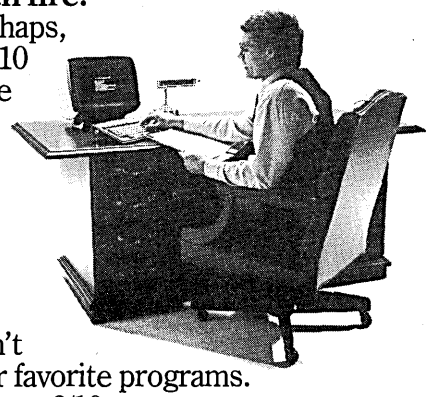
Fight fire with fire.



Best of all, perhaps, the microSystem 6/10 will be an immediate hit with employees wed to their PCs. Because it accepts popular software packages based on CP/M-86® and MS/DOS,® chances are your people won't have to give up their favorite programs.

The microSystem 6/10.

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And the war for control.

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Together, we can find the answers.

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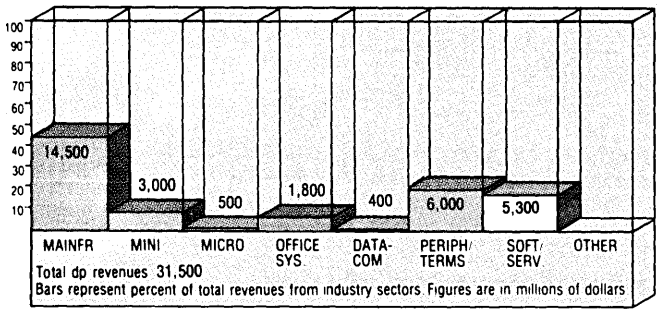
CIRCLE 69 ON READER CARD

1



INTERNATIONAL BUSINESS MACHINES CORP.

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

Once again International Business Machines Corp. proved the business school theory that the number one company in an industry will outperform its peers in bad times as well as good: 1982 may have been a recessionary time for most of the mainframe companies, but IBM's revenues and earnings rebounded to record levels after weakness in 1981. A long list of triumphs made Big Blue a stock market favorite—the price almost doubled to 96 by year-end.

DATAMATION estimates total data processing revenues of $31.5 billion were up 20% from 1981. Earnings rose 22% to $4.4 billion, after a $449 million increase due to a change in foreign currency translation. Significant changes in the revenue flow were part of IBM's more aggressive attitude toward its markets: outright sale of computers and peripherals accounted for 49% of total revenues in 1982 versus 42% in 1978, while the percentage of revenues representing rentals dropped to 32% from 46%. Analysts explain that the new IBM pricing strategies, such as its volume discount program, and new credit policies made purchase more attractive for customers.

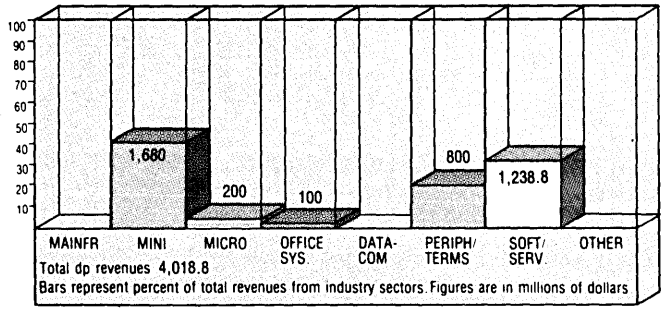
IBM's personal computer, a resounding success with more than 200,000 shipped in 1982, was only one of the many successful hardware products in a weak economy. Mainframe models continued to sell well, with revenues up 21% to $14.5 billion, according to DATAMATION estimates. The top-of-the-line 3081 model was a big hit, as was the delayed 3380 disk storage system. Office automation equipment such as Displaywriter and Datamaster workstations were up 13% to $1.8 billion.

Only the older midrange systems, the company said, suffered soft order rates in the second half of 1982; DATAMATION estimates minicomputer revenues were flat at $3 billion.

The end-user emphasis is typical of the strong impact on the company of John Opel, president and chief executive. He spearheaded the 1981 reorganization of the sales, support, and marketing operations, a huge success according to analysts and IBM watchers. New joint venture arrangements, unheard of in the past, became commonplace in Opel's first year as ceo—strong links were made with chip supplier Intel, telephone switching equipment maker Mitel, and small computer supplier Matsushita. New market efforts are also part of the new, more dynamic IBM such as its venture in robotics.

On the horizon are several challenges that may slow the strong momentum Opel & Co. have built up over the past year. The midrange machines, the 4300 series, are four years old and in need of replacement. Japanese firms like Fujitsu are mounting ever-stronger efforts in large computers. To meet the competition, the Sierra machine, rumored to have capabilities of up to 50 million floating point operations/sec., is expected soon.

2



DIGITAL EQUIPMENT CORP.

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

The recession finally caught up with Digital Equipment Corp. After years of strong annual sales and earnings gains despite the weak economy, including a 30% jump in 1981, DEC took it on the chin last year. To be sure, total dp revenues were up 12% to more than $4 billion, but slow hardware sales in general, and for DEC's primary product, 16-bit minicomputers, in particular, crumpled the long string of annual earnings records.

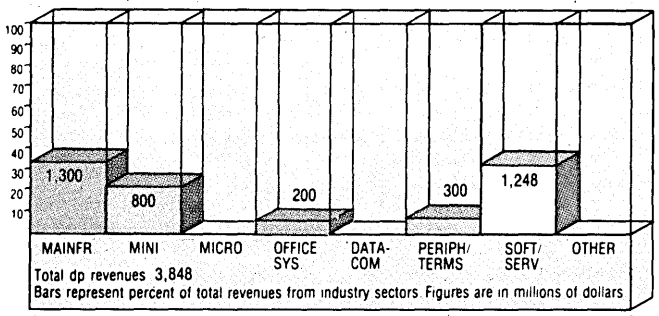
Minicomputer revenues were down 19% to $1.7 billion, with the popular VAX line of 32-bit superminicomputers the only bright spot in the cpu area. Slack demand from oems for DEC's bread-and-butter line, the PDP-11, was especially painful. The May introduction of the new DEC personal computer trio helped, adding $200 million in overall dp revenues, DATAMATION estimates. The recently introduced office automation systems also had a positive impact, adding another $100 million to sales. The big increases in revenues came, of course, from peripherals and software: each was up about 33% to $800 million and $1.2 billion, respectively.

The recession's impact was strongest in the profits column—DEC's calendar year net income dropped 14% to $347 million in 1982, despite the cost-control efforts made by president and chief executive Kenneth Olsen. Hiring limitations early in the year soon gave way to a payroll freeze. Internal controls were not enough to ease the burden of foreign currency translations, as the strong dollar abroad forced DEC to cut its gross margin dramatically—overseas profits dropped 26% in the 1982 fiscal year, to $215 million.

Despite the earnings pressure, Olsen kept intact an ambitious research and development program—last year R&D spending leaped 63% to $409 million. In addition to the personal computer group, DEC introduced several new microcomputer chips as well as a sophisticated disk storage system. Emphasis on new user application programs for office automation and other lucrative end-user commercial areas continued as the company expanded its position from hardware manufacturer to systems supplier. R&D spending is expected to plateau at 9% of revenue, a slight decrease from the 1983 mark but significantly above the rate of the past several years.

At year-end Olsen pointed to rising order rates as a sign of recovery for the company. Strong demand for the office automation system, personal computers, and the new low-end superminicomputer indicated that DEC would rebound in 1983 but that it would not reach the record earnings level until next year.

3



BURROUGHS CORPORATION

Burroughs Place
Detroit, MI 48232
(313) 972-7000

Burroughs Corp. spent last year cleaning shop as it gathered its forces for a renewed marketing assault under the leadership of chairman W. Michael Blumenthal. The company introduced a number of major new products, revamped top management, and increased its pursuit of the IBM customer world.

Total data processing revenues for 1982 are estimated to be $3.85 billion, out of a total of $4.19 billion in revenues. While net earnings for the year did not meet analysts' expectations, they came in at a fairly healthy $165.9 million. That was up slightly from the previous year's net of $148.9 million on revenues of $3.41 billion.

Much of the firm's profit-making came from the Memorex subsidiary, which was purchased in late 1981 for $115 million. Memorex brought with it a large debt but also gave Burroughs a firm foothold in the IBM-compatible market. That is an arena Burroughs would very much like to pursue as it concedes IBM's dominance and ability to set de facto standards.

The company's renewed efforts, including a planned R&D budget of $260 million this year, were hampered by adverse order rates and the strong dollar's effect on foreign exchange. Blumenthal, however, has said he expects a turnaround in orders to become apparent in the second half of 1983.

But, in the meantime, Burroughs realigned its top management, reaching outside its own ranks to IBM, Nixdorf, Bendix, and Xerox for new ideas and approaches to the fast-changing data processing market. Prime among the appointments was Paul G. Stern, the new president, whom Blumenthal had hired a year earlier as chief of engineering and manufacturing. Stern, formerly of Gillette Co. and Rockwell International, is hoped to bring to Burroughs a strong hand in planning the company's advances into the marketplace. Blumenthal's strength, he admits, is in finance while the 43-year-old Stern is a physicist by training.

Among the new products Burroughs brought to market are the B 20 workstation/microcomputer, built by Convergent Technologies; a series of B 4900 and B 7900 mainframe processors designed as upgrades for previous products; the CP 9580 communications processor, which attaches into IBM's SNA circuits; and, from Memorex, the 3680 line of high-capacity drives.

Other trouble spots for Burroughs include its Ofis 1 office automation equipment which, according to the Cowen & Co./DATAMATION survey of mainframe users, has produced dismal results; and a series of pending user lawsuits relating the B 800 line of computers. The B 20 is said to have been well received by Burroughs mainframe users, but it is not clear that the company can move the machine successfully into new arenas.

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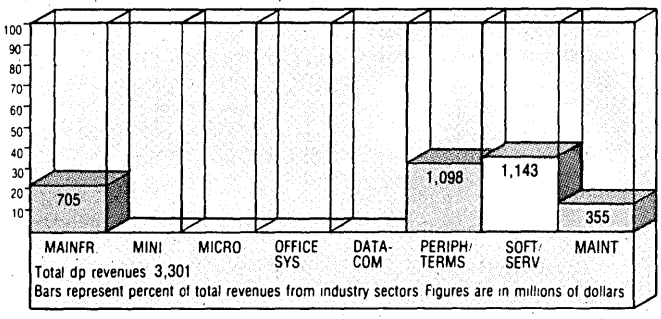

CONTROL DATA CORPORATION

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

After six years of steady growth, Control Data found 1982 tough going. While it managed a 5.8% increase in dp revenues and a 4.6% increase in corporate revenues for the year, corporate profits fell 9.4% to $155 million from $171 million. The decline is largely attributable to CDC's Commercial Credit financial subsidiary, which was hard hit by the recession.

Several years ago, CDC was the first of the BUNCH to decide that competing directly with IBM was not a desirable strategy; consequently, it chose to diversify into peripherals and services as a way to ensure its success. This path had worked very well, giving CDC a 60% share of the mainframe peripherals market and turning it into the nation's largest service company.

The primary culprit of CDC's lower earnings was its oem disk drive business, which soured in 1982. The disk drives CDC supplied to other vendors contributed about 90% of its $1.12 billion in peripheral sales in 1981, and as 1982 began CDC was fully geared up for volume production of new product lines. Unfortunately, nobody wanted to buy and inventories mounted. The company reacted quickly with plant shutdowns and layoffs, but sales remained depressed all year. Final sales of the peripherals division dropped 1.8% to $1.098 billion for the year.

On the services side, the picture was brighter, but 1982 could still be called an off year. Revenues climbed 10.9% to $930 million, a slower pace than CDC had experienced in the previous five years, when revenues doubled. Still, the service operation is by far the largest in the country. While CDC has numerous scientific and governmental contracts, the bulk of its business comes from commercial clients like the Ticketron entertainment reservation and ticket sales network.

Another ray of hope for Control Data is the educational market, where the company has spent some $900 million in R&D over the past 20 years. One product from this effort, the Plato computer assisted educational system, finally appears to be paying for itself. Once seen as Control Data's answer to the Edsel, Plato has seen some success among corporations as a training tool: General Motors uses Plato to train its workers in assembling robots. Control Data has been looking for a larger market for Plato, and in 1982 made some of the Plato programs available to PC owners of Apple, Atari, and Texas Instruments.

Control Data is still the number two supercomputer maker as well. Despite a slack market and fierce competition from crosstown rival Cray Research, CDC's mainframe revenues increased 13% in 1982, to $705 million. But Control Data still has less than 30% of the supercomputer market; instead, much of the credit for the improved mainframe revenues goes to the 800 series of general purpose mainframes.

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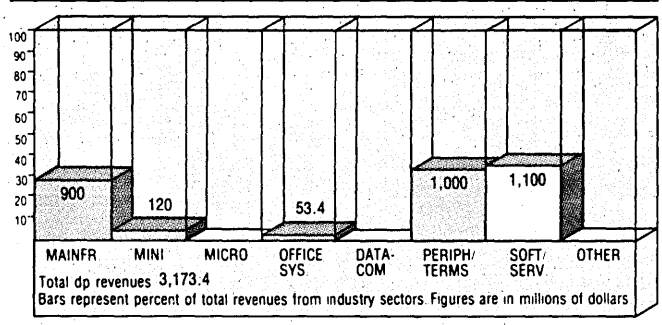

NCR CORP.

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

Like many of its mainframe competitors, NCR found only modest growth in revenues and profits last year, but it boldly entered several high-growth markets in which it has never competed before. Revenues were up only 3% to $3.5 billion, while profits rose 13% to $234.4 million, compared to the previous year.

The slow growth was attributed to the worldwide recession's effect on orders and to adverse foreign exchange rates. The company said, however, that it expects a slow recovery to begin in the second half of this year. It also claimed to have emerged from 1982 in a "healthy financial position."

The biggest development at the company last year was its embarkation on an ambitious plan to broaden its product line downward, taking advantage of new technologies and leveraging internally developed products into new markets. The new push was backed by an 8% boost in R&D spending, to $248 million. The company also began operations in a newly built microelectronics facility.

In the merchant semiconductor market, NCR continued to offer nonvolatile memories and marketed for the first time a set of 32-bit microprocessor chips. The NCR/32 microprocessor chip set showed up in early 1983 as the basis of the new 9300 mainframe line.

NCR last year also made its debut in the oem arena, offering a multi-user Unix system based on Motorola's 68000 microprocessor. Designed for sale in volume to systems houses and distributors, the so-called Tower 1632 system is expected to form the basis of a fully packaged system NCR will sell to various vertical markets this year.

Early 1983 saw NCR enter the personal computer market with Decision Mate V, a locally networked system aimed at office use. It runs on the MS-DOS and CP/M operating systems and can be attached to an NCR-designed file server.

The Applied Digital Data Systems subsidiary continued to expand its lines of crt terminals and Multivision small business computers. The latter use the popular Pick operating system and have found substantial success in a market once dominated by Microdata. ADDS founder and chairman William Catacosinos left in early 1983 but continued to consult with NCR.

In the office systems market, a relatively new one for NCR, the company introduced its first internally developed word processor, the First Step. It also continued to sell, apparently without great success, Convergent Technologies' workstation under the WorkSaver label.

NCR's two strongest vertical markets, financial and retailing systems, saw several important new products. These include the POS terminal, a mini-based system for small stores.

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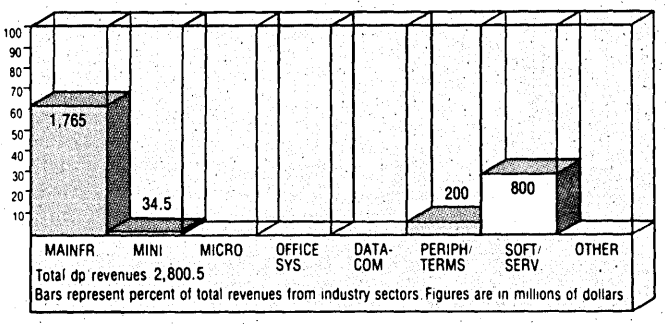


SPERRY CORP.

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

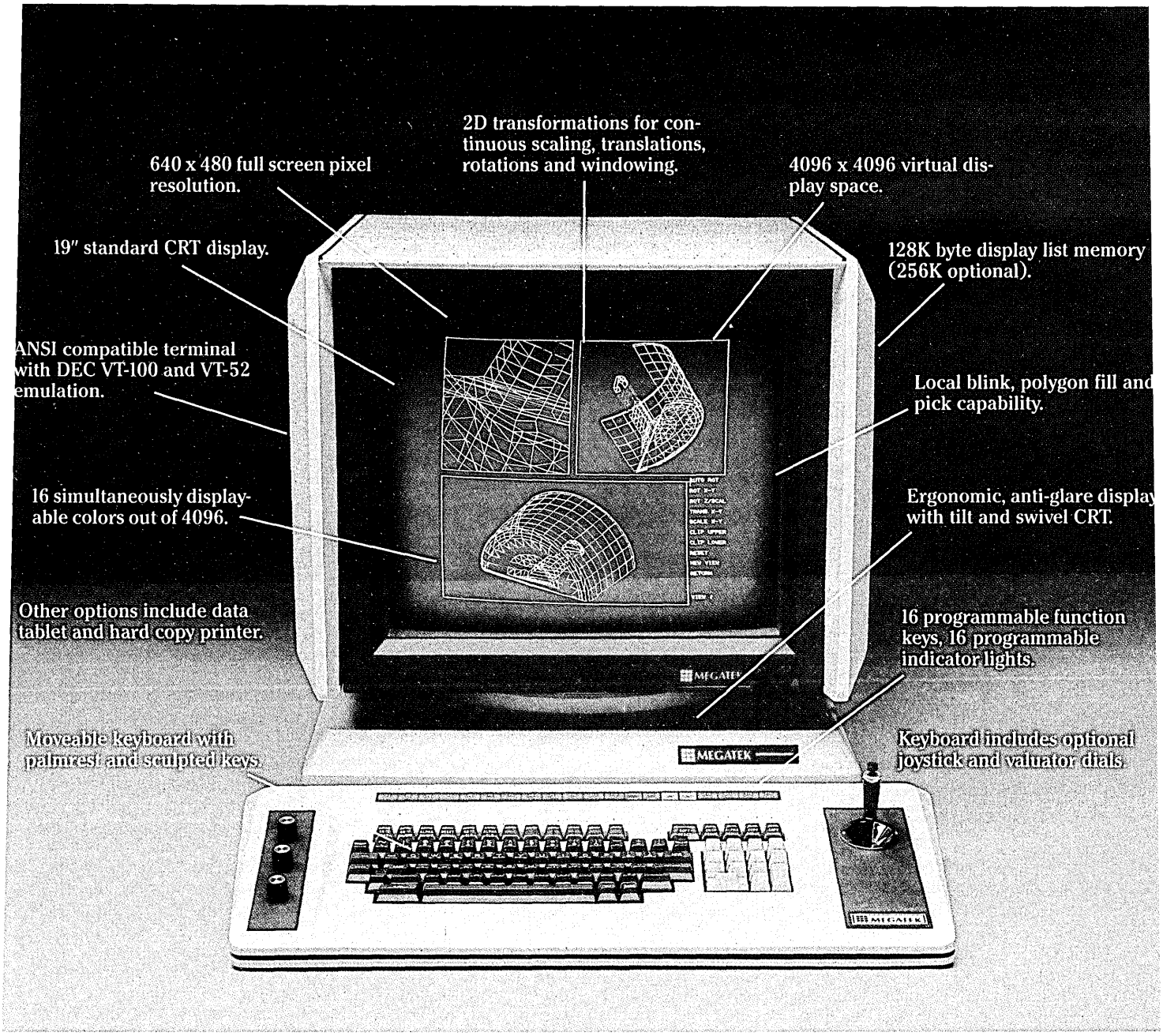
Weak demand for Sperry's mainframe computers plagued the company for most of calendar 1982, as new orders fell 4% and data processing revenues were flat at about $2.8 billion. Computer division earnings, reported only on a fiscal basis, with FY '82 ending March 31, plummeted to about $100 million, or a third less than the anemic $150 million of 1981. The recession's impact on Sperry's key computer markets, manufacturing and energy companies, was especially painful as the conglomerate's aviation, farm implement, and hydraulic equipment lines were simultaneously hard hit by the economy. By year-end, though, several important new products filled gaps in the computer line and order rates improved.

The long-awaited introduction of top-of-the-line cpu, the 1100/90, was met last summer with the open checkbooks of customers squeezed into the limit of their 1100/80 series systems. Within months of its July introduction, American Telephone & Telegraph, for example, ordered $58 million worth of the new model for inventory tracking and other projects. The 90 models, with a maximum performance of 25 million instructions per second, is three to four times faster than the 1100/80 series and customer interest "exceeded expectations," says Joseph Kroger, computer systems president.

After several false starts in the office automation market, Sperry's latest entry, Sperrylink, was unveiled in October. The executive workstation features word and data processing, personal computing, CP/M compatibility, and other features. Company officials hope that Sperrylink revenues will approach $1 billion by 1985 and soar to 50% of the computer group's total revenues by the end of the decade; analysts caution that while Sperrylink will be attractive to existing Sperry customers, its chances in the hotly competitive open market are less than optimum owing to its reliance on a mainframe and a lack of exclusive features.

Research and development spending jumped 20% to about $300 million, or more than 10% of sales last year, as the company focused on software along with the technological advances expected from the world's oldest computer company. In another break with the past designed to emphasize the systems approach, the dp business is no longer called Univac, but Sperry Computer Systems.

As for 1983, the company's dp revenues and earnings are expected to modestly improve due to increased Defense Department orders and new financial controls. As part of a belt-tightening process, Sperry decided to halt offering subsidized financing for computers, laid off 11,000 employees companywide, and cut executive salaries by 17.5%.



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*Thaumaturgy (thô´ma tûr jē), n., the performance of miracles.

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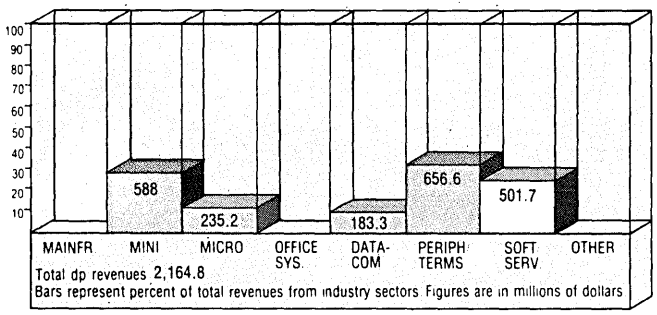

HONEYWELL INC.

Honeywell Plaza
P.O. Box 524
Minneapolis, MN 55440
(612) 870-5200

For Honeywell, 1982 presented an almost overwhelming array of problems, obstacles, and misfortunes to overcome, and to some extent the company was successful. Overall, Honeywell posted a 2.6% growth in revenues, to $5.5 billion, with a 5.4% increase in earnings to $272.9 million.

Those corporate numbers disguise real problems for the company, however. Honeywell sold a 16% share of General Electric Information Services Co. and 27% of its holdings in Cii-Honeywell Bull, a combined capital gain of $66 million. Excluding that figure from the company's revenues, earnings dropped 20% to $207 million.

Honeywell's most important component is Honeywell Information Systems, which generates over 30% of the company's revenues. In 1982, HIS sales dropped 5% to $1,684.7 million, while earnings tumbled 50% to $79.8 million. This sharp decline was caused by a large number of cancellations and deferrals of orders from customers in the recession-prone auto and steel industries. Consequently, HIS reduced its employees by some 2,700.

The company is hoping for something of a turnaround in 1983 and 1984, especially from the HIS component. That division was reorganized through most of 1982, culminating in the appointment of James J. Renier as president. The reorganized enterprise hopes to be more flexible in adapting to market demands and in using technology developed by Cii-Honeywell Bull.

Prospects for the company do look better than the continued poor performance would indicate. In 1982, HIS was awarded a 10-year contract with the Navy to supply $603 million worth of hardware, including 1,800 DPS 6 processors, 33,000 terminals, and 26,000 printers for shipboard nontactical use.

Honeywell can also look forward in the long term to revenues generated by two large-scale computer systems introduced in 1982. The DPS 88/81 uniprocessor-based mainframe is about four and a half times faster than anything the company had yet introduced, and the DPS 88/82 dual-processor model was about eight times as fast as previous models. The systems will not be ready until 1984, which gives competitors room to cut their prices and squeeze Honeywell before it can even begin shipping.

The company is hoping to diversify its product line through acquisitions; to that end, it purchased Disc Instruments, Executone/South Bay, Shield Protection, and Tetra Tech in 1982, and Votan in 1983. Eventually the company hopes to offer all of their products under the Honeywell name.

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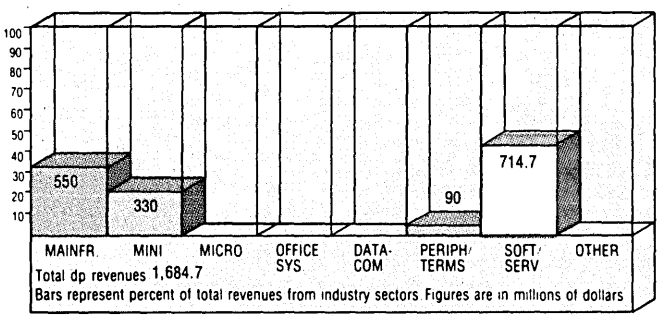


HEWLETT-PACKARD COMPANY

3000 Hanover Street
Palo Alto, CA 94304
(415) 857-1501

Other companies would consider a 17.3% revenue growth rate and a 25% earnings growth rate a spectacular performance during a recession, but Hewlett-Packard's 1982 figures didn't ease the cautionary outlook of chief executive John Young. For a company that enjoyed 40% annual revenue growth in good times and about 20% in bad times over the past years, the $2.2 billion in data processing revenues seems modest indeed.

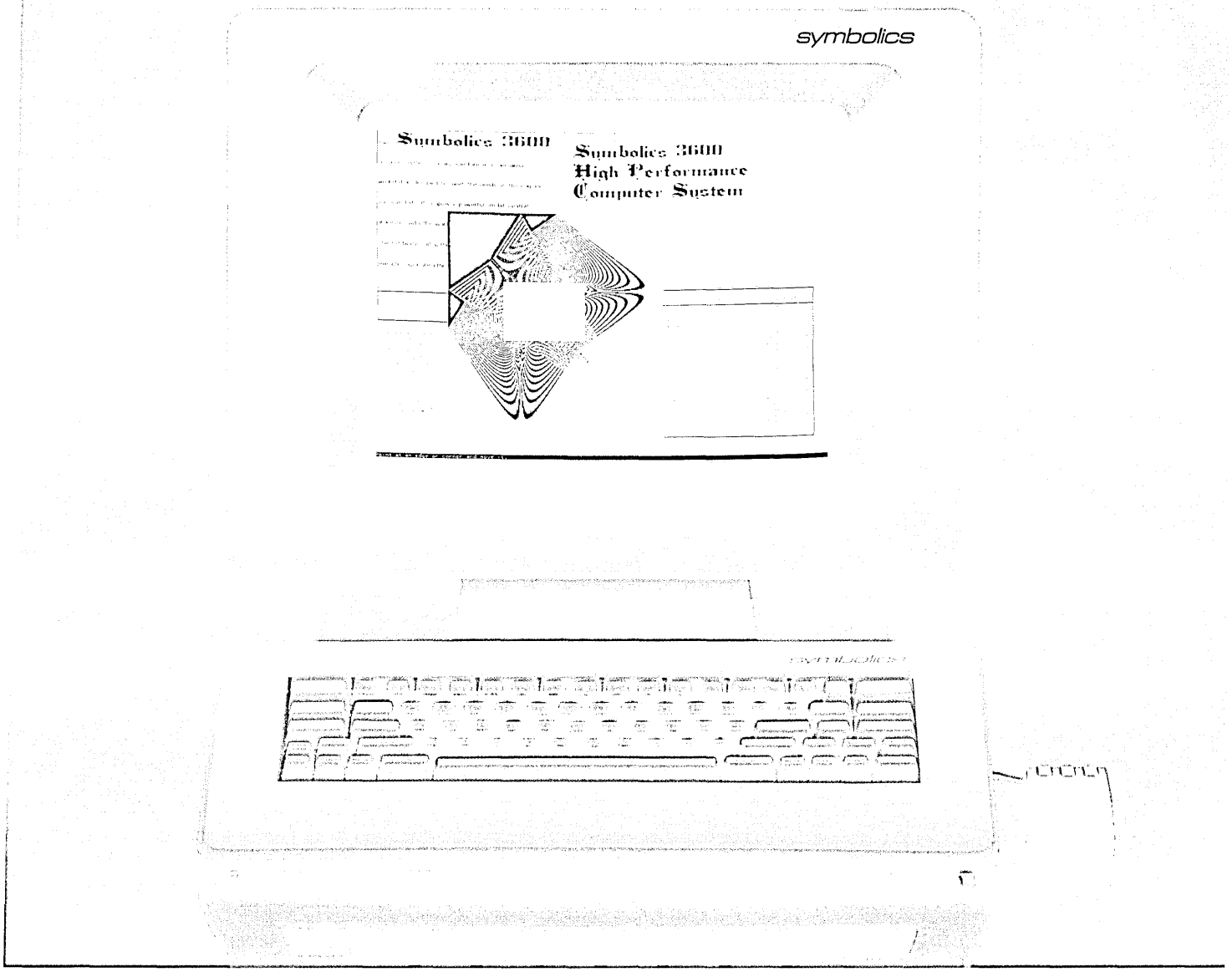
The recession's impact on HP computer operations was uneven. Minicomputer sales were up 37% to $588 million, even though HP does not have a true 32-bit minicomputer line, the only growth area for minicomputers. Personal computer revenues were up a solid 20.6%, but that's not an impressive amount considering the overall torrid PC market explosion. The weak economy's sharpest impact on HP revenues was in peripherals and software, a growth of 10.3% and 7.2% respectively.

Typical of Young's tightfisted attitude toward spending, HP's earnings growth exceeded revenue growth. Net income in the fiscal year that ended Oct. 31 was up 25% to $390 million, but it was not achieved without some pain: capital spending plans were slashed 25% to $362 million. Hiring limitations held the HP payroll to 68,538 persons. Research and development spending, the lifeblood of HP, increased 24.4% to $432 million in calendar 1982 and is now 10% of revenues as the company further positions its product line for the recovery.

Foremost among the new products coming from the labs was the new family of 32-bit desktop computers, the HP 9000, introduced in November. Proprietary silicon chip technology enabled HP engineers to squeeze the equivalent of 600,000 transistors onto a 128K RAM chip and 450,000 transistors on the cpu chip to assemble what is considered superminicomputer or mainframe processing capability in a breadbox. Touted as the ultimate workstation at less than $30,000, ideal for CAE/CAD projects, the HP 9000 was a landmark in the company's history.

Yet technological expertise is no guarantee of marketing success in the computer industry these days, and many question HP's ability to profit from the $100 million research effort behind the superchips and the 9000 family. Critics say decentralized marketing was a handicap in the small computer market: too many HP salesmen pushing different variations of basic product lines.

Recognizing the weakness, Young recently reorganized the multitude of computer segments into five coordinated groups. The streamlining should help the dp division's profit margins With dp revenues now accounting for more than half of total HP sales, and the office and personal computer marketplaces the critical growth areas of the 1980s, improved margins are crucial for HP to continue its strong financial performance.



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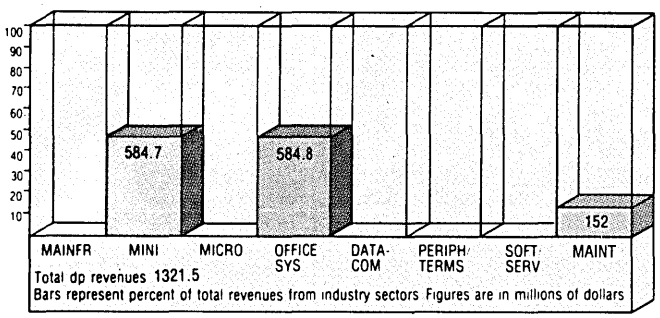

WANG LABORATORIES

One Industrial Avenue
Lowell, MA 08151
(617) 459-5000

The drumbeats of success banged loudly again at Wang last year. The company had higher revenues, higher profits, higher earnings per share, and more employees than ever. The company seemed impervious to both the worldwide recession and the more frenzied industry competition. Total corporate revenues, which had edged over $1 billion for the first time in 1981, soared to $1.3 billion, a 31% increase. That was less than the astonishing 48% rise the company experienced in 1981, but no one was complaining.

Profits passed $100 million for the first time. The company had expected to exceed that figure after finishing 1981 with $90.4 million, but even chairman An Wang probably didn't anticipate a 36.7% jump to $123.6 million. Earnings per share responded with a 29.9% rise, from 77 cents per share to $1. Wall Street's reaction to all this was bullish. Wang stock opened 1982 at 16¾ and closed at 29½, a 77% increase.

The company attributed part of its improved financial position to a dramatic rise in the level of internally generated funds through improved collection of receivables, better inventory management, and comprehensive tax planning. It expects further improvement this year, particularly in the management of inventories and capital. Wang has set a 1983 goal of 30% growth in revenues and earnings. One major New York investment house believes Wang can maintain a 30% to 35% earnings growth over the next three to five years, with considerably higher growth likely in a recovering economy.

After introducing a number of new products in 1981, Wang kept the production lines running in 1982. The company in May introduced its long-awaited Professional Computer. This low-cost product can function in three modes—MS-DOS (16-bit), CP/M (8-bit), or as a terminal. It allows users to access data from a host (VS, OIS, Alliance, or 2200) system and use those data in programs run on the desktop unit itself.

Wang was also active on the high end. It reduced the entry level of its VS distributed office systems family by introducing the VS 24 and VS 45 and, on the highest end, the VS 90.

The VS 25 and 45 are designed for first-time users of office dp in small- to medium-sized companies or the distributed processing environment of a large organization. The systems have all the high-performance features of the larger VS systems.

The VS 90 is the lower-priced member of the company's 32-bit superminis. The VS-90 can be equipped with up to 4 million bytes of main memory and 5.2 billion bytes of disk storage. It can also be upgraded to a VS-100.

Wang continued to stress its claimed position as the leading edge of office automation. With last year's figures available, no one seems willing to argue the point.

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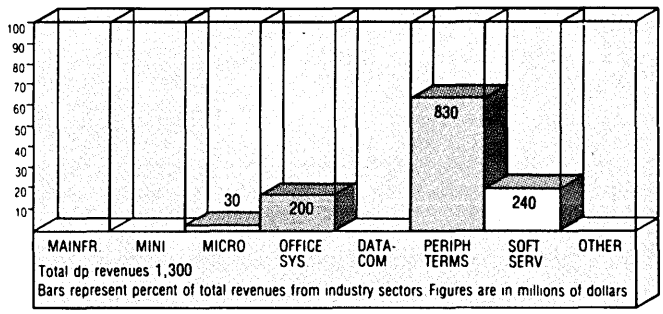


XEROX CORP.

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

Xerox Corp. has suffered hard times in the past 18 months as it struggles against tough odds to regain lost strength in the copier business and to establish momentum in the crucial office automation arena.

Earnings from continuing operations for 1982 slid 36% from the previous year, ending up at $423.7 million. The company attributed the poor results to a weak worldwide economy, fierce competition from Japanese vendors, a strong dollar, and heavy investments in new products.

Xerox made some significant moves in 1982, however, the most notable of which was the purchase of Crum & Forster, the New Jersey property and casualty insurance company, for $1.6 billion in cash and stock. The move was seen by analysts as a way to maintain a steady cash flow and to decrease Xerox's risk of being taken over as a pure technology company.

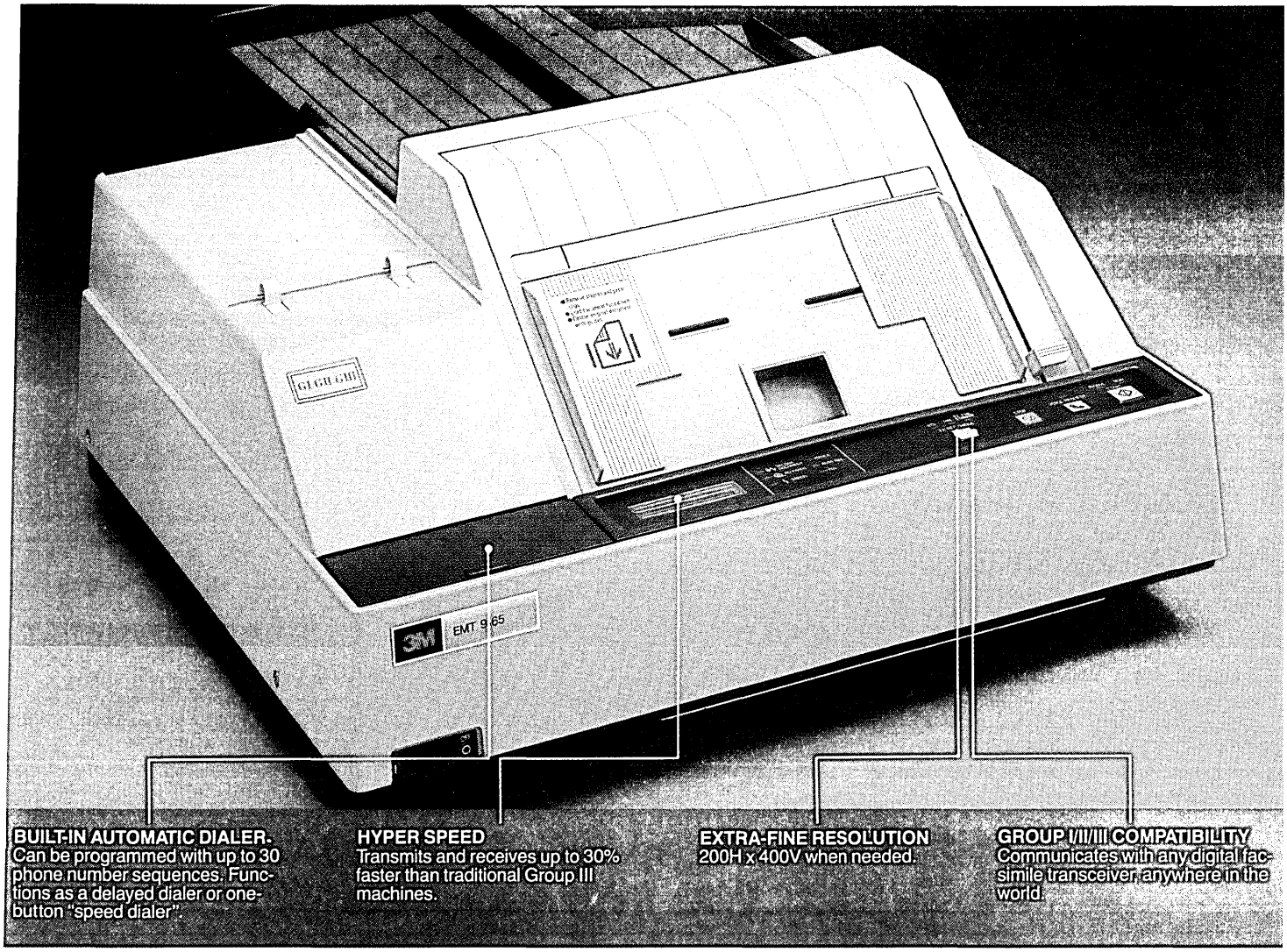
Xerox also continued to reduce its work force as a result of sluggish orders and a continuing general trimming instituted in 1981. A total of 9,500 people were let go in 1982, bringing the total work force to 109,940.

The company is estimated to have had data processing revenues of $1.3 billion in 1982, compared to an estimated $1.1 billion the year before. That total is thought to have come largely from Xerox's peripherals subsidiaries (Shugart Associates, Versatec, Kurzweil, among others) as well as from a fairly successful computing services subsidiary. DATAMATION estimates that total office systems revenues were $200 million in 1982, up substantially from $132 million in 1981.

The company's year in the all-important office systems market had its good and its bad points in 1982. On the plus side was an increasing acceptance by customers of the Ethernet local network, and slow but steady deliveries of the 8010 Star workstation.

The firm's microcomputer marketing efforts, however, fell far short of expectations because of what chief executive David T. Kearns admitted was a poorly executed distribution effort. Meanwhile, two top office automation executives left abruptly to start their own company. By all accounts, Xerox has a long way to go before its office system business is profitable, a fact conceded by the company, which has told analysts not to expect much of an upturn this year. Nevertheless, top management said it is committed to pursuing the elusive market.

Among other developments, the firm introduced a new line of small copiers, installed an optical disk storage system at the Library of Congress, beefed up its product line and marketing efforts in the nascent artificial intelligence field, and installed an experimental copy editing and layout system for the *New York Times*.



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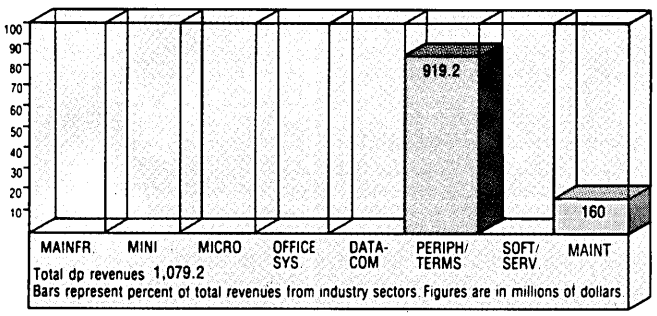

STORAGE TECHNOLOGY CORP.

2270 S. 88th St.
Louisville, CO 80027
(303) 673-5151

Optimism raged throughout STC in the early months of 1982. The company continued its string of quarterly revenue and earnings records, maintaining its position as a darling of Wall Street. Jesse Aweida, chairman, said in May that he was not "uncomfortable" with 1982 earnings estimates 40% higher than the $2.50 per share posted for 1981.

Then the outlook changed.

The strong demand for the company's disk drive memory systems melted during the summer of 1982, as the recession and renewed competition from International Business Machines Corp. intensified. Incoming orders dropped 58% for the first nine months of 1982 compared to the same period a year earlier. To match output to the reduced order level, Aweida had to take the unprecedented step of laying off 400 workers last year and another 500 workers in early 1983.

After several years of posting 50% annual revenue and net income gains, STC's 17% revenue increase to less than $1.1 billion was a distinct disappointment. A quality control problem, the sudden shortfall in orders and its impact on operations battered profits—net income dropped 21% to $64.7 million. By year-end the disappointing outlook knocked off more than a third of the company's stock market price.

Particularly embarrassing to STC was the in-the-field retrofit of disk-head assemblies of the 8650 drive that is plug compatible with the IBM 3350. STC technicians replaced the assemblies in the field and rebuilt them in the factory, at a pretax cost of $17 million. Another embarrassment was the discontinuance of the Virtual Memory System project. Software development problems repeatedly delayed the data storage management package.

The future good health of the company depends in large measure on the success of its new 8380 disk drive with 2,500 megabytes of memory. This is STC's higher capacity version of the IBM 3380 unit. Also high on observers' lists of significant new efforts was the optical storage disk project. Both products are to enter commercial markets this year and provide key sources of revenues in the future. As for 1983, Aweida expressed subdued optimism, forecasting a 10% to 15% increase in revenues and earnings.

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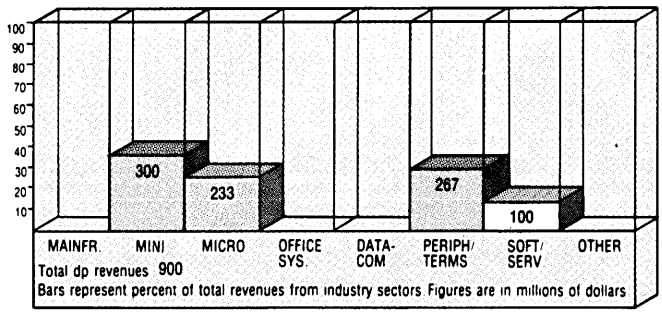


TEXAS INSTRUMENTS INC.

P.O. Box 22574
Dallas, TX 75265
(214) 995-3773

The data processing business at Texas Instruments had more triumphs and tragedies than a Shakespearean festival last year. The 99/4 home computer, ridiculed a few years ago for its limited performance and $1,200 price tag, flew off retailers' shelves in 1982 after it was marked down to a rebate-induced $150. Fred Bucy, TI president, bragged a few months ago that 1 million were sold, but the impact of an emergency retrofit in February because of a potential electrical malfunction remains to be seen.

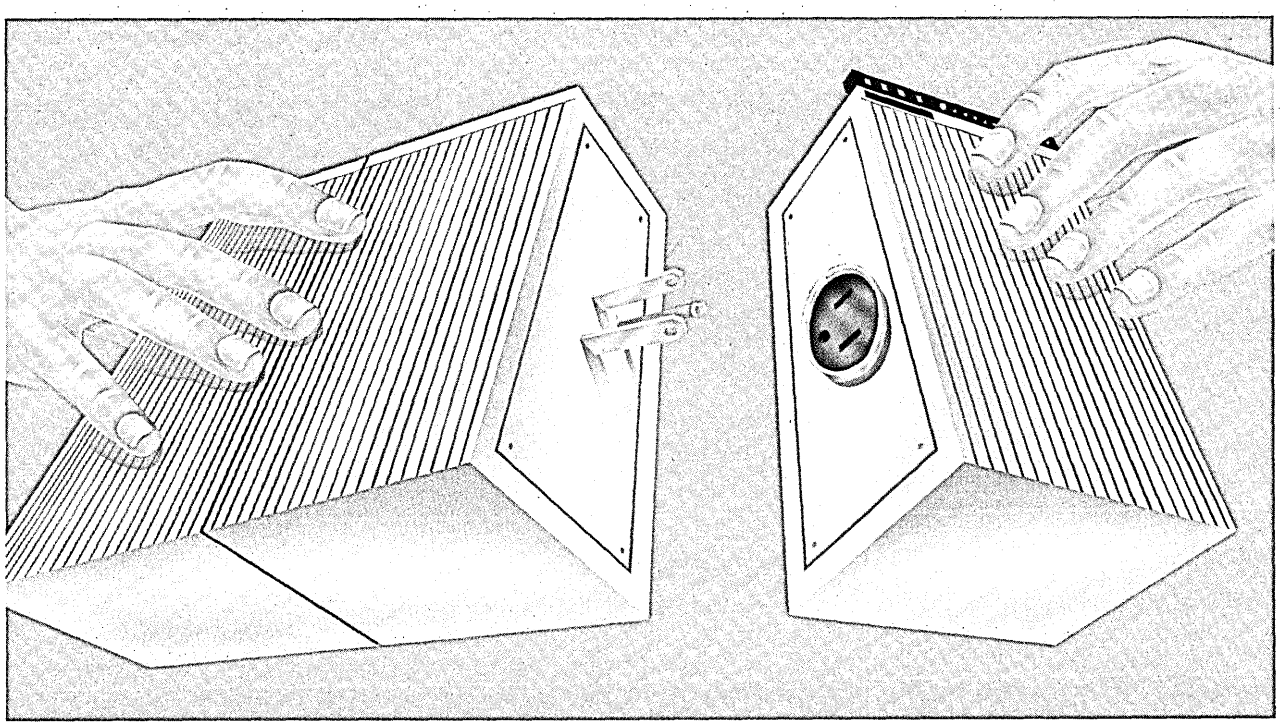
The 61% increase in microcomputer revenues last year credited to the 99/4a unit was one of several pieces of good news for the company, but even that was dampened by the poor bottom line. TI's digital products group—which includes minicomputers, micros, peripherals, and non-dp gadgets using TI chips—isn't making much money. Last year, the company said, digital products cleared a mere $23 million on $1.2 billion in sales, or about even with the 1981 results and less than half the profit level of 1980. Company officials admit that the intense price competition in the home computer area came earlier in the product cycle than they had expected, an indication that the 99/4a is not a big profit contributor.

The depressed profit levels are caused by weaknesses in TI's other dp businesses. Minicomputer revenues dropped 5% to $300 million despite a steady stream of new products. Peripheral revenues also lagged the industry, up 1% to $267 million, according to DATAMATION estimates. Total TI dp revenues were up 12.5% to $900 million.

TI overall performed without much strength last year, except for its thriving defense electronics business. Sales were up modestly to $4.3 billion, but earnings were up an impressive 33%, to $144 million. TI's Defense Department business generated 24% of revenues but 52% of profits as the company's line of airplane and missile radar continued to win military contracts.

As the new year dawned, TI faced a number of good news/bad news situations. The home computer problem was followed a few weeks later by the introduction, to rave reviews, of a new personal computer, complete with a speech recognition box, priced below the comparable IBM P.C. Then, just as TI's chip business started recovering from the weak economy, a manufacturing problem forced the company to recall 64K RAMs vulnerable to moisture damage, an embarrassment to a company that prides itself on manufacturing prowess. A surging order rate indicated that there is more good news than bad ahead for the pride of Dallas.

At last, plug-in parallel processing in a 32-bit supermini system.



Perkin-Elmer announces the Model 3200 Multiple Processing System, an exciting new concept for demanding real-time applications.

Room to grow

The Model 3200MPS gives you extraordinary system expandibility. You can start with a host CPU and one auxiliary processing unit (APU). Then as your needs grow you can plug in more performance by adding as many as eight additional APUs.

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With parallel-processing APUs you can take advantage of application segmentation and structured programming techniques to speed system development. You can segment your application into multiple task modules, with each APU performing a set of related functions. To further optimize system performance, you can easily re-allocate tasks among the APUs.

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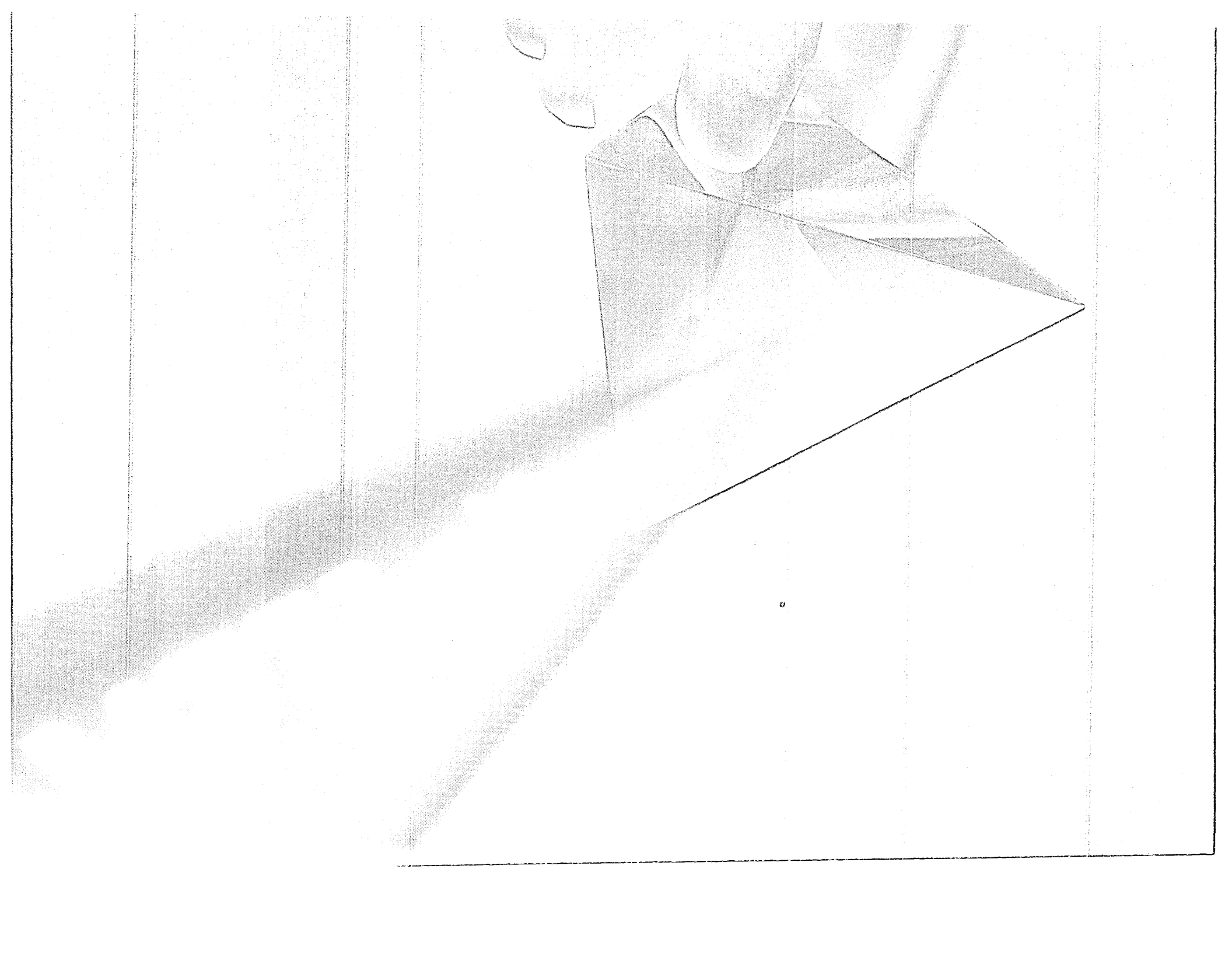

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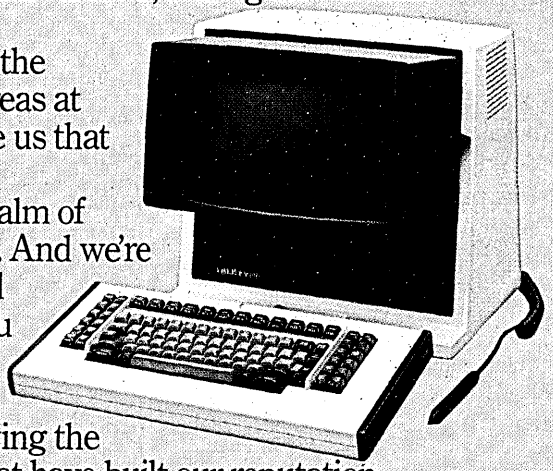
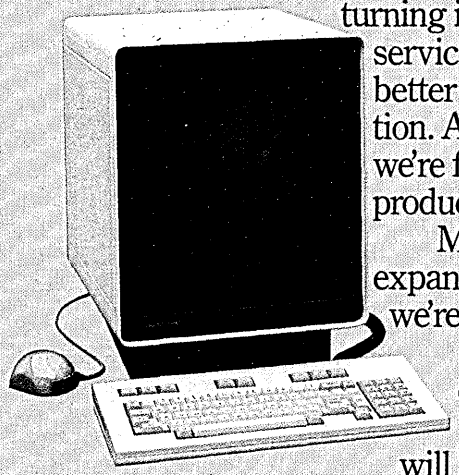


We've taken our technology beyond the realm of traditional data and message communications. And we're turning it into products and services that will help you better manage information. At the same time, we're focusing on improving the products and services that have built our reputation.



Much of what we're doing has been made possible by expanding our research and development. This year alone, we're increasing R & D expenditures by over 25 percent.

We're set to be more competitive in terms of product technology, features and functions. So that in the long run our reputation for value will become even stronger.

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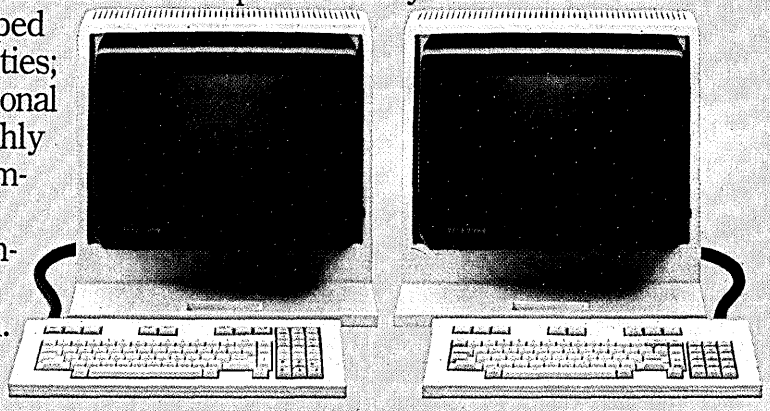

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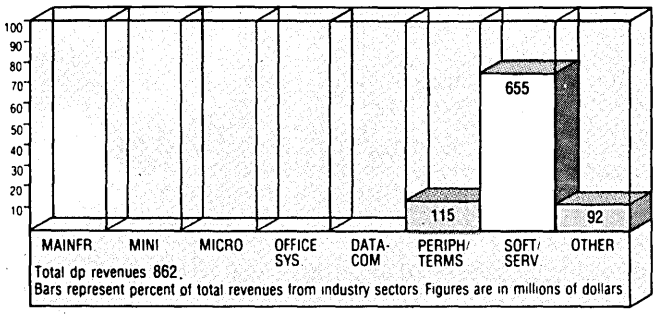

GENERAL ELECTRIC COMPANY

3135 Easton Turnpike
Fairfield, CT 06431
(203) 373-2211

In its attempts to "bring good things to life," General Electric has managed to bring more than a few good things to itself. With its cash hoard of about $5 billion, GE has quickly and quietly positioned itself as a key contender in the very business in which it failed so spectacularly in the '60s. The emphasis is clearly on high technology, and analysts continually speculate on which computer-related company GE will gobble up next.

Over the past two years the company has acquired and disposed of business entities at an astonishing rate. During that time GE completed some 120 transactions involving acquisitions, joint ventures, and formations of new companies. It also disposed of 71 businesses that didn't fit its long-range strategy. Those transactions involved $1.5 billion—roughly $1 billion for acquisitions (such as IC-maker Intersil and CAD/CAM company Calma in 1981) and $500 million for dispositions (like the sale of its central air conditioning business last July). But the big bartering took place this January. Realizing that investments in coal and ore didn't mix well with investments in dp and datacom, the company made way for the sale of its Utah International Inc. mining subsidiary for about $2.4 billion.

The shift in market mix began back in April 1981, when Reginald Jones retired as GE's chairman, passing on his post to current chairman John F. Welch Jr. Both strong leaders, Jones and Welch preach different philosophies: Jones rallied for respectable and rising profits year after year; Welch wants ever-increasing share of market. Interestingly, both goals appear to have been met last year.

Despite a decline in total corporate revenues to $26.5 billion in '82 from $27 billion in 1981, GE's earnings climbed 10% to $1.8 billion from the year earlier's $11.7 billion. Such an increase on declining revenues was a feat few information processing companies performed during 1982.

In a year when many companies reported fattened revenues but starved profits, how did General Electric fare so well? The company took a strong dose of cost-cutting measures, including the trimming of its work force to 367,000 employees from the year earlier's 404,000 and reduction of R&D expenses to $1.6 billion last year from $1.7 billion in '81. Even on the leaner budget, the corporate R&D center in Schenectady, N.Y., saw completion of its $130 million expansion.

A significant part of GE's R&D investment is aimed at microelectronics. The company wants an even wider array of products and services—from industrial robots that "listen" and "see," to kitchen appliances that "think." With $5 billion in the corporate coffers and a goal of ever-growing market share, the question becomes: what market? Not even Wall Street analysts will hazard a guess on which high-tech company will be the next to satisfy GE's voracious appetite.

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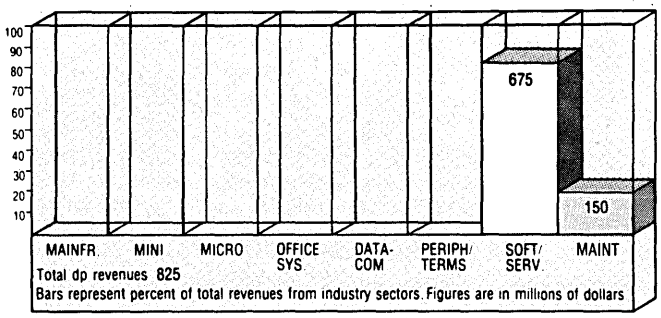


TRW INC.

23555 Euclid Ave.
Cleveland, OH 44117
(216) 383-2121

The original concept of being a conglomerate was to protect earnings and revenue growth from the peculiarities of just one business. The recession of 1982 put that concept to the test. Cleveland-based TRW failed the test, finishing the year with a 3% decline in revenues to $5.1 billion, but a whopping 15% decline in earnings to $196.3 million.

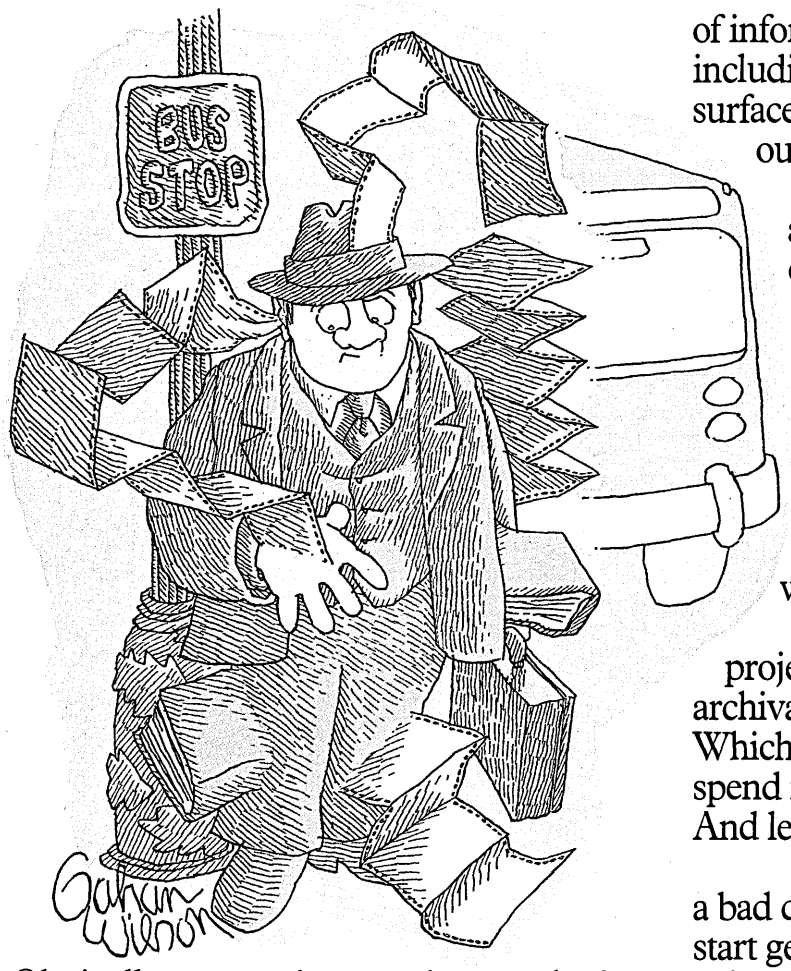
All wasn't going too well for TRW in its industrial and energy group or its car and truck operations. In the dp arena, things apparently went sour between TRW and its Japanese partner Fujitsu Ltd. In early 1983, the partnership broke up, with Fujitsu taking control of the operation. (A number of TRW executives transferred over to Fujitsu.)

TRW reports to DATAMATION that its only dp operations are now its maintenance and service company and the credit analysis operation. The company says its credit service expanded to $675 million from $485 million for the previous year. The maintenance operation only increased to $150 million from $135 million. This small increase in maintenance is surprising, because so many manufacturers reported a much larger percent increase in their maintenance costs. This seems to indicate that TRW is losing market share. TRW's service operation is located in Fairfield, N.J., and has over 200 locations with 3,000 employees. It boasts over 80,000 customers at 250,000 different sites. During 1982, the service and maintenance operation took a new approach, and opened its first retail outlet in Dallas, aimed at local personal and home computer owners. This is a testing of the waters; if it is successful, the company may open others.

What will TRW do now that the Fujitsu deal has fallen through? Will it stay out of the dp business and concentrate on its components operation? Or will it simply remain in the services and maintenance business, and try to expand these? Most analysts expect the company to move further into dp, but they predict it will wait until some of its other operations are turning bigger profits before taking any new risks.

TRW's overseas dp business again fell into turmoil. In the past few years its Datacom division had the overseas marketing and distribution contracts from Datapoint, NBI, and other companies, but within a year each was dissolved as those companies expanded their own operations. Now TRW distributes Convergent Technologies workstations overseas, but the large equity positions in CT taken by Burroughs, NCR, and others probably preclude a TRW acquisition.

Funny how computers grow on you.



Oh, it all starts out innocently enough. A printout here. A reference manual there.

But before you know it, all those papers and books and program listings are sprouting up all over the place.

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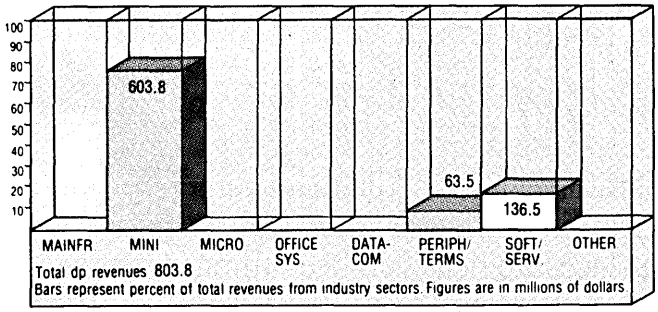

DATA GENERAL CORP.

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

Industry analysts have been having a lot of fun in the past two years dissecting Data General. After all, it's not too often that a company records revenues over $500 million in its 10th year of business and then falls flat on its face. From a high of $87 in mid-1980, Data General's stock tumbled—crashed, actually—to a low of $20 a year later. And while revenues increased in each of the last two years—to $803.8 million in 1982, a 5% gain over 1981—earnings slipped in 1981 and plummeted in 1982. DG's profits in 1982 were $12.9 million, a 75% fall from 1981 and a far cry from its 1980 peak of $54.6 million.

The problem isn't really that anything went wrong, per se. It was a huge corporation operating like a tiny startup. As a result, problems mounted. Where DG once was the technological leader in minicomputers, it came in over a year late with its 32-bit Eclipse MV/8000 and almost as late with its midrange MV/6000. Digital Equipment and Prime took advantage of that lateness to build their bases, while DG languished.

That's only half the story, however, and the other half indicates that Data General's downward spiral may soon be reversed. Management shake-ups took place, resulting in a senior team with more experience running large corporations. The company's internal structure was fundamentally reorganized in 1982 into Technical Products, Small Business Systems, and Information Systems divisions. The restructured sales force is now more attuned to end users than to oems.

The company also hiked its R&D budget 13% to $84.5 million, or 10.5% of corporate revenues. The fruits of that effort may be particularly sweet to Data General: the Eclipse MV/4000, introduced in November, was introduced only about six months later than DEC's comparable VAX-11/730; that is as close as DG had come in the 32-bit world to catching up with DEC. More important was the company's March 1983 announcement of the MV/10000, the top end of its superminicomputer line. The MV/10000 has about twice the power of DEC's biggest VAX and has set an industry standard for supermini performance and price. Neither DEC nor Prime has as yet introduced a competitor.

Data General has also made considerable strides in the software arena. In past years, DG software did not sell well because the company's hardware went primarily to oems; by 1982, fully half of DG's MV/8000 sales went to end users, and as a result, software picked up considerably. The Comprehensive Electronic Office, an office automation software system introduced in November 1981, was something of a sleeper product in 1982, selling moderately while winning excellent reviews from its users. In February 1983, Data General announced that E.F. Hutton was purchasing $40 million of the CEO software.

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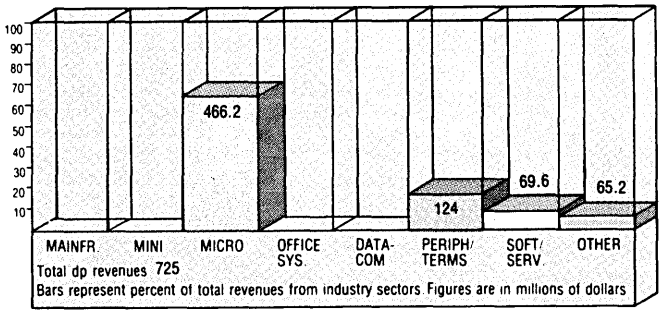

TANDY CORP.

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

It was life in the fast lane all over again for Tandy as the giant consumer electronics retailer continued to cash in on the personal computer craze that's put dollar signs in the eyes of the humblest hardware vendors. Continuing its sales streak, Tandy chalked dp revenues of $725 million last year, a 58% increase over 1981. Corporate earnings were up 23.3% to $254.1 million.

There's no doubt about it, things at Tandy are just fine, despite the recession and despite its growing number of rivals in the microcomputer market. The company's success in the PC business is largely due to its worldwide distribution network, which is the envy of every PC maker. The object of all that envy is of course Radio Shack, Tandy's retail consumer electronics chain that has captured the fancy as well as the finances of a whole new breed of would-be computer users.

Tandy's microcomputer sales in calendar '82 totaled $466.2 million, a 59% improvement over 1981. Peripheral and terminal revenue reached $124 million, up nearly 47%. The biggest growth area, however, was in software. The company, which has gradually learned to appreciate the programming side, boosted its software sales to $69.6 million last year.

Software has indeed become more important to Tandy, particularly programs aimed at its target market. To satisfy that market, the company is developing home educational software for preschool through high school youngsters. It's also going after software to support home applications such as filing, home management, word processing, and communications/videotex.

On the disk front last year, Tandy agreed to buy 50% of Texas Peripherals Inc., the joint disk venture it launched with Datapoint back in 1980. During FY '82 the company also acquired Memorex's Consumer Products Division—a move that should strengthen its magnetic media muscle.

A significant move in Tandy's history came when it decided to set up computer departments in various Radio Shack stores. There are currently over 450 of these setups, each staffed by an on-site marketing representative. The company plans to open 125 more computer centers in 1983.

In making such a decision, Tandy used both hindsight and foresight. The 62-year-old company, which started out peddling leather and other crafts, sees more and more of its total sales stemming from the computer segment.

Most of those sales will still be in the consumer sector. While the company has recently come out with a new portable, battery-powered workstation for executives, it remains to be seen whether the wonder of the micro world can dazzle or even make a small dent in the office market.

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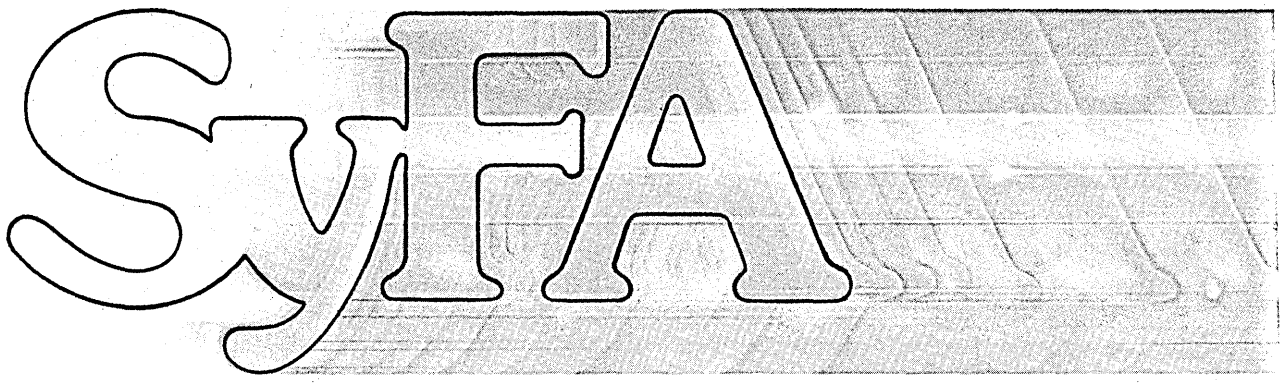
NETWORKING VS. NOTWORKING:

ANNOUNCING THE NET RESULTS.



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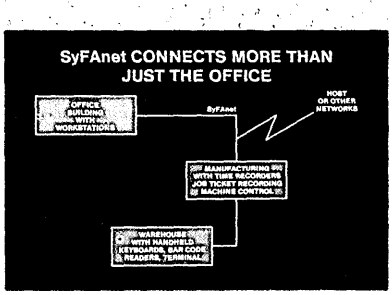

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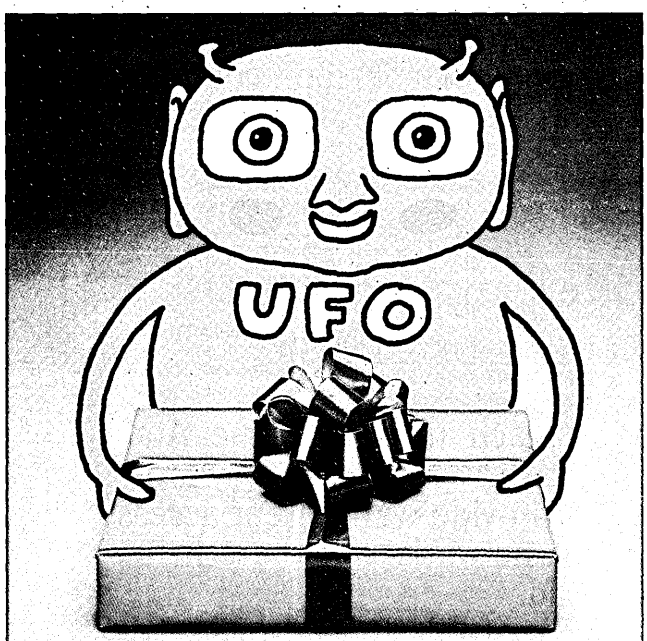

Before Labor Day, we'll be installing our 1,500th UFO applications development system for CICS. That's more installed systems than all of the other independent suppliers *combined.* And to celebrate, we'd like to give everyone who schedules a UFO trial this summer a free gift worth $3,000. The gift is Oxford's data compression software package called SQUEEZE . . . that will pay big benefits by reducing on-line terminal response time up to 25%. And it's yours absolutely free, just for scheduling a UFO trial this summer and seeing for yourself why UFO is the #1 CICS application development system.

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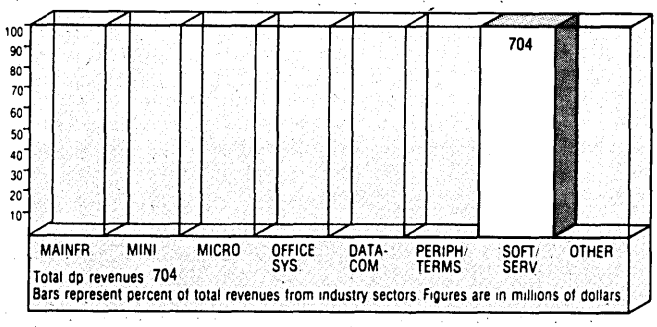

AUTOMATIC DATA PROCESSING INC.

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

ADP was in the limelight last year as chairman Frank R. Lautenberg left the company he cofounded in 1953 to take over his new duties in the nation's capital as U.S. senator from the State of New Jersey. Returning to the chairmanship of ADP was Henry Taub, who in 1949 started the small, privately held predecessor to the public company that is today a leader in the computer services industry.

Last year also saw ADP leapfrog dp services challenger Computer Sciences Corp. for a higher rung on the DATAMATION 100 ladder. ADP's total dp revenues for calendar '82 came in at $704 million, clearly ahead of CSC's $683.4 million total. While ADP's revenues climbed 14.8% from the $613 million in 1981, its net profit rose 11.1% to $60 million from 1981's $54 million. Those earnings are even more impressive in light of R&D expenses, which rose 19% over 1981, for a total of $25 million.

During its fiscal year, which ended June 30, ADP slowed its acquisition pace from the year-earlier level, purchasing only three companies and a majority interest in a fourth compared to 1981's string of seven companies. Fiscal 1982's total transaction volume approximated $4 million in cash and stock, plus additional payments contingent on future performance of the acquired companies, while the fiscal '81 purchases cost about $16 million in cash plus the additional pay-out contingencies.

ADP in '82 gobbled up a firm in California, National Healthcare Administrators Inc., which provides employee medical benefits administration; the major interest in Rechenzentrum Frankfurt KG (RZF), a computing service business operating in Frankfurt and Hamburg, West Germany; and the Houston and San Antonio dp operations of Computer Statistics Inc., which provides payroll and accounting services. On the flip side of the acquisition coin, ADP in fiscal '82 sold, for a small net gain, its income tax processing service and its commercial operations in France. These operations had combined revenues of about $12 million and a small loss.

Commercial Services is ADP's oldest and largest group, accounting for slightly more than half of the company's revenues. Despite reduced transaction volume caused by the weak economy, the group continued to grow well in fiscal '82, adding more new clients than in any previous year. ADP's Banking and Thrift group, which serves over 500 financial institutions from eight regional centers, saw services expand last year to include a new nationwide shared-ATM network with point-of-sale and debit card capabilities. New to the Network Services division in 1982 was the enhancement of its nationwide datacom network, Autonet, to support datacom services for other ADP divisions as well as outside companies. All in all, to well over 100,000 companies and financial institutions, ADP has truly come to be called "The Computer Company."

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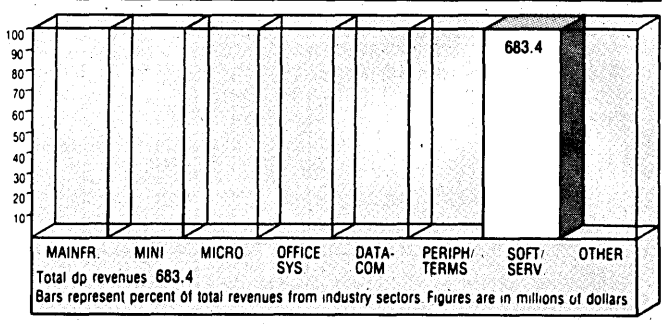

COMPUTER SCIENCES CORP.

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

It should be the best of times for Computer Sciences Corp., but it isn't. Revenues and earnings growth should be on a fast track as its number one growth customer, the military, increases its budget, but competition in CSC's contract services and software businesses plus some special problems leave CSC managers fighting several fires at once.

Last year CSC dp revenues increased 9.3% to $683 million. Contract services—providing specialized programming work for local, state, federal, and foreign governments—continued to show modest gains; revenues increased 6.8% to $512 million. Software revenue, mainly timesharing and database sales, increased sharply, up 17.9% to $171.3 million, but profitability lagged because of startup costs for its new data center and product line expansion. The apparently impressive 15% increase in net earnings to $19.7 million is in part due to a write-off last year.

Slow growth in the contract business is partly caused by CSC's problems with its biggest customer, the federal government. Defense, NASA, and civilian agency computer support and software development contracts produced about 57% of CSC's fiscal 1982 revenues, down from 64% in 1980. The appeals court reversal of a "not guilty" 1980 criminal case against CSC officials, over questionable pursuit of civilian agency contracts a decade ago, went from the Supreme Court back to the federal court for retrial later this year.

And the financial impact of the case continues. Several "recompeted" contracts were lost to other companies. CSC efforts to expand its DoD business from its traditional NASA base met with limited success: big contract awards elude the firm while it continues to win small ones. Project VIABLE, a $656 million Army package, went to archrival Electronic Data Systems, while CSC won a $38 million Navy contract for its research laboratories accounting department.

CSC's government troubles are not limited to the aforementioned. A five-year, $20 million contract from the Tennessee health department for processing Medicaid claims was canceled after one year. CSC president William Hoover blamed part of the problem on the former claims processor, ESC, and insists the loss is not serious.

Aggressive new marketing approaches began to bring dividends for CSC. International sales comprised 18% of total revenues in fiscal 1982, up from 9% in 1978. The Infonet timesharing service is expanding its database activities to increase demand for its dp power. A new distributed network service, electronic mail, and a package deal for access through a microcomputer are part of the CSC effort to break into new markets.

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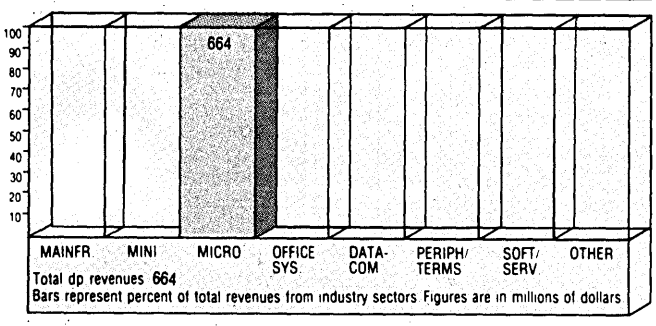

APPLE COMPUTER INC.

20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

The micro market has been changing so rapidly that even those first to the market can barely keep up. Innovations abound, while increased competition from the industry's giants has curbed what was once automatic sales growths of fantastic proportions. Even worse, competitors and imitators have made the market so crowded that margins are down. Apple had to respond to all these pressures during 1982. Its performance was good, but not as good as Apple had become accustomed to. For 1982, total revenues grew by 65.5%, a far cry from the 142% increase of 1981. Profits also slowed, up 55.5% versus the 176% increase of 1981. Sales for 1982 totaled $664 million, and profits came in at $61.3 million.

Without question the biggest threat to Apple came when IBM entered the market. DATAMATION estimates that during 1982 IBM captured about $500 million in personal computer sales. Industry observers believe that if IBM hadn't entered the market, a good deal of these sales would have been Apple's.

Besides IBM's entry, Apple had a struggle keeping its machines out of discount computer stores during 1982. This was apparently at Catch-22 situation for its dealers. First of all, Apple encourages the dealers to buy in quantity by giving large volume discounts. The dealers comply, but in an uncertain economy they are unwilling to hold inventory for too long. They then start calling up the local discount store and unloading some of their Apples for a modest profit. Apple's management feels its whole marketing strategy is being compromised by this practice, and it's looking for ways to stop the discount dilemma. Industry experts doubt that this is possible because the practice is so widespread it's impossible to pinpoint the culprit.

Meanwhile, sales of the Apple II became a source of dealer criticism. The dealers were dismayed at some of Apple's promotions during the Christmas season, when special price reductions increased Apple's sales but reduced dealer margins, which is of course the opposite of Commodore's philosophy.

Apple is pinning its future growth on Lisa as well as on its improved Apple IIe, both announced in early 1983 at Apple's annual meeting. The Lisa, priced just under $10,000, is a 16-bit personal office system featuring integrated common office functions and advanced graphics. Industry observers were generally left unimpressed by Lisa, feeling it fell short of the mark of offering superior performance for a conservative price.

The Apple IIe, however, met with more enthusiasm. Priced at about $2,000 for a package including peripherals, it has an expanded keyboard, 64K bytes, and a simplified circuit board. The big dilemma for Apple during 1983 will be to crack the office market while not losing its traditional market to aggressive newcomers. On both counts, the outlook is uncertain—made even more so by that spunky P.C. from IBM.

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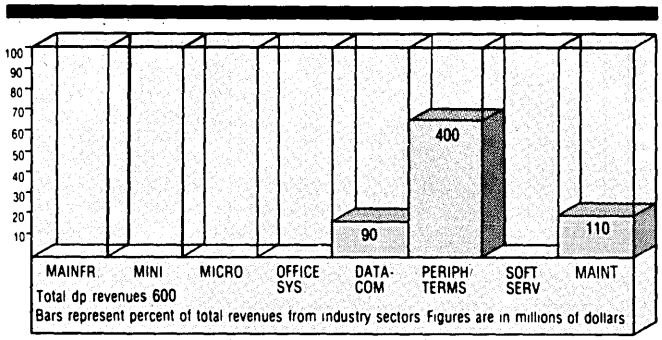

ITT CORP.

320 Park Avenue
New York, NY 10022
(212) 752-6000

Not even 3% of ITT's corporate revenues come from dp, but that still represents some $600 million in 1982, a 30% increase over 1981. By comparison, the rest of ITT is not doing as well. Corporate revenues were down 6% to $21.9 billion, and some 41,000 employees departed without replacement. The more streamlined operation did manage to boost profits 4% to $702.8 million.

ITT's dp operations are composed of two subsidiaries, both acquired in 1978 when the company was diversifying its business markets. Qume Corp. manufactures and markets character printers to the oem and end-user markets; in addition, it makes and sells data terminals to dealers, and printwheels and ribbons to the distributor market. In 1982, Qume introduced a modular daisywheel printer that is compatible with a wide variety of business mini and microcomputer systems.

ITT's second entry in the dp field is ITT Courier Terminal Systems Inc., which has sold more than 200,000 display terminals in its history. Courier introduced the SNA model 7601-1 remote terminal controller and began first shipments in November. The controller is diskette-based and can communicate at up to 9,600 baud with a host system through a telecommunications network using SNA/SDLC. Up to 16 Courier displays (Type A, Type B, or the new color version) or printers can be attached to the 7601-1.

ITT is indirectly involved with dp and office automation in several other operations. In August, its World Communications unit introduced a Faxpak service that makes it possible for incompatible facsimile machines to talk with one another. It permits communication between low-speed and high-speed machines, and can be used to broadcast a single transmission with a number of fax machines.

Early in 1982, ITT merged its World Communications, World Directories, Publishing, and United States Transmission Systems into the Communications Operations and Information Services (COINS) group. The new entity offers long distance telephone service, record and facsimile transmission, telex, electronic mail, and information/database, directory, and software application services. Late in the year, ITT acquired Dialcom International Inc., an electronic mail and information retrieval systems provider; Dialcom was also merged into COINS.

One of ITT's largest businesses is telecommunications, with related hardware sales accounting for 22% of the corporation's revenues. Although revenues declined 13% and profits dropped 12% in 1982, the company had reason to be optimistic. The System 12, ITT's first fully digital telephone switch, was delivered in 1982 to telecommunications authorities in Belgium and West Germany.

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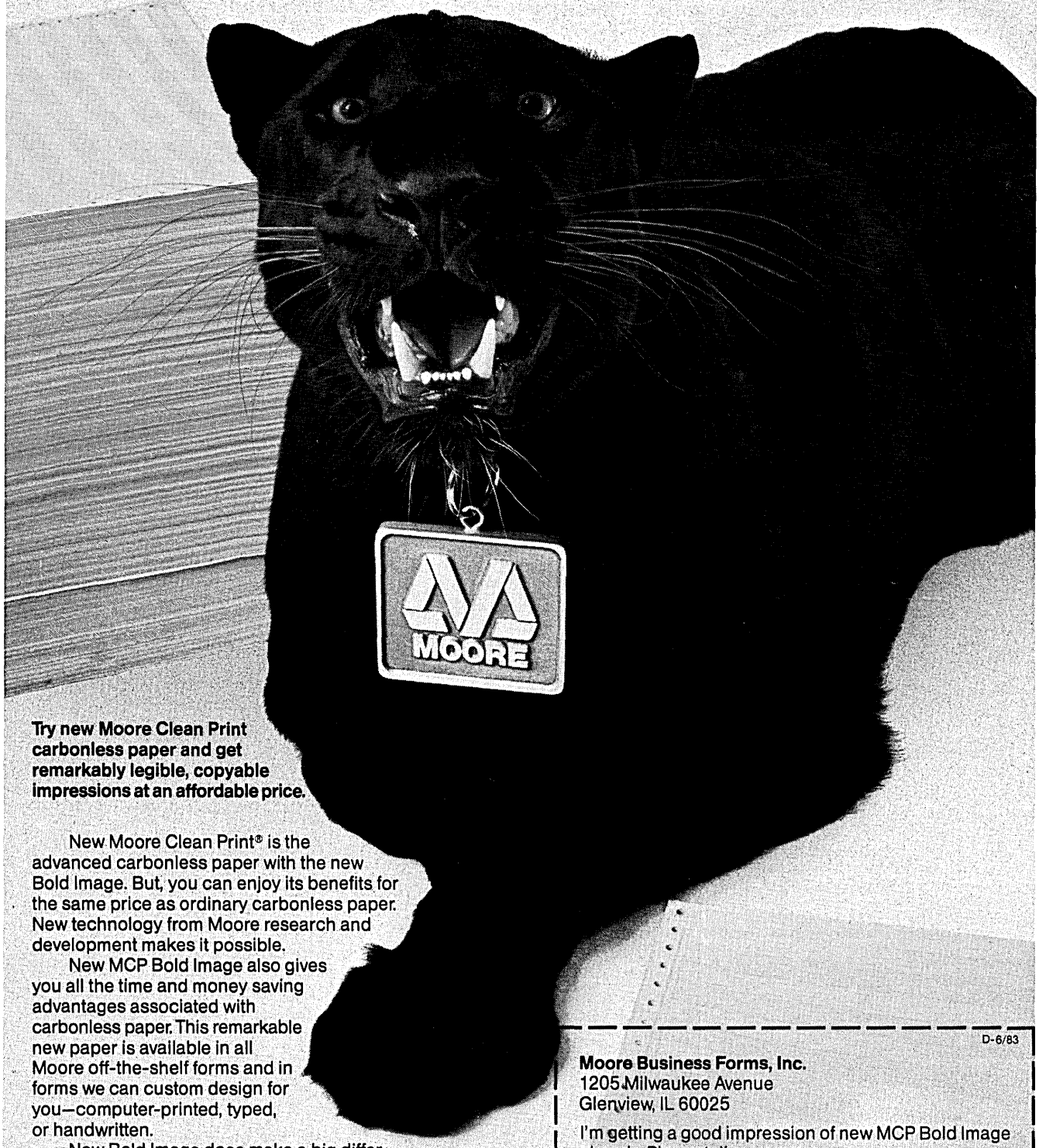

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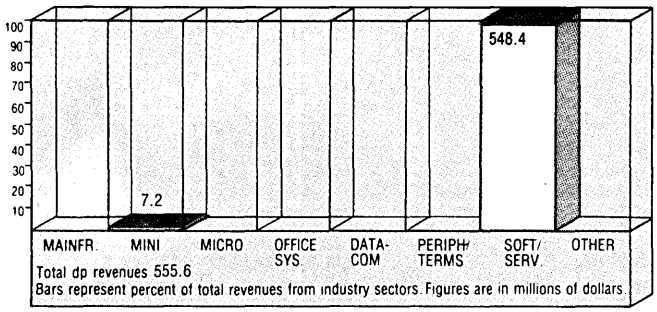

ELECTRONIC DATA SYSTEMS CORP.

7171 Forest Lane
Dallas, TX 75230
(214) 661-6311

Two decades after Ross Perot parted with $1,000 to create EDS, the company hooked a big one. In fact, nothing in the history of the computer services industry has been larger than the $656 million, 10-year VIABLE contract awarded by the U.S. Army. The project, which began in April 1982 and will take three years to build, will provide an integrated nationwide computer network that will revamp the Army's information processing capabilities. Forty-seven military bases will have access to computer power at five regional dp centers, instead of relying on current standalone computers at bases throughout the country.

"VIABLE was the perfect 20th anniversary for us," Perot said. "We were the underdog." Indeed, EDS and its software supplier, Applied Data Research, weren't even on the odds-makers' board against the mighty team of Computer Sciences Corp. (CSC) and IBM.

Winning VIABLE was only the best of the good news that made EDS' 20th year its finest. Total dp revenues in calendar year 1982 rose 15.6% to $555.6 million. Processing services, EDS' mainstay, accounted for $548.4 million of that business. That represents a 15.7% leap over 1981.

The only negative chord was struck by minicomputer sales. EDS in 1981 had obtained revenues for the first time from hardware sales, with $6.9 million from the Centurion Data Corp. of Richardson, Texas. Centurion's MicroPlus Business Management Systems was sold through a dealer network. Centurion in July 1982 was absorbed into EDS' Commercial Systems Group. Sales for the year totaled only $7.2 million, less than a 1% increase over the previous year.

All other signs were positive. Total corporate profits were up 27% to $53 million from 1981's $41.7 million. Earnings per share jumped nearly as much, $1.91 per share compared to $1.54 per share in 1981.

EDS was also active on the acquisition front. It finished the year with a total of 13. By purchasing four small credit union systems, the company added 1,000 credit unions to its customer list. Now more than 2,200 credit unions use EDS computer systems to service the accounts of 6.3 million members. Last year, the total stood at 3.2 million members.

Banking customers also multiplied. Seven large banks and thrift institutions signed or extended contracts with EDS ranging from five to eight years. Six hundred banks and thrifts now avail themselves of EDS' range of services.

And don't worry about EDS running out of work to do. The company's long-term contracts give it a backlog of business exceeding $2 billion. That's enough to keep a company busy for a few years.

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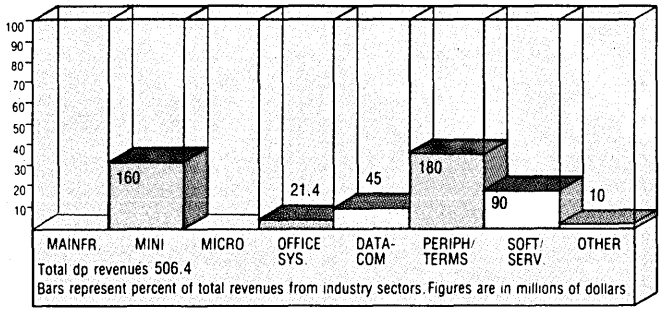


DATAPOINT CORP.

9725 Datapoint Drive
San Antonio, TX 78284
(512) 699-4428

It will be a long time before Datapoint will forget 1982, the worst year in the company's history. The onetime shining star of Wall Street became embroiled in a marketing scandal that sent its stock plunging to $12 from $67.50 in three months and cast long-term shadows over the company's credibility.

Datapoint suffered from an overriding dogma of quarter to quarter growth, resulting from a string of 39 quarters with record profits. By January 1982, the company's marketing staff was under such heavy pressure to boost sales despite the lagging economy that, according to reports, they resorted to increasingly shady measures that finally collapsed. In order to credit shipments as revenues in a quarter about to close, marketers sent shipments to customers who hadn't yet met Datapoint's credit requirements, used their own money to pay for warehousing that distributors couldn't afford, and even sent hardware to a mythical "Joe Blow."

Once these practices became known, Datapoint's management took strong steps to eliminate them and restore order to the company. Five executives were fired and one demoted, and the company's books were finally balanced by charging some $15 million of revenue from prior quarters against its April quarter, resulting in a $22.9 million quarterly loss.

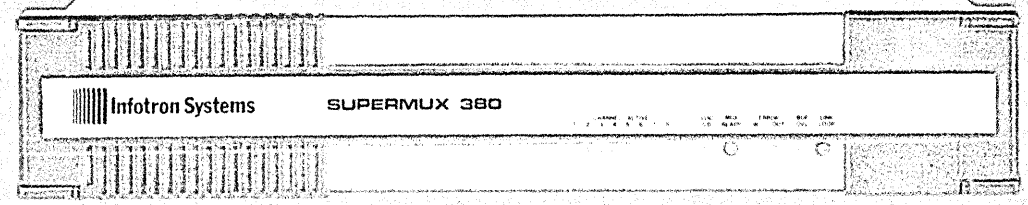
Part of the recovery was the result of new products introduced in 1982. These included the 1560 small business computer system introduced in October. The 1560 was the first microcomputer that could use the company's ARCnet local area network. The company also introduced a telex management system, a laser printer, a color graphics system, a video workstation, and the 8600 business computer system. Plans for releasing ARCnet on Tandy's Radio Shack computers continued on schedule, and in early 1983 ARCnet became a TRS-80 option.

Management at Datapoint was revamped during the year, with Edward P. Gistaro elected president and chief operating officer. When all of these pieces are put into place, Datapoint comes out of 1982 pretty much exactly where it went in. Total corporate revenues were $506.4 million, practically identical to the $506.2 million in 1981. But where the company turned a $48.4 million profit in 1981, the same revenues yielded a $17.4 million loss in 1982—about minus 87 cents a share.

Datapoint is looking to the future with its small 1560 and other products. The company spent some $44.6 million on R&D in 1982, compared to $36.5 million in 1981, and boosted its work force by 900 workers. The company—and Wall Street—will not forget 1982 soon, but Datapoint has made a turnaround both in its practices and in its financial picture.

What's Behind the Supermux 380 Multiplexer?

INFOTRON



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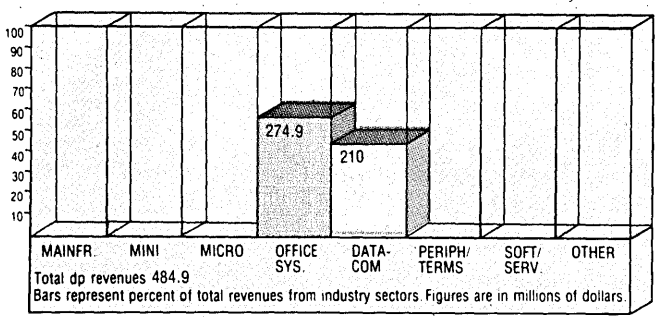

MOTOROLA INC.

Information Systems Group
1303 E. Algonquin Rd.
Schaumburg, IL 60196

All eyes were focused on Motorola's soaring stock last year, as the semiconductor, communications, and dp equipment manufacturer scored a rousing success on Wall Street despite less than rousing financial returns. The 50% gain in the price of a Motorola share last year outdistanced by a large measure the company's economic performance—revenues were up 6% to $3.8 billion, but net income declined 7% to $170 million. The small but important dp operations were a crucial part of the company's earnings shortfall.

Four-Phase, Codex, Intelligent Systems, and other parts of the new Motorola Information Systems Group produced $484.9 million in revenues last year, an 18% increase from 1981, but operating profits dropped 28% to $31.1 million, according to company figures. Apparently it will be a while before Motorola has much to show for the $253 million in stock it issued to purchase Four-Phase in March 1982—the company blamed Four-Phase for the drop in operating profits.

Total office automation revenues, the primary market for Four-Phase and the Information Systems Group, were up 18% to $261 million. The Four-Phase product line consists of workstations, office automation cpus, and distributed data processing products. Sales of datacom gear, primarily modems, from the Codex subsidiary were up 17%, to $210 million.

New products from Four-Phase followed the familiar path of OA equipment vendors trying to keep up with the microcomputer explosion—it announced a series of retrofit packages to convert its workstations into personal computers, with the addition of logic and disk storage modules. A new integrated OA system, including voice mail, touch-sensitive screen, broadband local area network, and advanced programming features, was also introduced as the Series 5000.

Lower-cost and higher-performance modems, an expanded line of intelligent network signal processors, and data switches for OA were introduced last year by Codex. Interestingly, several of the new Four-Phase and Codex products contained Motorola's new 16/32-bit microprocessor, the 68000, an indication that the integration of the recently acquired dp companies into the Motorola fold is gaining momentum.

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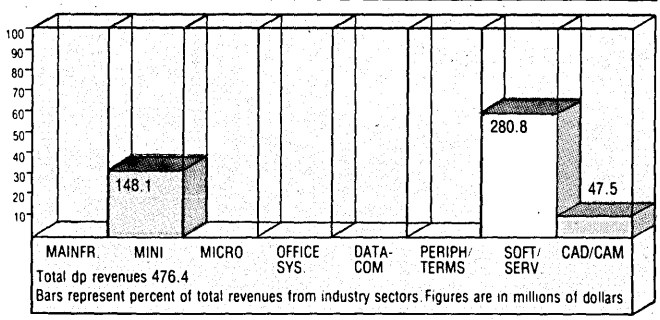

MCDONNELL DOUGLAS CORP.

P.O. Box 516
St. Louis, MO 63166
(314) 232-0232

No longer can McDonnell Douglas Automation Company (MCAUTO) be considered primarily an internal service arm of its aerospace parent. In 1982, for the first time, more than half of MCAUTO's sales were to customers outside the MDC family of companies. And in light of the fact that commercial aircraft sales declined $1 billion or 42% last year—a fact that caused MDC's total sales to slip 1% to $7.3 billion—the corporation was especially proud to report high growth rates for both MCAUTO and MDC's other dp revenue producer, Microdata.

Dp revenues from commercial sales hit $476.4 million last year, up 37% from the prior year's total of $347.2 million. Total dp revenues, including sales to internal divisions, were $747.9 million. While MDC doesn't break out profits by divisions, corporate officials have conceded that 1982 dp earnings dropped below 1981 levels.

Last year MCAUTO's commercial revenues were $328.3 million, up 45% from the $226.7 million reported in 1981. Among product lines achieving rapid growth was Unigraphics, the company's CAD/CAM system, which recorded sales of $47.5 million in 1982, up substantially from 1981's $31.2 million. MCAUTO beefed up its CAD/CAM marketing overseas; had increased sales in the U.K., Austria, and West Germany; and made its first CAD/CAM sales in India and France. Sales of computer services to health care institutions provided another $133 million to MCAUTO's total.

With the claim to fame of serving one out of every six hospitals in the U.S., MCAUTO last year announced two new products for this market. RxCom is a standalone pharmacy management sytem, and LabCom+ provides a communications link with nursing units, critical care areas, admissions, and other hospital areas. Last May, MCAUTO was chosen by the Department of Health of the Republic of Ireland to provide information systems to its hospitals.

By year-end, MCAUTO had a new man at the helm. Robert A. Fischer was brought in as president and chief executive officer. He previously headed Dun & Bradstreet's remote computer services division, National CSS, and before that had worked at IBM for 18 years. With 1983 to go on record as his first full year at the controls, Fischer is expected to throw open the throttle for even greater commercial selling this year.

Microdata also had a successful 1982, with commercial sales rising 23% to $148.1 million from the prior year's $120.5 million. The company further refined and enhanced its Reality small business computer system, first introduced in 1974, and shipped 939 systems in 1982. This raised the total number of installed systems to 6,997 at year-end. Among new Reality purchasers were the Marriott Corp. and BMW of North America.

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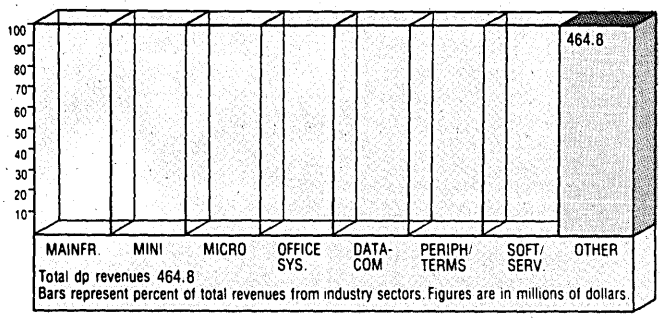

COMDISCO INC.

6400 Shafer Court
Rosemont, IL 60018
(312) 698-3000

Following its philosophy that "whatever IBM does, you have to make sure it won't hurt you," Comdisco came through 1982 seemingly unscathed by IBM's price cutting and new product introductions. During a year when other remarketers of new and used IBM equipment fell on hard times, Comdisco reported a revenues increase of 35% to $464.8 million. Even more impressive was the earnings rise of 46% to $32.2 million.

As the largest dealer in the IBM remarketing business, Comdisco offers customers a wide range of financing options—purchase, purchase leaseback, or leasing under a variety of terms. The company reported a total of 7,000 transactions during 1982.

Holding true to its philosophy, the company cashed in on IBM's initial deliveries of its new 3081 processor—Comdisco not only participated in the leasing of the new system, but also capitalized on the remarketing of the displaced IBM 3033 processors. This marketing effort boosted the company's lease base by 31%.

Comdisco chairman and founder Ken Pontikes explains his business this way: "We are traders and dealers of equipment. Typically, an IBM move will hurt one side of our business, but the other side will pick up. We're not committed to doing business just one way, and we can react to any change in the market."

To help protect the company from IBM's changing marketing strategy, Comdisco itself has moved into new areas. One new business area is the relocation of dp centers, and another is disaster control planning and consulting. These relatively new endeavors show signs of a good future.

One aspect of the company's business that is under a cloud is its financial services operation, which was formed to take advantage of certain tax laws. Here, business boomed with the Economic Tax Recovery Act of 1981, which provided "safe harbor" or pass-through tax advantages. Congress has recently moved to shore up this loophole, but Pontikes remains unperturbed: "They are always changing the tax code, but we can normally figure out a way to legally do a deal that will satisfy all parties." The financial services operation contributed $73.9 million to 1982 sales, or 15%, so even if Pontikes can't get around the tax code, the loss of this business won't make a big dent in Comdisco's business.

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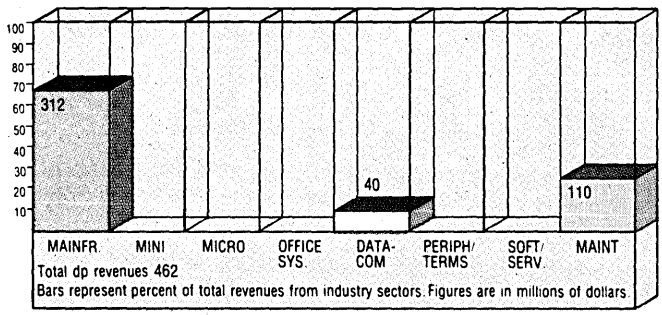


AMDAHL CORP.

1250 East Arques Avenue
Sunnyvale, CA 94086
(408) 746-6000

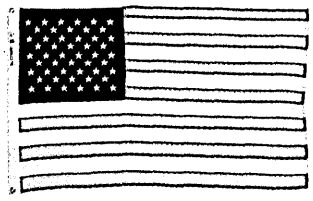
After two solid growth years, Amdahl ran into rough waters in 1982 and ended the year with a slight increase in revenue—but a huge decrease in profits. While revenues inched forward 4.3% to $462 million, income tumbled 75% to $6.8 million, or 33 cents per share. Part of the company's problems can be attributed to the sluggish economy, as more customers decided to lease rather than buy Amdahl equipment. Sales actually declined 4% to $317 million, while leasing and maintenance revenues climbed 30% to $145 million. Yet Amdahl's pricing structure throughout 1982 discouraged leasing, as sales margins declined by 9% while leasing margins increased 4%.

Amdahl's corporate picture is colored mostly by its mainframe and storage businesses, which DATAMATION estimates generated $312 million in 1982, a decline from $334.5 million in 1981. The problems encountered by Amdahl's mainframe business were more of their own making than results of economic pressures or other external factors. First customer shipments of the 5860 uniprocessor mainframes—the first of the new 580 line to be introduced—were delayed four months because of engineering complications the company encountered with the design of the I/O processor. During that period last spring, IBM's sales force diligently convinced many Amdahl users to switch rather than wait, and as a result, Amdahl's market share declined during the year. (Amdahl's market share was also hurt by IBM's announcement of the 3084, which eclipsed Amdahl's 5880 as the most powerful general purpose computer available.) Since deliveries finally started in the third quarter, about 25 of the 5860s were installed in 1982. The company expected to catch up on its delivery schedule early this year.

Amdahl believes that maintaining IBM software compatibility is the only route to survival in the mainframe business, since customers can be won away from IBM without software conversion. Yet as the 5860 debacle shows, the same compatibility can be a road to ruin.

Amdahl entered the data communications field two years ago with its acquisition of Tran Telecommunications Corp., a worldwide supplier of public and private digital communications network equipment. The Communications Systems Division, as it's now called, added several new products to its line of modems, multiplexors, and communications controllers during 1982. Unlike the mainframe division at Amdahl, DATAMATION estimates, the Communications Systems Division grew briskly in 1982, with $40 million in revenues, or a 56% jump over 1981.

Amdahl plans to continue keeping up with IBM in the mainframe and communications businesses and has for eight consecutive years increased its R&D budget to keep its product line up-to-date. In 1982, Amdahl spent $81 million on R&D, 8% more than in 1981 and 17.5% of the company's 1982 revenues.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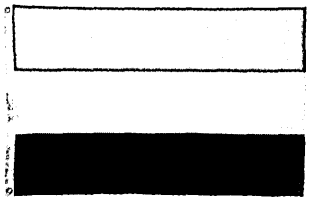
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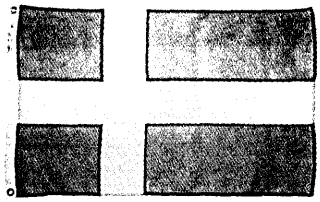
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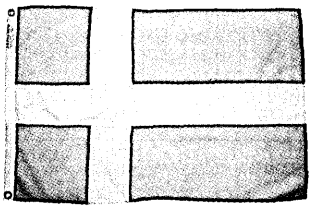
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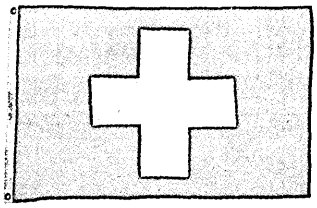
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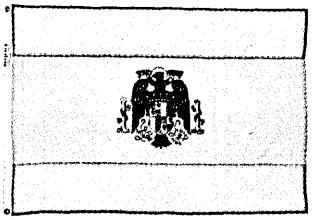
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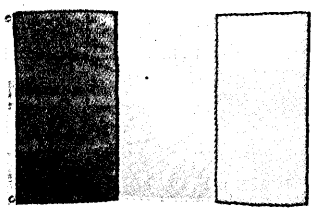
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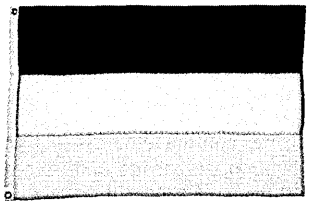
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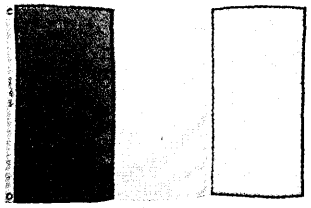
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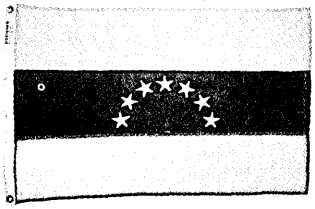
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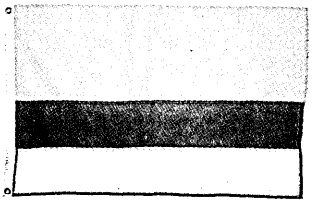
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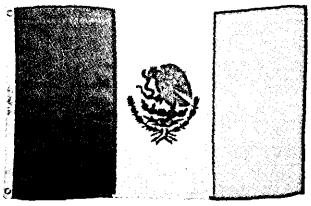
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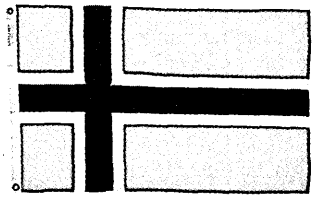
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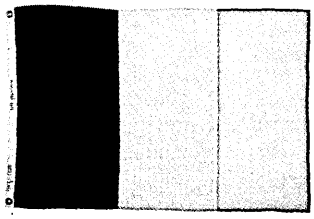
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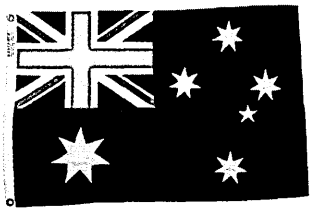
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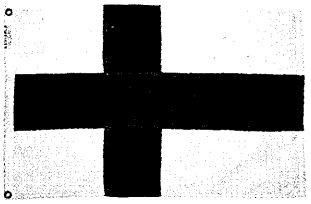
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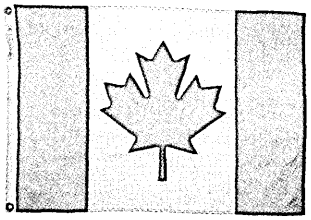
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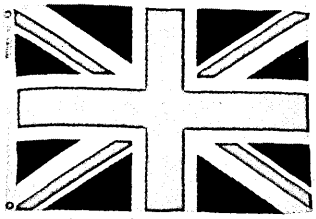
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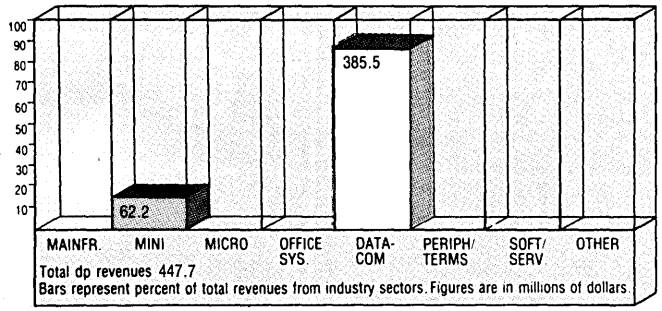

ROLM CORP.

4900 Old Ironsides Drive
Santa Clara, CA 95050
(408) 988-2900

The December introduction of its PhoneMail voice store-and-forward messaging system, along with the summer announcements of the Distributed Digital Network products, are key indicators that Rolm should remain a leader in the PBX field. Other indications are its financial results for 1982.

The company came in with a healthy 35% increase in revenues to $447.7 million from $331.5 million in 1981. Most of its revenues, or 86% in '82, came from sales of PBX and CBX products. Those sales were up 42% last year to $385.5 million from the previous year's $271.8 million.

The remaining revenue producers are Mil-Spec minicomputers, which contributed $62.2 million in 1982. Users of these systems built to military specifications saw a stream of new products last year. Two examples are the Serial Multiprocessor Communications Adapter (MCA) and the 4150 disk subsystem. The Serial MCA provides the capability to connect Rolm computers in a network through a high-speed, fiber optic link. The 4150 is designed to operate in severe computer environments such as airborne operation at altitudes up to 30,000 feet.

Revenues weren't the only reason to boast. Profits met all expectations as well, climbing 26% over calendar 1981's $26.2 million to reach $33.0 million in '82. Per-share earnings rose from $1.50 to $1.85.

Rolm remains both a technical and marketing leader as it continually upgrades the hardware of its CBX architecture as well as adds software packages and protocols that facilitate, automate, and control telephone use. Additionally, since an estimated 75% of CBX sales in fiscal '83 (which ends in July) will be through the company's own marketing organization, the Rolm Operating Companies or ROCOs, Rolm appears ready to wage war with American Bell, Northern Telecom, IBM, and others for market share primarily in the North American business telecommunications systems market.

Rolm is placing its office systems bets on a market trend toward diversity, not standardization, in office equipment, leading to a customer need for objective integration of the office into a local area network. The company claims it has installed more integrated voice and datacom networks than all of its competitors combined. Customers include such heavyweights as Westinghouse, Dolby Labs, and Evans and Sutherland Computer Corp.

The California company has also made a major commitment to networking. Its Office Systems Division last year announced a synchronous data terminal interface to connect the CBX with synchronous terminals and computers at switching data rates up to 56Kbps. It also announced an interface to X.25 packet switching networks, extending the Rolm integrated datacom capabilities into public and private data networks.

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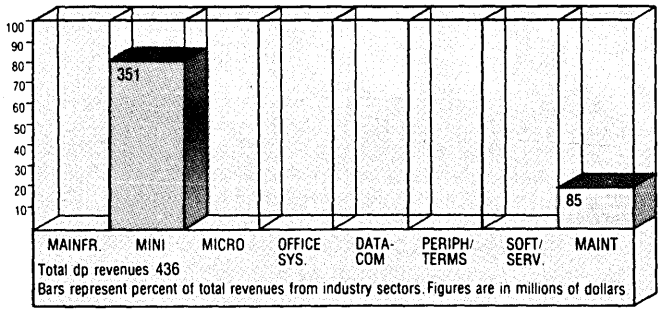

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

Prime continued to prosper through the recession largely because of its strong end-user positioning. Total sales climbed 19.4% to $436 million, helped considerably by a steep increase in support/maintenance revenues that accounted for around 19% of total sales for the year. Minicomputer revenues didn't grow as much as total revenues, climbing only 13.5% to $351 million, and reflecting increased competition in the 32-bit sector from such companies as DEC and Data General.

Net income growth slowed down a little over previous years but still rose a healthy 18.4% to $45 million. Earnings per share were up by the same percentage, and its stock had a good year on Wall Street, closing at 34⅝—up 47%.

A good insight into the company's future can be gleaned from the $12 million federal government contract it secured in the latter part of the year. The client—the Geological Survey—will tie networks of Prime minis into its own mainframes. The minis will share multiple databases among themselves as well as with the hosts. At the same time, each mini will handle multiple local tasks—either scientific or commercial—on its own.

Prime's future strategy will be to add new workstations, office automation, and CAD/CAM applications to the mix, and hammer away at the price/performance curve every year.

As a prelude to this, Prime ended a quiescent year with a flurry of product announcements. Included were a new CAD workstation, the PW 200—Prime's debut in the under $100,000 class—which combines Prime hardware with Medusa software. Unveiled in November was a new Electronic Design Management System, a shared library system that allows large CAD/CAM design teams to work in a fully integrated DBMS environment.

Also announced last year was a new commercial distributed data processing system, the 2250, which the company said "solidified" its commercial thrust. Since Prime is known for its orientation to scientific/engineering clients, this was clearly viewed as a marketing and imaging shift. The company also departed from standard norms by unveiling a new block mode terminal, the $1,595 PST 100, which was the first terminal to be wholly designed and built by Prime and, some say, heralds a greater push into vertical integration of its manufacturing.

Another highlight of the year was the appointment of W. L. Brubaker as vp of sales and service and a member of Prime's elite operating committee. That effectively completed the restructuring of Prime's senior management, initiated late in 1981 with the appointment of former IBM executive Joe Henson as president and ceo. Senior management at Prime, as at competitor Data General, is now heavily weighted with IBM backgrounds. The new stability, which is evident in the company's new strategic positioning, seems to have pleased investors.

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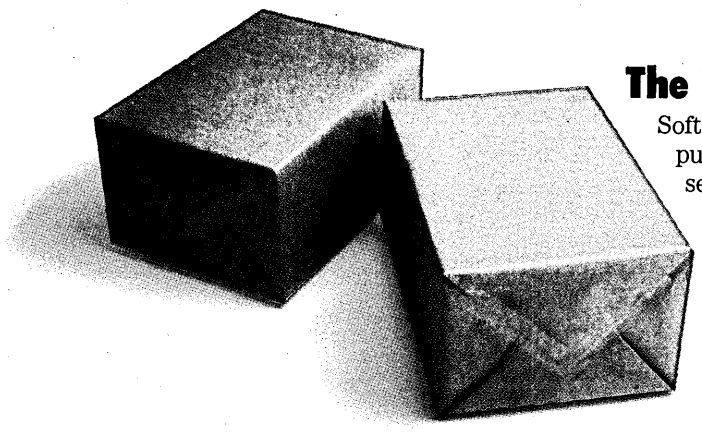

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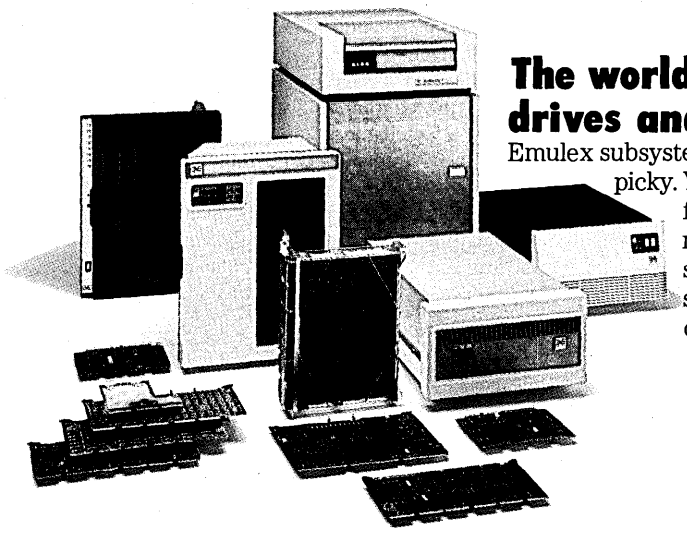

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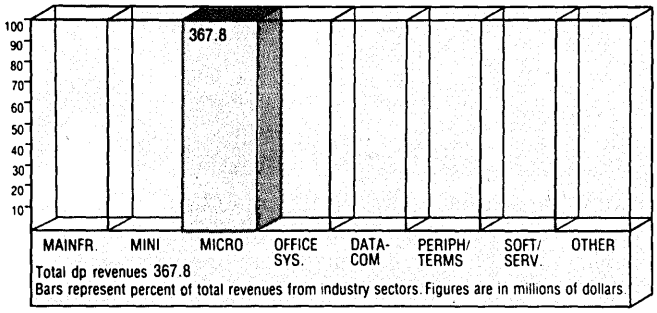

COMMODORE INTERNATIONAL LTD.

Valley Forge Corporate Center
950 Rittenhouse Road
Norristown, PA 19403
(215) 666-7950

Consumer acceptance of personal computers came of age in 1982. The market was crowded with new products and increased competition. At year-end, Commodore surprised its competitors and Wall Street analysts by emerging as the clear victor, with over 1 million of its Vic 20 machines sold. This represented over half of all sales of these lower-priced models.

These sales pushed Commodore's 1982 dp revenue up almost 100% to $367.8 million. Corporate profits made even larger strides, up 107.6% to $65.8 million. The profit picture is all the more impressive considering that Commodore dropped the price on its Vic 20 to $140 from $200 during the year.

Commodore isn't about to rest on its 1982 laurels. The company has big plans for new products and new markets in 1983. First is its more advanced personal computer, the Commodore 128, priced at $795 with a 16-color display and a 128K memory. While this is double the Apple IIe memory, the 128 is selling at a little more than half the price.

Commodore is aware of the growing market for portable computers and has announced two new machines in this category. Interestingly, these portable machines are to be compatible with the IBM Personal Computer.

In addition, Commodore is following Apple into the office automation market. It plans to have two very powerful computers that include on-board floppy disk drives and 128K and 256K of RAM. All of Commodore's new computers are expected to be price competitive with those on the market.

One area where Commodore has been criticized is software, and the company has moved to change that. Commodore hired Sigmund Hartmann from TRW Inc. as president of its newly expanded software division. The company plans to double its software personnel and produce products for all its computers.

One of Commodore's secrets of success in Europe (where it's the market leader) has been the pampering of its dealers. The company has continued that practice in the U.S., and dealer loyalty has become very strong. During 1982, for example, when Commodore cut the price on its Vic 20, the dealers were guaranteed their higher cut on any machine still in inventory. Therefore, the company and not the dealer took the loss. Analysts expect that may have cost Commodore over $1 million during 1982, but as the marketplace becomes more competitive, dealer loyalty could be worth much more than that.

Wall Street remains divided on Commodore, with some security analysts praising it and others preaching caution. Commodore also gets criticism from dp purists because it's not a high-technology threat. But it seems oblivious to these changes and remains confident it can keep up with the fast pace.

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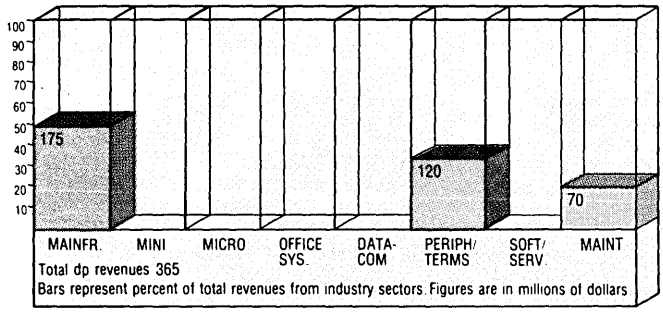


NATIONAL SEMICONDUCTOR CORP.

2900 Semiconductor Drive
Santa Clara, CA 95051
(408) 721-5000

Things went from bad to worse for National Semi in 1982. Of course, 1981 wasn't much fun, but at least the company posted a profit. At the close of 1982, despite slight increases in both total corporate ($1.2 billion) and dp revenues ($365 million), National Semi showed a drastic decline in profits. The $23.8 million profit of calendar 1981 disintegrated into a $15.4 million loss, a drop of 647%. Earnings per share, $1.04 in 1981, fell to a loss of 68 cents, a decrease of 653.8%.

The red ink forced considerable reshuffling within National Semi, which, despite the difficulties, continues as one of the world's largest manufacturers of integrated circuits (ICs). National implemented shutdown days to control inventory buildup, curtailed its capital spending, and retrained and shifted employees (and actually increased its total by 7%).

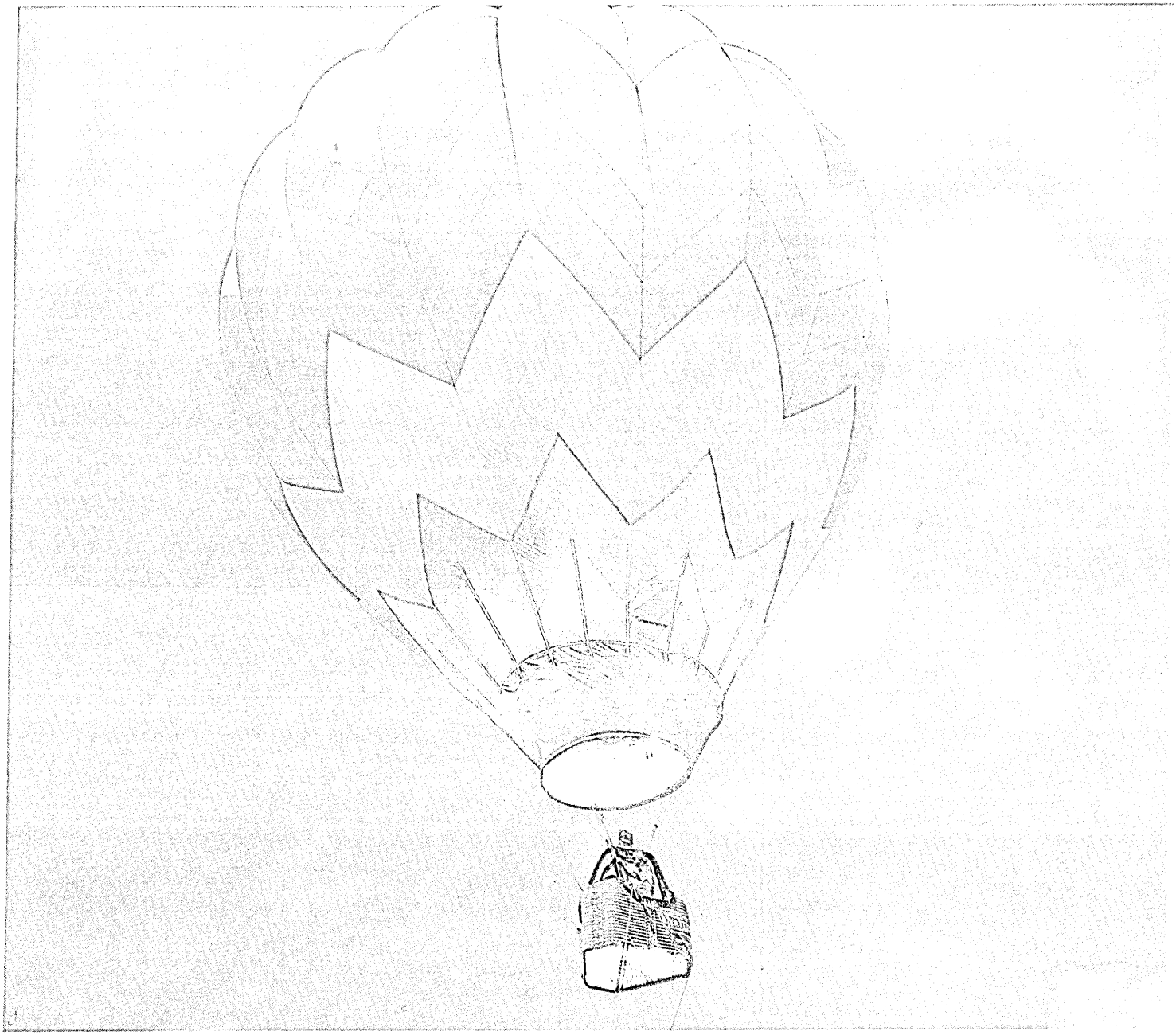
The situation appeared to be improving in the latter half of 1982, with demand for the company's semiconductor components and systems increasing. But the positive signs were somewhat negated by the continuing strength of the dollar in Europe, which adversely affected the company's earnings performance.

Attempting to improve its position in the point-of-sale (POS) scanner systems, in which it ranks second to NCR in total supermarket installations, National announced this January an agreement to acquire Data Terminal Systems in a friendly tender offer of $50 million. Data Terminal produces individual checkout terminals used in the retail market. The merger was in the final phase and was expected to be completed in May.

In response to the fluctuating international scene, National made two other moves in January. It signed a letter of intent to transfer its 49% interest in Eurotechnique, a joint venture in France, to Thomson-CSF, a French concern. The company also signed a multiyear joint venture agreement with OKI Electric Industry, a Japanese electronics concern, to develop and produce advanced computer chips. National Semi will make OKI-designed 64K RAM memory chips and market the devices.

Finally, National Semi threw in the cpu on mainframes. The company in February announced its National Advanced Systems Unit would cease the manufacturing of mainframes, which it had been making since 1977. National Semi will continue to sell general purpose computers made by Japan's Hitachi Ltd. National's AS/6100 will be replaced by Hitachi's AS/6600. The 4-megabyte, five-channel systems, selling for $370,000 to $580,000, will be available this fall.

"It remains difficult to say with full confidence that the corrections in some key economic indicators worldwide are harbingers for a successful 1983 for the industry or for National," president Charles Sporck told stockholders.



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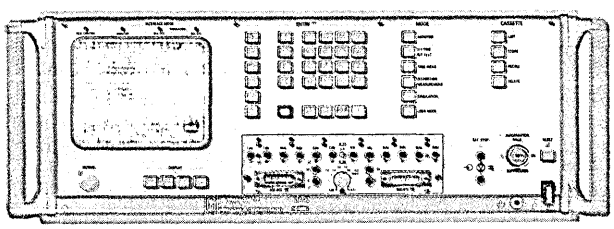

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CIRCLE 85 ON READER CARD

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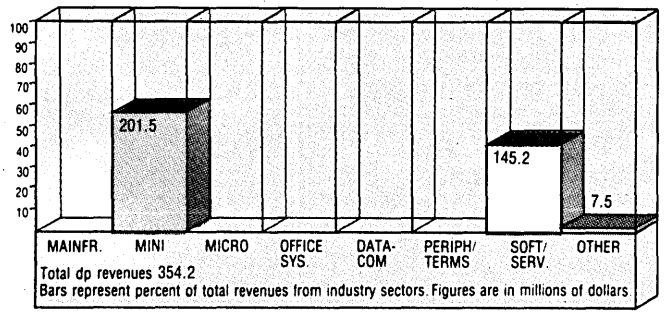

MANAGEMENT ASSISTANCE INC.

560 Lexington Avenue
New York, NY 10022
(212) 909-1400

Management Assistance Inc., continued in the doldrums again last year, bogged down by sluggish sales of its Basic Four product line. Revenues, which reached $349.1 million in calendar 1981, inched up only 1.4% to $354.2 million in 1982. MAI blamed its lackluster performance on the poor economic conditions and the adverse impact of foreign exchange rate fluctuations. While other heartier companies were able to weather these storms, MAI found the going rough.

Hardest hit was the Basic Four flagship, which ran aground in 1982. Basic Four minicomputer revenues actually dropped 9.5% to $201.5 million during calendar 1982.

The services scene at MAI was decidedly brighter. Processing services revenues totalled $145.2 million, up almost 23% from calendar 1981. Equipment rentals and other revenue declined 8% during the same period, due primarily to the termination of G-Series products.

To bolster its market base, MAI came out with two new Basic Four systems during 1982. At the high end, the company announced the System 810, which doubled the capacity of its top-of-the-line System 710. This is a new ball game for MAI, which had formerly focused its sights on the lower end of the systems market. At that end, MAI introduced another new product in 1982—the S/10 microcomputer. The desktop system, which sells for under $4,000, functions in a standalone mode or as a terminal that can be hooked to mainframe hosts.

Last year MAI also entered the supplies business, offering assorted accessory items for dp, word processing, and personal computer systems. The company expects the supplies sector to grow between 40% and 50% by 1985.

MAI, which prides itself on its maintenance muscle, embellished that image further in 1982 by announcing the Sorbus Station, a carry-in repair service that boasts a 24-hour turnaround time. The centers will provide repair service and supplies for various small computers, printers, and crt terminals.

During the year, MAI was the target of a takeover attempt by Continental Telecom of Atlanta, which purchased almost 15% of MAI's outstanding stock. MAI directors informed Continental that the proposed acquisition would not meet with their approval, and after much negotiating a sell-back was arranged. MAI must pay Continental some $22 million to buy back its shares, while Continental promised not to purchase any more stock for three years. Angry shareholders resented the deal, which gives Continental a hefty profit, because a good portion of those shares were purchased at a low of $8.875, while the sell-back price is close to $17. The shareholders are suing to prevent the sale, and this battle could rage on in the courts for quite some time.

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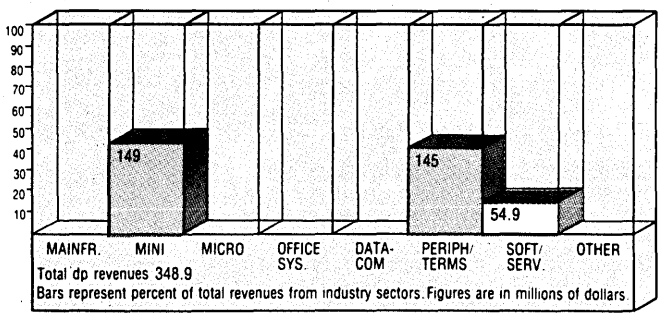

MOHAWK DATA SCIENCES

Seven Century Drive
Parsippany, NJ 07054
(210) 540-9080

It was one of those years for Mohawk when everything was up except the item that counted most—profits. So what looked like a good year really wasn't.

All parts of dp revenue rose, as did the whole. Mini revenues were up 8.7%, to $149 million from $137 million. Peripherals and terminals revenues increased 11.2%, to $145 million from $130.4 million. Software revenues rose 17.8%, to $54.9 million from $46.6 million. Overall dp revenue rose 11%, to $348.9 million from $314 million. Why, then, with all these pieces in the black, did the whole end up red?

Mohawk was hammered more than most by the prolonged recession, continued high interest rates, and a dollar that was 25% to 35% stronger on average than in 1981. The dollar's increased strength versus the numerous foreign currencies in which Mohawk conducts business overseas hurt the company considerably. With 40% of its business overseas, Mohawk cannot tolerate much fluctuation in currency rates.

Correspondingly, total corporate profits dipped 18.3%, to $13.4 million from $16.4 million. Earnings per share decreased even more, showing a 21.4% drop from $1.22 per share to 96 cents per share.

Despite the negative balance sheet, Mohawk increased its research and development expenditures by 22.8%, spending $20.4 million, compared to $16.6 million the previous year. The number of employees also rose, to 6,000 from 5,200. A third indication of better times ahead was a backlog at the close of 1982 that was 18% greater than at the close of 1981.

In 1982, Mohawk acquired DEK Identification Systems, which produces photo ID cards. Early in 1983, Mohawk Data Sciences-Canada acquired CTS Computer Systems. CTS had sold and serviced the complete line of MDS Qantel business computer systems since 1975. Qantel offers specialized software packages for manufacturers, professional sports teams (11 National Football League teams use the system), shoe retailers, electrical wholesalers, hard goods retailers, and hotels.

To aid users of that system, in May 1982 the company introduced its System 64, a high-performance supermini. The previously existing System 20 Qantel line was enhanced by the Systems 22 and 23, specifically designed for the small business user and for use in communications networks. A System 40 line was also unveiled, featuring a new cpu architecture that the company claims allows up to a twofold performance increase over the System 20 series. The high-end System 64 has the capability to process data in 64,000-byte increments, and offers a performance increase almost four times that of the System 40.

While 1983 may not be easier than 1982, Mohawk management believes it will be better.

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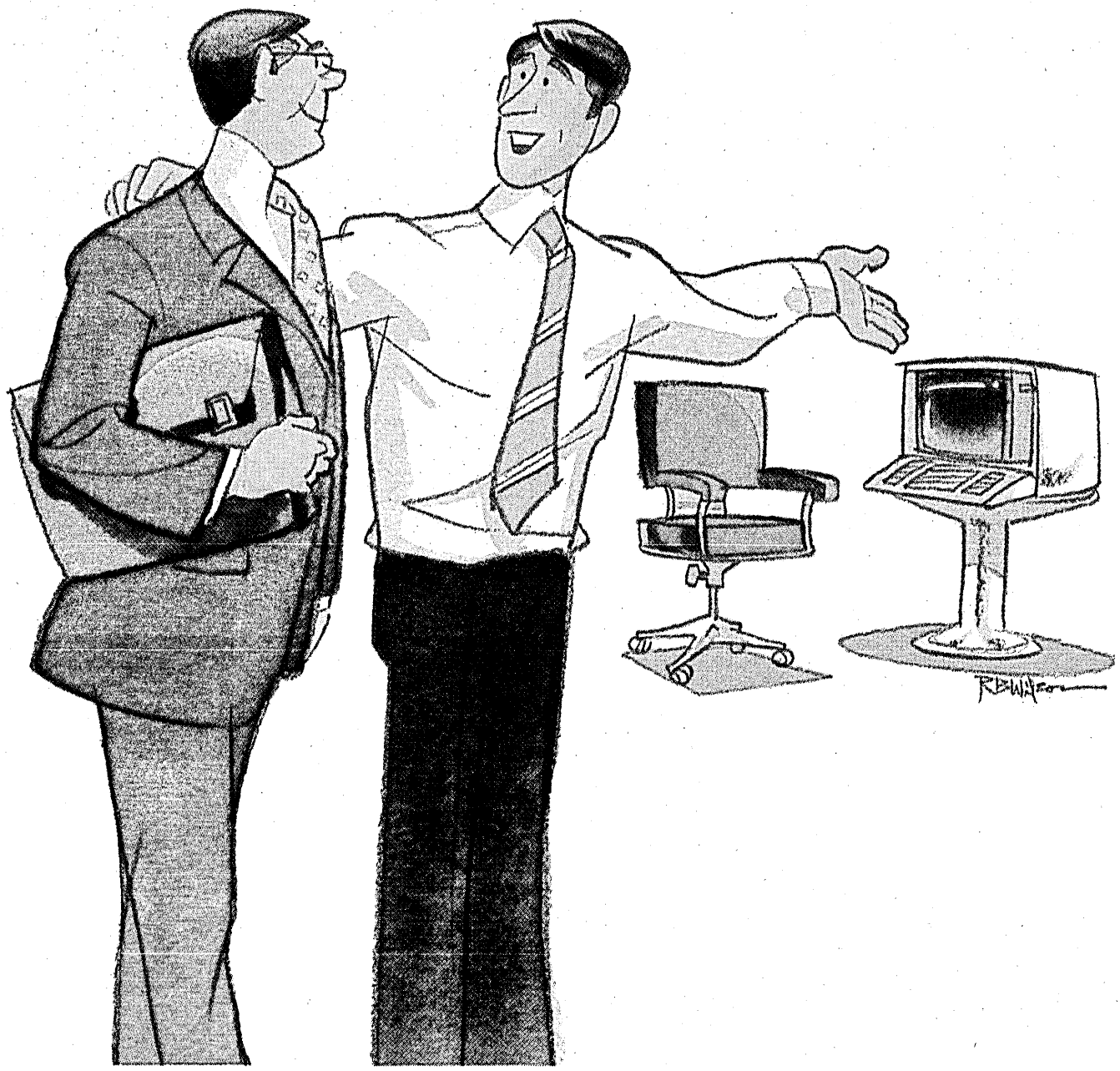

CIRCLE 87 ON READER CARD

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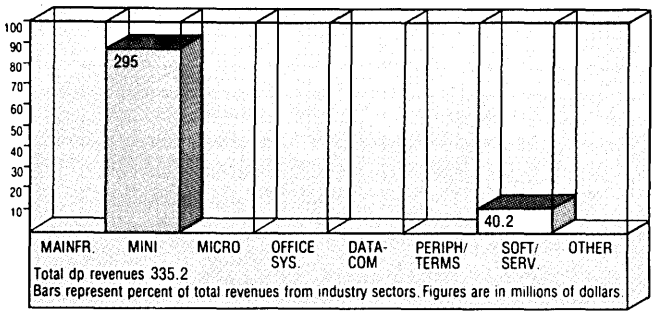

TANDEM COMPUTERS INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408) 725-6000

The image of high-flying Tandem Computers took a nose dive last year as it was forced to restate (read "reduce") results for its fiscal year ended Sept. 30. Revenues increased only 40.7% (less than half the year earlier's growth rate) to $335.2 million; profits, however, plunged 2% to $29.1 million from the $29.7 million in calendar '81.

When auditors reviewed Tandem's fiscal year-end statement, they found $23.8 million of reported revenues that they thought should not have been recorded as such for the period ended Sept. 30. After much throttling of numbers, Tandem's originally reported results were deflated by 7% in sales and an unsettling 20% in profits.

Last year the company introduced a 2-megabyte memory board for the NonStop II, as well as new peripheral products. The Tandem-designed and manufactured 6530 "ergonomic" terminal, introduced in February '82, showed sufficient market acceptance to stir the company to ramp up production.

Extending its market focus, Tandem bared plans for its comprehensive corporate information system, scheduled for availability this year. The first products are the Transfer information delivery system, Transfer/Mail, and Transfer/FAX. The company also unveiled a fully integrated computer/satellite communications network, called INFOSAT, that will be marketed jointly by Tandem and American Satellite Corp. A new communications product, SNAX, which will provide Tandem users with access to IBM SNA networks, rounded out the year's product announcements.

Tandem opened 12 branch offices in the U.S., Canada, and England. Because about one third of revenues are derived from foreign sales, new sales subsidiaries were set up in Belgium and Norway, and distributors in Argentina and Israel were established. Facilities were further expanded with the opening of new plants in Austin, Texas, and Bensenville, Ill., and an addition to headquarters in Cupertino.

By the end of 1982, analysts were saying the tremors at Tandem were over. After all, the company had taken drastic measures to control expenses and inventories. Known nationally for such employee perks as Friday afternoon "beer bashes," Tandem announced in November that all employees would have a 2½-day unpaid vacation, to be taken prior to Dec. 31. In addition, a series of resignations left president and ceo James G. Treybig as the sole member of the four cofounders still in the cockpit. But Tandem's "fall" is relative only to its year-after-year highfalutin successes. The company still shipped 1,542 processors in fiscal '82, compared with 1,210 the year before. And with a calendar 1982 growth rate of 40.4%, Tandem still flies far above the industry norm.

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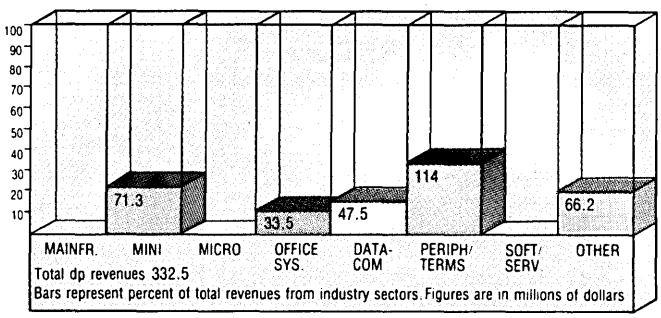

HARRIS CORP.

1025 West NASA Blvd.
Melbourne, FL 32919
(305) 727-9100

Revenues of Harris Corp.'s Information Systems sector, which produces superminicomputers, interactive terminals, distributed data processing systems, word processing systems, digital telephone switches, microprocessor-based telephones, composition equipment, and supervisory control systems, were up 11.8% in 1982 to $332.5 million from $297.4 million in 1981. Internal 1982 sales would add another $17.6 million.

Profits for the sector were down, as were overall corporate profits, which the company attributes to losses in its European marketing operation caused by the recession and a strong dollar and the fact that the previous year's earnings included an after-tax gain of $12.2 million from the sale of the company's investment in Quotron Systems Inc.

Total corporate revenues were up 11% in 1982 to $1.8 billion from $1.6 billion, while corporate profits fell 28% to $66.7 million from $92.6 million. Earnings per share declined to $1.97 from $2.97. Percent of revenues derived from foreign sources declined slightly from 31% in 1981 to 30% in 1982.

In addition to its Information Systems sector, Harris's sales came from its communications, semiconductor, government systems, and printing equipment sectors. In late 1982 it announced it would sell its printing equipment business, with the exception of electronic operations, for $250 million to an investment group. The sale was consummated early this year.

The Information Systems sector in '82 enhanced its top-of-the-line Harris 800 superminicomputer with new operating system software, expanded memory, and new communications options. New software products included X.25 networking, CAD/CAM applications packages, a word processing package, and a fast color graphics capability.

The Harris 9200 interactive terminal system, introduced in 1981, did well in 1982. It can communicate with two host computers simultaneously in either of the two most widely used protocols. With new offerings of a fiber optic communications link, base color support, and a 132-column screen format, it is strongly positioned in the IBM 3270-compatible market.

The Harris 8000 series of terminals continued to enjoy good customer acceptance. Deliveries of custom versions for the Avis Wizard II reservation system and the NASDAQ stock quotation network were completed in 1982.

The company's new Mind series, a distributed data processing system introduced in 1982, offers such features as a trilevel architecture incorporating an interactive processor for host computer communications, a distributed processor for file management, and intelligent, multifunctional workstations for delegating processing power to end users.

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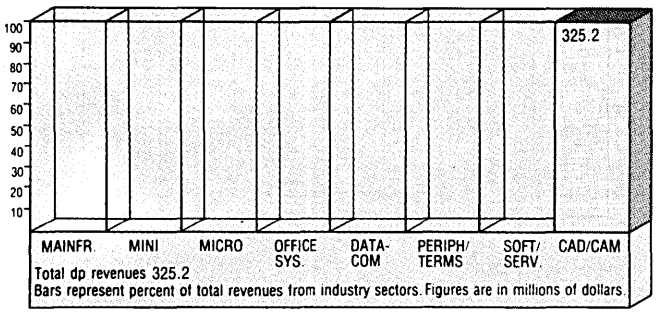

COMPUTERVISION CORP.

201 Burlington Road
Bedford, MA 01730
(617) 275-1800

Increased competition in the CAD/CAM market, recessionary pressures, and what some call an outmoded marketing strategy all spelled calamity for Computervision. For the second straight year, the company's growth rate was sliced in half. Following explosive revenue growth of 85.5% in 1980, the company's revenues rose only 41.7% in 1981, and by year-end 1982 the revenues increase was down to 20%. Meanwhile, '82 earnings were up a mere 2%. The market share leader in CAD/CAM systems closed its books on 1982 with earnings of $32.4 million on sales of $325.2 million. Comparable figures for 1981 were $31.8 million in earnings and $270.7 million in sales. Per-share earnings for '82 dropped 9.3% to $1.18 from $1.30.

Computervision points out that contributing to the low return on sales were high spending rates for marketing activities and for R&D (which jumped 33% last year to $36.3 million), lower gross margins resulting from a higher proportion of sales to the federal government, capacity-related manufacturing variances, and of course the economic woes.

Unlike its competitors—such as Calma, Intergraph, and Auto-trol, which concentrate on developing the software and buy other vendors' hardware—Computervision insists on sticking with its vertically integrated posture. Despite analysts' admonishments, the company is determined to manufacture all its own hardware and software, as well as do its own training and servicing. Nonetheless, some of the more nimble vendors appear to be beating the company at its own game. Intergraph, for instance, beat Computervision to the 32-bit punch by aggressively marketing its new CAD/CAM software on a DEC 32-bit processor. Meanwhile, the Massachusetts-based granddaddy of the CAD/CAM market missed the boat on the 32-bit business last year, announcing in the third quarter that introduction of its 32-bit challenger had again been postponed, this time until 1983. (It had been announced a year earlier.)

The company claims its earnings slowdown is not the product of the delayed 32-bit processor introduction, but rather of the economic nightmare—"the fact that most of our customers are in smokestack America, and smokestack America isn't doing too well right now," as company spokesman R. James Carr commented. The company did begin shipments of its new Instaview HC, a high-resolution, color interactive graphics workstation, and early orders showed promise.

Last fall Computervision made a major management change when it named James R. Berrett, formerly a Honeywell Inc. group vp, to succeed Martin Allen as president and ceo. Allen, who remains chairman, now devotes his time to strategic planning. Berrett wasn't the only new person to be brought on board last year; Computervision upped its total work force by 8.7% to end the year at 4,130 strong.

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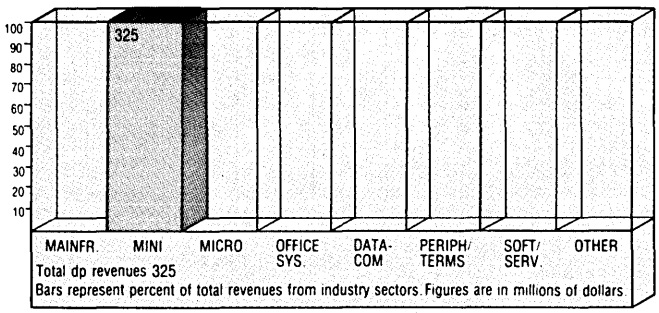


GOULD INC.

10 Gould Center
Rolling Meadows, IL 60008
(312) 640-4000

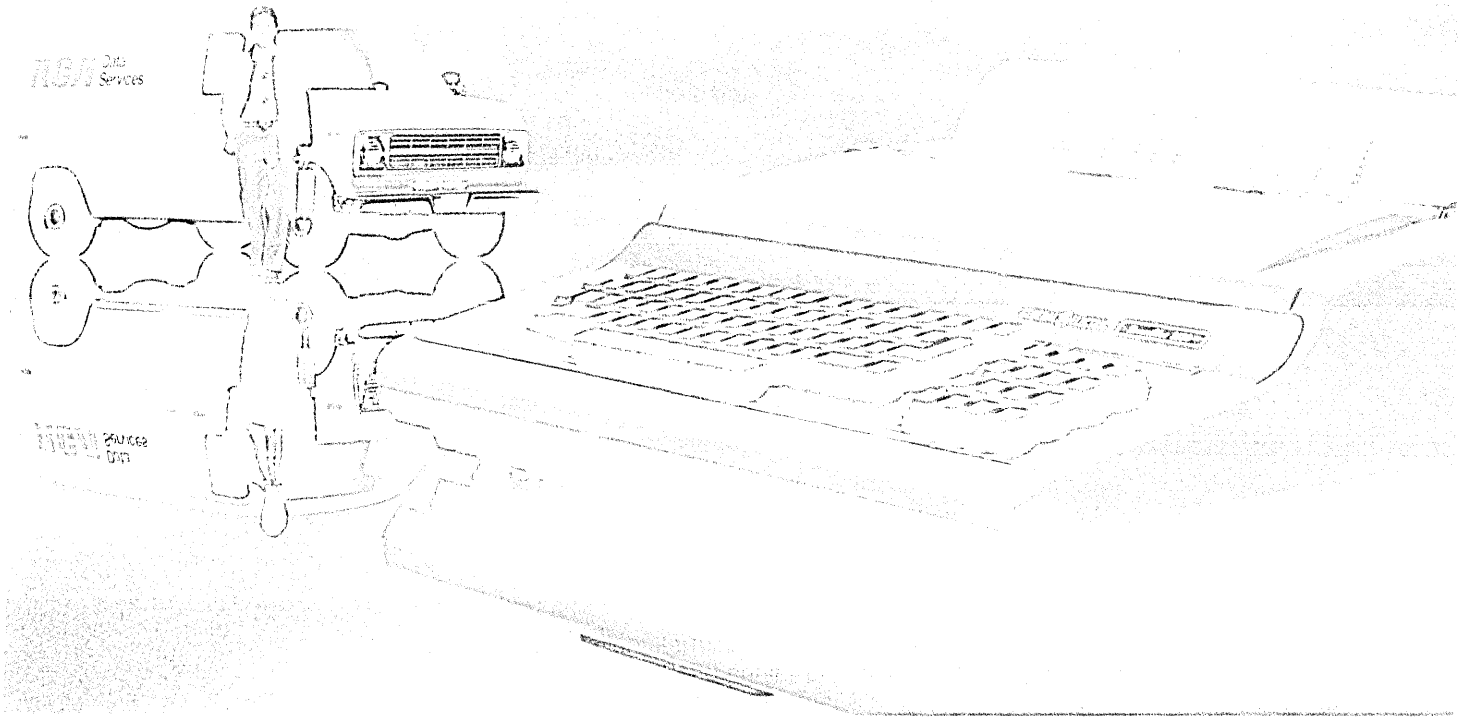
William Ylvisaker, Gould chairman and chief executive, last year continued his relentless drive to convert the poky circuit breaker company of the 1970s into a fast-growing electonics powerhouse. The February 1982 acquisition of custom chipmaker American Microsystems Inc. and planned divestiture of the rest of its electrical products business just about completed the worm-into-butterfly metamorphosis, yet Gould's new look did not translate into healthy growth last year—corporate revenues were only up 5.3% to $1.6 billion.

Data processing revenues did advance 20% to $325 million, as the high-performance 32-bit minicomputers from the SEL division of Ft. Lauderdale, Fla., which was acquired in 1980, continued in demand as the cpus for flight simulators and other heavy-duty number-crunching tasks. DATAMATION estimates a 25% increase in SEL revenues, to $162 million, from the 1981 level. Because of the recession and the resulting downturn in digital spending, Gould's Modicon division suffered. The programmable logic controllers, which are basically dedicated minis in a hardened enclosure suitable for factory locations—such as lathe and punch press controllers—were particularly hard hit. These products experienced a growth rate of 16%, which is about the half the growth rate of the previous few years.

Line extensions up and down the performance curve gave SEL expanded coverage in the superminicomputer market. The new big machine, the 32/8780 model introduced last June, features a 3.7 million instructions-per-second speed using ECL chips. To meet the board-level supermini competition, SEL announced Quadrabyte, consisting of a cpu, I/O, and 512KB of memory, for the oem markets at under $14,000.

Gould's overall earnings growth was as lackluster as the revenue advance. Total corporate net income from continuing operations, $90.5 million, was a bare 3.5% above 1981 level. The wave of acquisitions pushed interest expense to $31.7 million, but research and development outlays increased 27% to $154 million, or approximately 10% of sales.

Like other dp equipment vendors, Gould reported a weak second half of 1982 but saw a rising order trend late in the year. To smooth the consolidation of the once disparate parts of the company and profit from the strengthening economy, a new decentralized organizational structure was adopted early in 1983. If the parts mesh into a strong unit ready to profit from new opportunities like factory automation, Gould may yet deliver the kind of profits and high-technology image that Ylvisaker craves.



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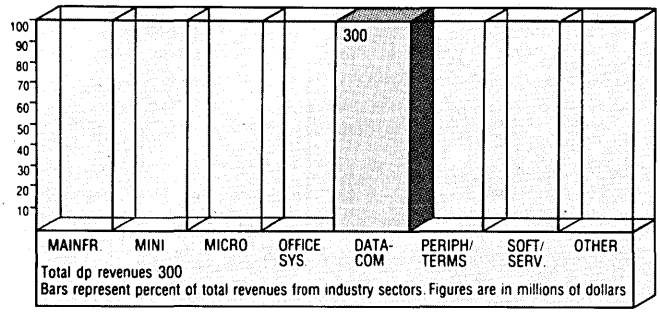

RACAL DATA COMMUNICATIONS INC.

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Miami, FL 33166
(305) 592-8600

Modems are big business these days, and nobody is bigger in the booming modem business than Racal-Milgo and Racal-Vadic, the American branches of the British company Racal Electronics. Vadic and Milgo, managed separately but with combined headquarters in Miami, together grossed about $300 million last year from their lines of modems, signal processors, terminals, and other peripherals.

Vadic is the number one manufacturer of low-speed, low-cost modems, while Milgo concentrates on higher speed and more sophisticated peripherals such as data encryption devices. As the modem market continued its 35% per year growth rate, Racal's subsidiaries emphasized new product and marketing efforts to retain the ranking.

Vadic's small oem modem business received a shot in the arm with the introduction of the new VS212P modem card in July. Bell 212A/103J compatible, the $420 PC board includes a microprocessor and custom LSI chips for digital to analog or analog to digital conversion at 0-300bps or 1200bps. A memory dialer feature is an option. Racal predicts that oem sales will exceed commercial standalone sales in a few years.

Vadic also packages the micro and signal chips of the VS212P as a standalone modem. For $550, the VA212C includes automatic answering and a manual override. Five LEDs display self-test and operation status. An automatic detection algorithm distinguishes between 9- or 10-bit ASCII code.

Milgo, the larger of the two companies, with $200 million in fiscal 1982 revenues, announced its entry in the local area network sweepstakes in November. A baseband system modeled on the token ring passing scheme promoted by IBM, the Planet system can link up to 500 devices using 250 special termination interfaces. Data speeds of up to 19,200bps can be made in either synchronous, asynchronous, or bisynchronous modes.

A new series of high-performance 4800bps modems, the Omnimode, was introduced in September. Internal hardware straps are eliminated with a new front display panel for software-based alterations. Special circuitry permits international data transfers. A master and slave program arrangement among multiple Omnimodes is also available. Custom LSI chip design features include multiple operating speeds for up to four ports per modem—one port can operate at 2400bps while two others can receive or transmit at 1200bps.

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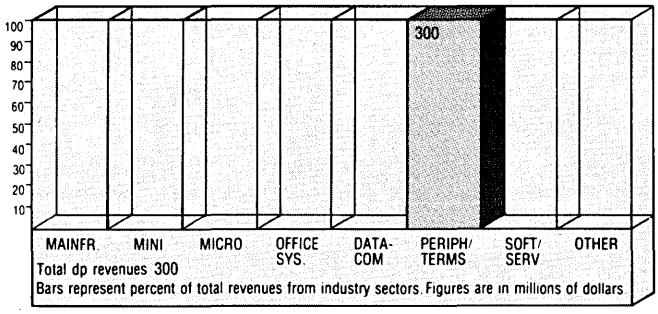


TEKTRONIX INC.

4900 S.W. Griffith Drive
Beaverton, OR 97077
(503) 644-0161

A sagging economy, soaring manufacturing costs, and an internal reorganization left Tektronix looking for brighter days in '83. Last year's earnings were off for the second straight year, declining 11.7% to $71.1 million. (Tektronix's fiscal year ended Nov. 31, and those are the numbers used for this survey.) Though the oscilloscope giant's total sales grew almost 10% to some $1.2 billion, its dp-related revenues declined 2.9% to $300 million from 1981.

Dp revenues were generated by the company's Information Display group, with over half coming from computer graphics terminals and displays and the remainder from graphics-based engineering desktop computers and hardcopy devices such as copiers, plotters, and image-making products.

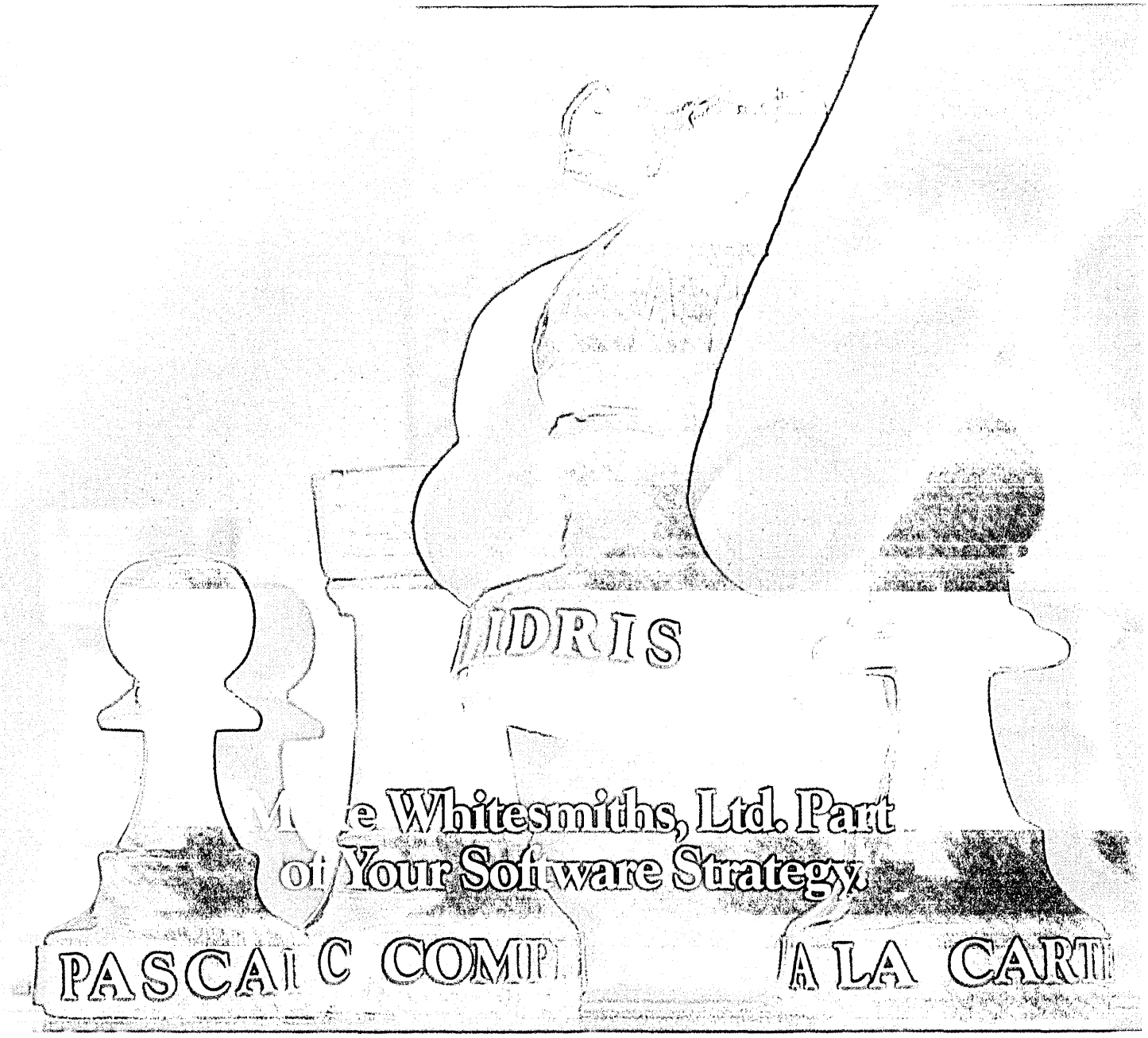
The ID group's results last year were bolstered by the introduction of Tektronix's new 4110 series of graphic computer terminals—monochrome and color. The star performer was the 4113 color raster terminal, a sharp break from the firm's traditional storage tube devices but a product that is compatible with them. The company also offers two copiers in support of this line—the 4611 (with storage tube devices) and the 4612 electrostatic copier (with the color raster terminals). November brought the announcement of the company's first color copier, the 4691 color hardcopy device, which uses ink jet technology.

New products were the good news and escalating manufacturing costs the bad, with those expenses accounting for about 50% of the company's cost of sales. As in 1981, the result was depressed margins.

Tektronix's solution to this problem is to switch from a functionally oriented organization to one that is more product- and market-specific. The former functional structures are now being integrated into a new divisional framework so that the divisional managers can gain control of, and accountability for, all aspects of their business.

In another cost-cutting measure, the company has opted to shed some employees. During 1982 it reduced its work force by 607 people to end the year at 22,924.

Once the new divisional structure begins to jell and the economy in general shows signs of an upturn, the Information Display group might get back in the groove of its former growth track. The focus of any new products can be expected to remain the same—for scientific/engineering uses, especially in CAD/CAM.



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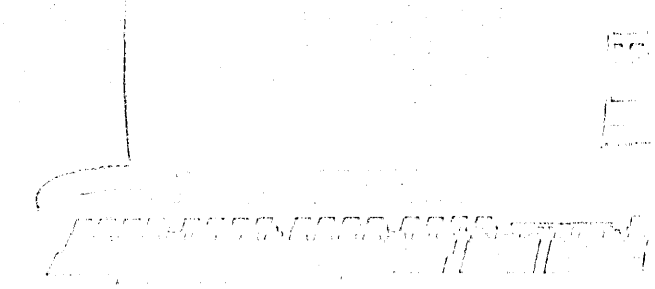

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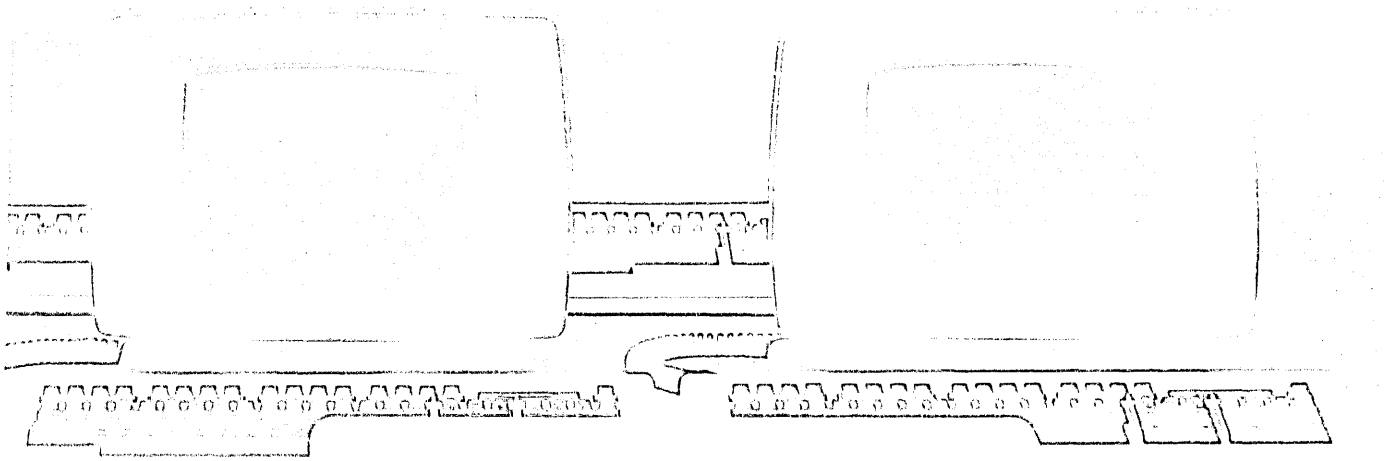

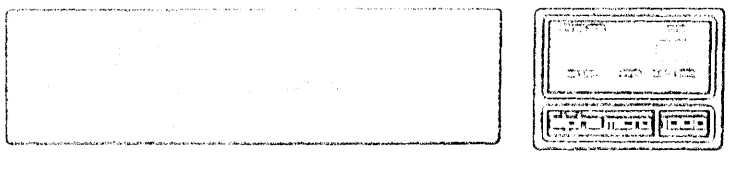

CIRCLE 90 ON READER CARD

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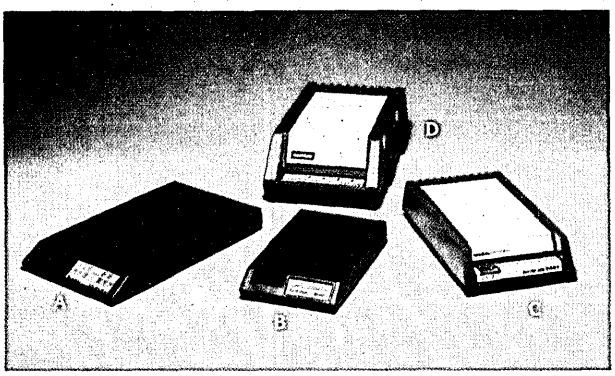


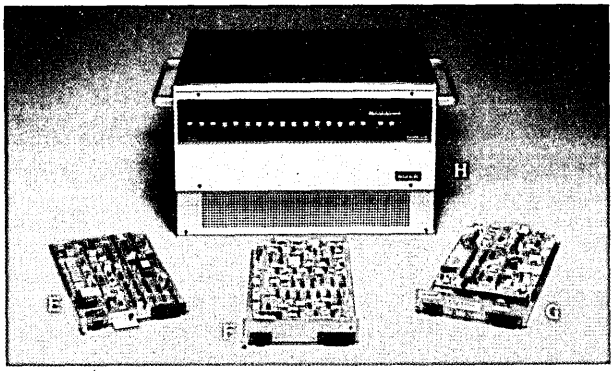
Remote Site Modems

A. VA212PA — Auto Dial Modem
This is the ultimate 212A-compatible modem. It operates full-duplex at 1200 and 0 to 300 bps. The VA212PA has a built-in auto dialer with a non-volatile memory that stores fifteen 31-digit phone numbers plus 26 user-programmable options. Phone numbers and options can be keyed in from the modem's front panel. The VA212PA even "talks" to terminal operators, indicating call progress, option status, and phone numbers stored in memory.

B. VA212LC — Low Cost Modem
It's a full-featured 212A-compatible modem with manual calling and automatic answering capability. Five light emitting diodes, including a carrier indicator, display data activity and connection status. A remote loopback feature provides end-to-end testing over the telephone from Racal-Vadic diagnostic centers.

C. VA3451 — Triple Modem
This first-of-its-kind modem combines a Racal-Vadic VA3400, Bell 212A and 103 in one low-profile desk-top unit. A built-in automatic dialer eliminates the need for a telephone, thus minimizing unauthorized calls and reducing dialing errors.

D. VA3413 — Dual Acoustically Coupled Modem
The world's first full-duplex dual acoustic coupler is compatible with Racal-Vadic VA3400 and Bell 103/113 modems. Just insert a telephone handset into the acoustic cups and begin transmitting data at 1200 bps (VA3400 mode) or at 300 bps (Bell 103/113 mode). Special phone line jacks are not needed.



Central Computer-Site Modems

E. VA212PAR — Auto Dial Modem Card
Racal-Vadic's newest 212 is an auto calling/auto answer Bell 212A-compatible computer-site modem card. It features a built-in tone or pulse automatic dialer. Because all circuitry is mounted on a single PC board, sixteen VA212PAR's will fit in Racal-Vadic's VA1680/81 rack-mount chassis.

F. VA3467 — Answer Only Triple Modem Card
The VA3467 is an answer-only direct-connect triple modem card. It automatically changes into a Racal-Vadic VA3400, Bell 212A, or 103, depending on which remote modem is calling. Using a VA3467 at the central computer site lets operators communicate with all popular low- and medium-speed modems. Eight VA3467 cards fit in a VA1680/81 rack-mount chassis.

G. VA3481 — Originate/Answer Triple Modem Card
The VA3481 is an auto calling/auto answer direct-connect triple modem. It can determine if the remote calling modem is a VA3400, 212A or 103, then configure itself accordingly. It's compatible with Racal-Vadic's VA811 Single/Multiline Automatic Calling Unit. Eight VA3481 modems fit in a VA1680/81 rack-mount chassis.

H. VA1680/81 — Multiple Data Set Chassis
The VA1680/81 is a compact rack-mount chassis which can house up to 16 intermixed modem cards. It has powerful diagnostics to isolate and test modems, telephone line, terminal and computer interface.

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RACAL

CIRCLE 91 ON READER CARD

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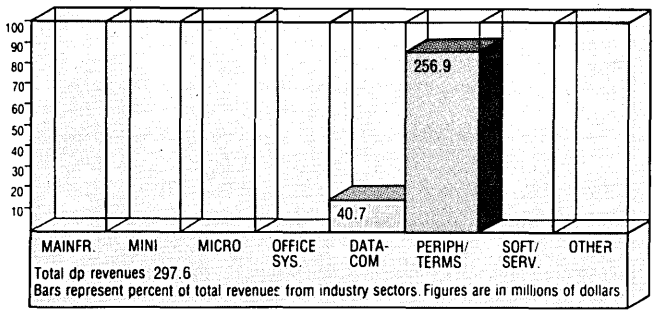

DATAPRODUCTS CORP.

6200 Canoga Avenue
Woodland Hills, CA 91365
(213) 887-8000

Dataproducts spent most of 1981 gearing up to meet demand that never came, but its 20th anniversary year provided the beginnings of a turnaround. Net sales rose 10.2% to $297.6 million, compared to 1981's zero growth. Total profits were up to $10.8 million, a 4.8% increase for the calendar year. On the brighter side, the stock rose a hefty 72.5% to end the year at 36.

Dataproducts' business splits basically into two streams: dp products and data communications equipment. Last year, oems accounted for 90% of the company's output, and Dataproducts is generally recognized as the leading supplier of medium- and high-speed line printers to this sector. Recently, the company has begun producing dot matrix and daisywheel printers.

The company's datacom products embrace network management and control systems, as well as digital communications transmission equipment. These products are sold primarily to the U.S. government and thus are more recession resistant. This proved true last year, with datacom equipment growing 15% to $40.7 million, while dp products only grew 9.5%.

Dataproducts also had a declining core memory business, which was facing increasing competition from semiconductor manufacturers. This was sold to Three Delta Corp., Sunnyvale, Calif., in the fall for an undisclosed price. Soon after this sale became effective, the company announced it had agreed in principle to buy the matrix printer manufacturer Integral Systems for 900,000 shares of Dataproducts stock.

The company was busy in the new product area too, announcing a completely new family of daisywheel printers. From this "second generation" the company unveiled the DP-35, a 35-character/second letter quality device; and a larger 55-cps equivalent, the DP-55. Both machines feature very low noise levels (62 decibels) in standard cabinets.

Other product highlights during the year included enhancements and modifications to the company's M-series matrix printers, and a high-end replacement for the company's 1,800 lines/minute band printer, the BP-1800, which now offers 2,000 lpm. As expected, the company moved to phase out its remaining 2200 series drum printers, now that customers have switched their preference to higher-performance band printers.

Several major new contracts were announced in calendar '82, including deals with Tandem, Prime, and Vector Graphic. In a burst of anniversary spirit, Dataproducts offered clients new lifetime warranties for matrix heads—an industry first.

One other item of note from a lively year was the completion in Dublin, Ireland, of a new 217,000-sq.-ft. manufacturing facility, which will supply the European market with line printers and could conceivably boost the company's overseas presence, which in 1982 accounted for 20% of net sales.

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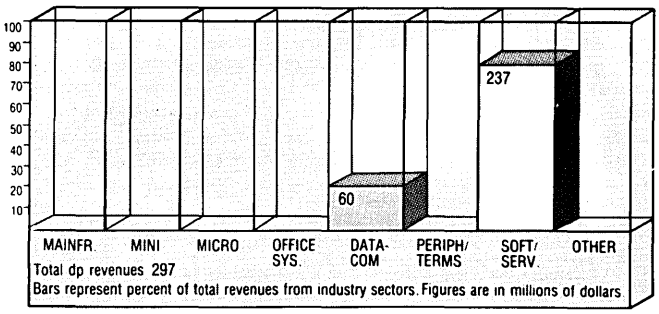

TYMSHARE INC.

20705 Valley Green Drive
Cupertino, CA 95014
(408) 446-6000

Tymshare boosted its revenues a modest 2.5% in 1982 to $297.0 million from $289.7 million, while its income plunged 44% from $15.7 million to $8.8 million. Per-share earnings went from $1.33 to 73 cents.

The 17-year-old data processing and telecommunications services firm trimmed its work force in '82 to 3,600 from 3,975 but upped its research and development expenditures from $16 million to $17.5 million. Tymshare in '82 was one of four companies authorized by the FCC to offer metropolitan networks for high-speed digital communications, a situation that some analysts see as boding well for the company's future while others worry about the threat of such formidable competitors as Citicorp, IBM, and AT&T.

Tymshare cut some losses in 1982 by selling off unprofitable credit card processing and medical systems businesses and backing off on a less than successful entry into the automated teller market.

The most significant event for Tymshare in 1982 had nothing to do with its products or even the marketplace. Tymshare in one fell swoop managed to get the entire Wall Street community very annoyed. In the process it cost Tymshare stockholders some $70 million in paper losses from which the stock has yet to recover. The problem occurred in November, when Tymshare announced its third-quarter figures. The company reported that it earned 19 cents a share, all of which had come from the sale of a subsidiary. This type of information is usually footnoted on the financial statement, but Tymshare merely put that announcement in the text of the news release. As the bad news spread that the company made no money from continuing operations, near panic ensued, and the stock took a beating. This error will have long-term effects as the company strives to regain the confidence of security analysts and investors, none of whom take kindly to being tricked. At year-end the stock had slumped to 18, down 37% for the year.

Many analysts continue to regard Tymshare's Tymnet network as a technological leader in data communications, and the company continues to offer enhancements to services it provides via the network.

In the hardware arena, an offering in late 1982 was the Scanset XL, priced at $895 and billed as a personal information terminal with a built-in telephone. Manufactured to Tymshare's specifications by the French telecommunications company Matra, it is the latest in a line of personal terminals the company began to introduce early in the year.

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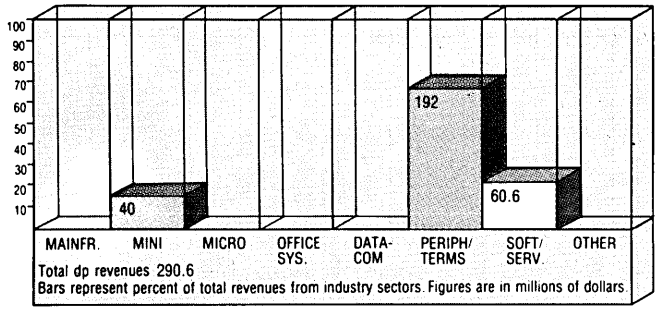

C. ITOH ELECTRONICS INC.

5301 Beethoven Street
Los Angeles, CA 90066
(213) 306-6700

Hardly a household word a few years ago, the name C. Itoh & Co., the Tokyo-based trading company, appeared in a sizable number of American homes and offices last year. The F-10 daisywheel printer bearing the Itoh label became a familiar sight in personal computer stores, sharing shelf space with peripherals from other Japanese firms making inroads into the PC market. Strong volume shipments of the F-10, the Prowriter dot matrix printer, and other gear led to a 45% increase in peripheral and terminal revenues to $192 million for C. Itoh's American subsidiary, C. Itoh Electronics Inc.

As a trading company, C. Itoh Elecronics imports devices made by other companies in Japan; the letter quality printer is made by Tokyo Electric. Overall 1982 dp revenues for the American subsidiary were $290 million, up 36% from the prior year. The company also recorded a 20% revenue surge in its minicomputer and software lines.

C. Itoh Electronics is a mere drop of sake compared to its Japanese parent, C. Itoh & Co. Ltd. One of the largest companies in Japan, C. Itoh's transaction trading total of $51.5 billion in the 1982 fiscal year that ended March 31, 1982 was roughly 50% larger than the total revenues for International Business Machines Corp. Most of C. Itoh's worldwide revenues come from making or trading basic materials such as ore, grains, and textiles as well as manufactured products such as machinery. Electronics is a small but growing part of the company, which does business through 403 subsidiaries in 81 countries around the world.

Electronics from C. Itoh come from three different operations. C. Itoh Terminals sells video display terminals and recently introduced a new line printer. CIE Systems announced a small business computer system last year based on the Motorola 68000 microprocessor. The daisywheel and dot matrix printers are from C. Itoh Electronics. Oem items such as crts are also part of the CIE product line.

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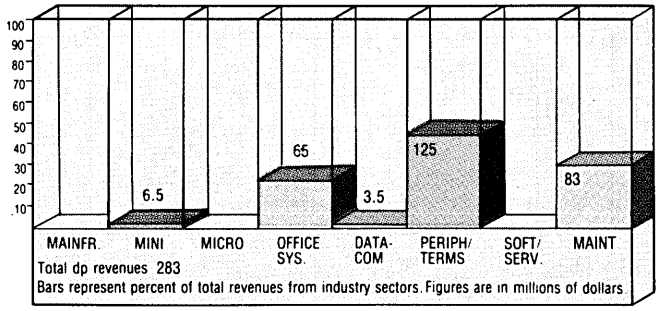

RAYTHEON COMPANY

141 Spring Street
Lexington, MA 02173
(617) 862-6600

Raytheon's roots are in the electronics business. Last year more than half of this diversified Fortune 100 industrialist's $5.5 billion in revenues grew out of sales of electronics products; two thirds of its pretax income was drawn from this same business area. Within this mammoth electronics group sits Raytheon Data Systems, the company's small dp revenues producer. Even though RDS represents but a small plot in the vast corporate acreage, its 1982 growth rate surpassed that of its parent.

Hard hit by the economic drought, total corporate sales shrank 2.2% from the 1981 level of $5.6 billion. Profits dried up even more, as indicated by the company's net income drop to $318.8 million in '82 from $324 million in '81. But sitting in greener pastures in nearby Norwood, Mass., Raytheon Data Systems saw sales climb 9.6% to $283 million from the year earlier's $258 million. Contributing to that healthier harvest was a 25% increase to $125 million in sales of terminals and a 31.7% growth to $83 million in maintenance and repair revenues. The company brought in $65 million from office systems revenues, and another $3.5 million from the data communications field. Although the minicomputer growth rate was stunted compared to the prior year, that area contributed another $6.5 million to the total. By year-end RDS was working with 400 fewer helping hands, as employment dwindled during the year to 4,200. Meanwhile, parent Raytheon had to let 4,500 people go, leaving it with 72,000 to tend the crops.

Times might have been tougher were it not for the fact that 39% of total corporate sales were to the U.S. government. Raytheon Data Systems had its share of that business as well. As part of the Army's Vertical Installation Automation Baseline Equipment (VIABLE) program, RDS will supply 18,000 terminals and printers to 47 U.S. Army posts. Raytheon is a subcontractor to Electronic Data Systems Corp. for the 10-year program.

New to Raytheon Data Systems' wares in 1982 was the RDS-200 word processor. In addition to word processing, the system performs business or engineering computations, and serves as a personal computer when used with standard software packages also being offered by Raytheon. Not to ignore its mainstay, the company enhanced the IBM-compatible PTS-2000 data terminal product line last year to further extend its performance. And with an eye on '83, RDS said it made major progress during the past year in developing a family of multifunction terminal systems that will debut this year.

Signaling the corporation's commitment to advanced microcircuits, Raytheon began construction on an 80,000-square-foot facility at Andover, Mass., for the design, development, and production of integrated circuits at the 1 micron level.

Help your programmers respond to new applications. Free them from the ASCII code trap with the ANSI Intecolor 2405. When your users are demanding color and graphics to solve their applications needs, adding more non-ANSI terminals to your system is like chaining the hands of your programmers. If your new terminals aren't ANSI X3.64, you may be locked into a generation of non-standard application programs and protocols. Your programmers may have to write translation codes for *each* application you want to update. And that means less flexibility, plus increased programming costs.

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CIRCLE 92 ON READER CARD

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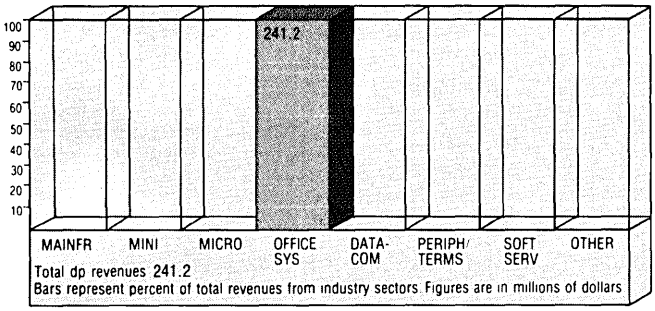

LANIER BUSINESS PRODUCTS INC.

1700 Chantilly Drive N.E.
Atlanta, GA 30324
(404) 329-8000

After five straight years of soaring profits, this office products specialist came back down to earth with a bang in calendar '82. Net income declined 11.4% to $22.6 million on the back of a moderate sales growth.

The company's three product divisions combined achieved total sales of $365.4 million—just over 12% on last year. A surge in field service revenues, however, had more to do with the revenues increase than any growth in demand for the eight major products that the company unveiled late in 1981.

DATAMATION estimates Lanier had $241.2 million in sales from its video display word processors and small business computers, representing a growth of only 5.7%.

Lanier attributed its moderate showing to delays in shipping its eight major new products. The company also cited the uncertain economic outlook as a contributing factor to its decline in growth rate. Despite all this, the company spent last year preparing the ground for an upswing through what it called its "year of investing in the future." Fiscal 1982 R&D revenue grew sharply to $8.1 million from $4.6 million, and throughout the year Lanier pushed on with a series of new software capabilites and product features for the new systems.

To its new Computereze small business computer, the company added word processing, CP/M, and Data Manager. Lanier's equally user-friendly EZ-1 video display word processor was adorned with three data communications options—3270/SNA, 3780, and tty/ASCII—as well as more general enhancements such as a shared printer option, Data Manager, CP/M, Business BASIC, EZ-Spell, and Full Math.

Lanier also announced enhancements to its Super No Problem typing system, including CP/M, Microsoft BASIC, and new advanced word processing features.

Lanier's "investment in the future" also resulted in the purchase of the Ramada Inn Central in Atlanta, which this year has been converted into a major sales, service, and market support operation.

Other future-directed moves, aimed at competitors such as Wang, Xerox, and IBM, included a 50% increase in manufacturing capacity at the company's Thomaston, Ga., plant.

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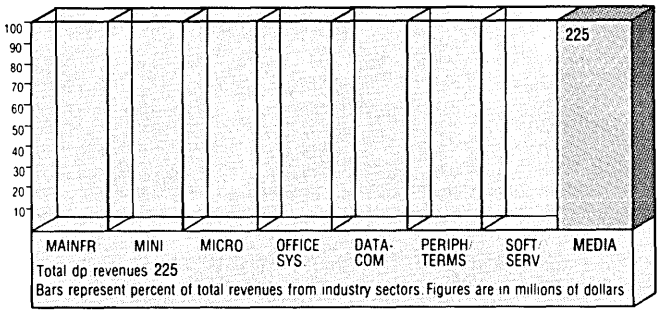


3M

3M Center
St. Paul, MN 55144
(612) 733-1110

From a company with a single product line, sandpaper, 3M has grown over the decades into a company that is among the most diverse in the world. The company restructured its operations in 1981 into four sectors—industrial and consumer, graphic technologies, life sciences, and electronic and information technologies.

The Electronic and Information Technologies Sector, with 1982 sales up only slightly to $2.02 billion from $1.99 billion in 1981, participates in three high-tech businesses—electrical, electronics, and telecommunications; office information; and magnetic and optical recording. While the company does not separate dp-related revenues from that group, DATAMATION estimates that such sales remained constant at the 1981 level of $225 million.

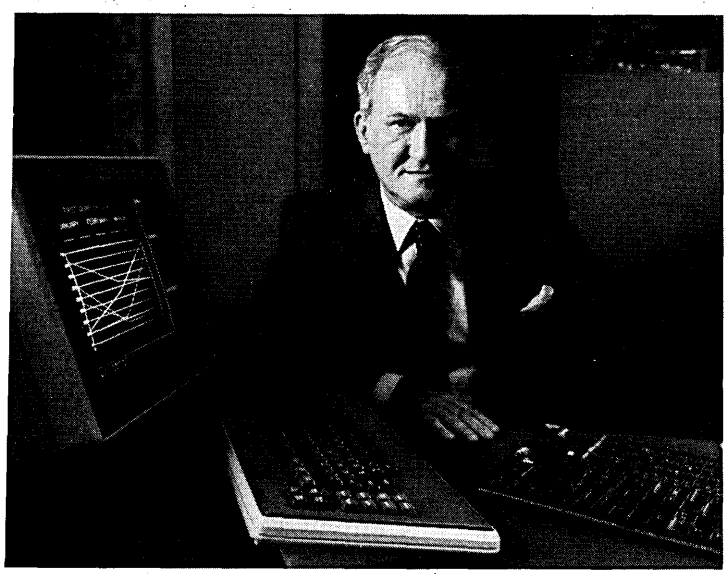
As a whole, 3M did not have one of its better years in 1982. Total corporate sales inched up only 1.4% to $6.6 billion from the year earlier's $6.5 billion. Corporate profits declined 6.3% to $631 million ($5.37 per share) from $673 million ($5.74 per share) in 1981. Helping to cushion the blows to the bottom line last year was a significant reduction in worldwide employment, which fell by approximately 4,000 employees to 87,388 at year-end. A major portion of the decline occurred in the U.S. and was due to attrition and to a voluntary early retirement program. While the effects of flat sales were felt in the dp sector as well, the company paved the way for improved results in 1983.

Last year 3M introduced two digital facsimile transceivers, upping its stature in the market for electronic document communications. The company expects its position to be further strengthened this year through the introduction of its Whisper Exchange. This system is a network of teleprinters that send and receive messages over phone lines under computer control.

Future prospects of 3M are also favorable in supplying magnetic storage media to the computer industry. The company is currently focusing on two major segments of the media market—flexible disks and data cartridge systems. Late last year 3M was selected by Apple Computer to develop a new generation of floppy disks offering a sixfold increase in storage capacity. In the fast-growing market for data cartridge systems, 3M's HCD-75 increases by nearly 50 times the amount of information that can be stored on a 4 by 6-inch cartridge. The system initially is being used in various Hewlett-Packard computers.

To meet future needs of the computer industry, 3M is working to develop new thin-film magnetic media, offering the potential for even greater increases in data storage capacities. Advanced optical technologies under development are said to offer high-capacity direct-read-after-write capabilities, with considerable potential for new generations of computer equipment.

A TESTIMONIAL FOR THE BURROUGHS B20 FROM SOMEONE WHO SPENT 17 YEARS AT IBM.



Dr. W. LEE SHEVEL
Senior Vice President, Corporate Operations, Burroughs Corporation

Some people think that because IBM is bigger than Burroughs, they're better than Burroughs. After working for many years at IBM, I can tell you that bigger doesn't necessarily mean better.

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The B20 Series can offer up to five times more memory capacity, can store twice as much data, can have more workstations, offer more kinds of printers, and has a 25% bigger screen (to display more data at once).

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CIRCLE 93 ON READER CARD

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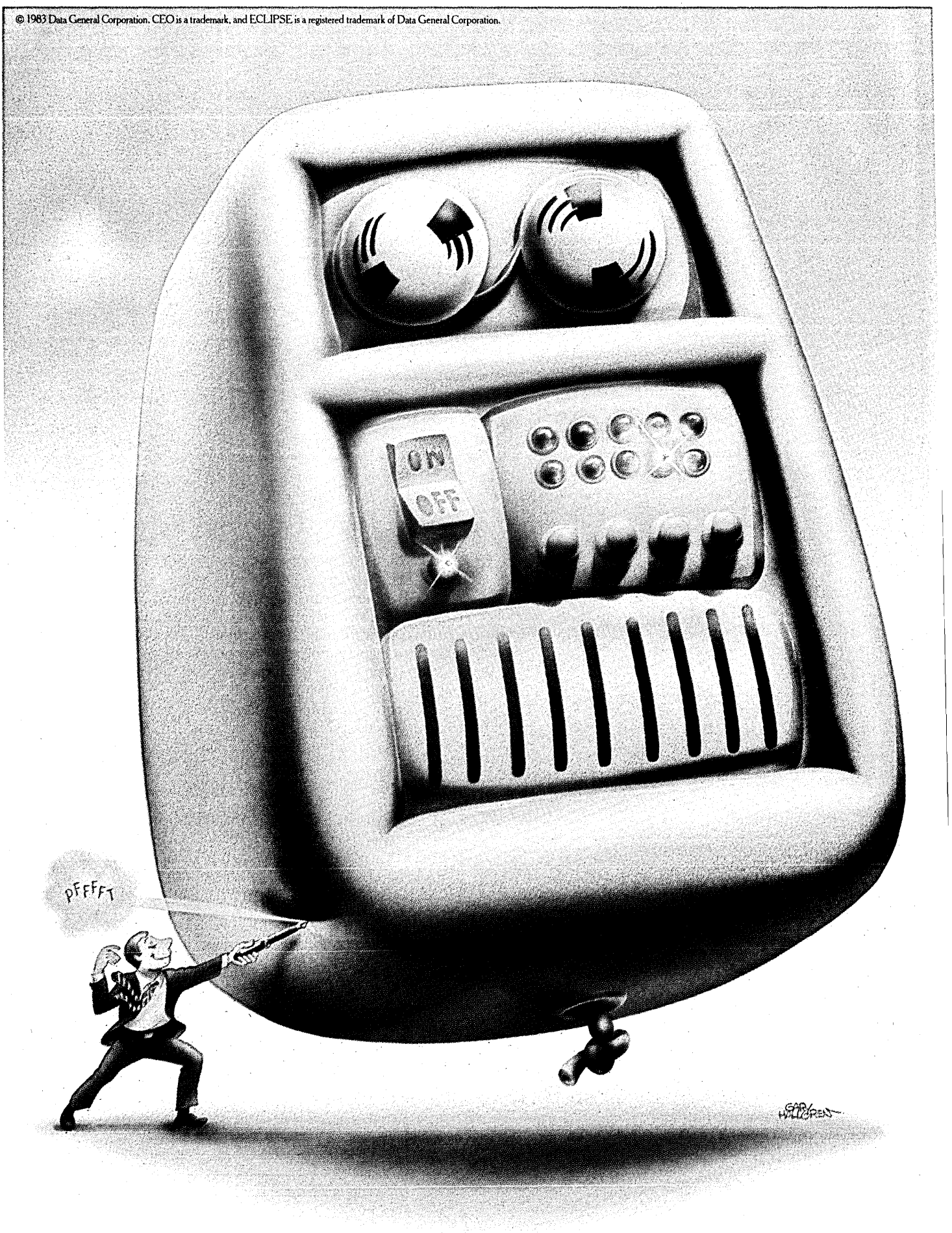

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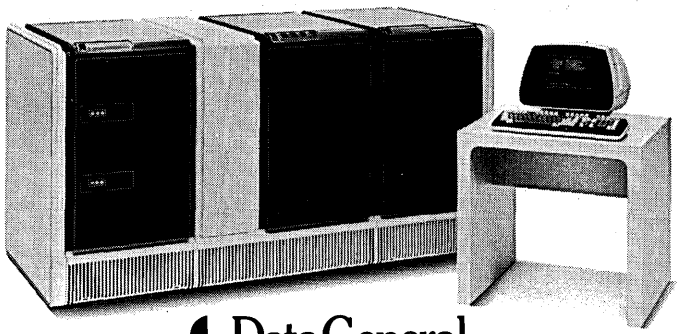
All of which gives you two things you've been denied up until now:

A reasonable price.

And reason to believe you'll get what you've been promised.

For more information on the complete line of Data General office automation systems, write to Data General, CEO 36, 4400 Computer Dr., Westboro, MA 01580.



Data General

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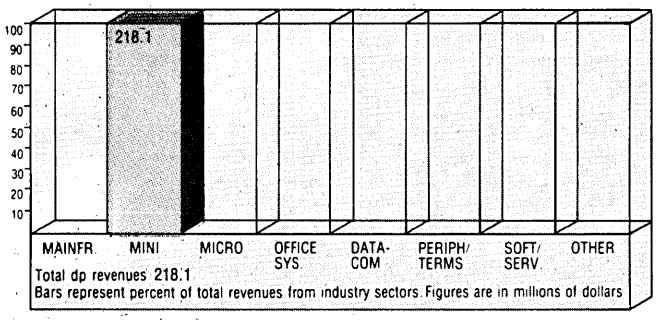

PERKIN-ELMER CORP.

Main Avenue
Norwalk, Ct 06856
(203) 762-1000

While Perkin-Elmer's corporate picture grew darker in 1982, its Data Systems Group of Oceanport, N.J., managed to come out of the year better than it went in. The corporation, a leading manufacturer of electronic analytical instruments, semiconductor production machines, and minicomputer systems, saw revenues drop 8% to $1.01 billion and earnings tumble 34% to $51.3 million, an operating margin of only 5%. The Data Systems Group, by comparison, had a strong year, with revenues climbing 17% to $218.1 million. (Figures for both years exclude the Memory Products Division, which was sold to Cipher Data Products.)

The Data Systems Group currently consists of the Business Systems Division, founded in 1981, and the Technical Systems Division, which dates from Perkin-Elmer's acquisition of Interdata a decade ago. The basic product within both divisions is the 3200 series of minicomputers, which run Unix or a proprietary operating system. Business systems based on the 3200 series run the Reliance transaction processing software.

The company introduced several new products in 1982. In July, the Intelligent Disc Controller was brought out to provide a high-performance interface between the 3200 Megaminis and their high-speed disk storage products. (When the old Memory Products Division was sold, the reason cited was that the products were not fast enough; the IDC is their replacement.) Later in July, the Data Systems Group introduced RQL/32, a relational query language for the Reliance software.

In August, a shared memory system was introduced; based on a multibank structure, it allowed users to combine uniprocessor 3200s into multiprocessor systems for applications requiring fault tolerance or very high throughput. And in November, the 3200 MPS was announced. The 3200 MPS is simply Perkin-Elmer's idea of how to use the shared memory system to create a multiprocessing superminicomputer.

In early 1983, the company continued with its spate of new products, introducing a supermini based on the Edition VII Workbench implementation of Unix in January and the PENnet X.25 compatible network in March.

Part of the reason behind the corporation's decline in 1982 was a lackluster performance by the Semiconductor Division. P-E signed an agreement with Censor to sell and service its step-and-repeat aligner for semiconductor wafer fabrication. The product is a direct competitor of Perkin-Elmer's own semiconductor product, the Micraligner projection aligner; P-E's management has pretty much conceded that this product is verging on obsolesence and that as a result, "the semiconductor division is unlikely ever again to attain its previous high margin levels."

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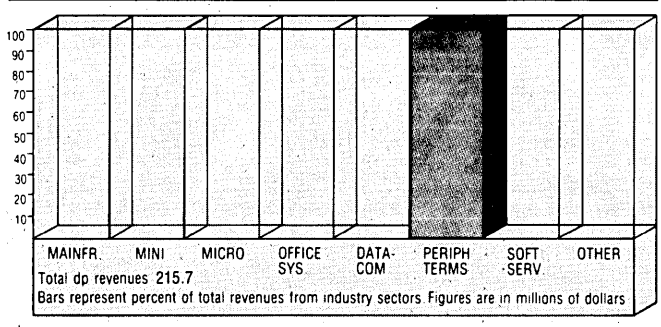

SANDERS ASSOCIATES INC.

Daniel Webster Highway South
Nashua, NH 03061
(603) 885-4321

Sanders Associates Inc. had a successful 1982. DATAMATION estimates that corporate revenues rose 19%, to $487.8 million from $408.7 million. Corporate profits showed a 23% gain, to $29.5 million from $23.9 million. The growth came in both Government Systems and Products—the company's name for its activities in electronic countermeasures and warfare systems—and in dp sales.

Sanders's dp activities come under the heading of Graphic Systems and Products. This part of the company, we estimate, saw revenues increase 40%, to $215.7 million from $153.9 million. Profits, however, don't appear to have kept pace. The company's annual report shows operating income for this division down 30% for the fiscal year ending July 30. The increase in revenues was good enough to move Sanders from number 49 up to number 46 in the DATAMATION 100.

Sanders's Graphic Systems and Products business includes five product areas: digital plotters, graphic displays, graphic systems for command and control, digitizers, and turnkey CAD systems. The company bought its way into most of these fields with the 1980 acquisition of Calcomp, which has been reorganized since it has been combined with the parent company.

In digital plotters, the company claims strong sales of its model 5500 electrostatic plotter/printer and 95X family of vector-to-raster controllers. There was also a new product, a mobile, rack-mounted electrostatic plotter/printer.

In graphic displays, Sanders received a $36 million order for continued manufacture of IBM's 3250 graphic display terminal. (IBM placed another order for 3250s, worth "as much as $38.7 million" in early 1983.) Sanders also says there was "strong demand" for its Vistagraphic 4000 line of intelligent graphics display terminals, which are targeted at oems.

CalComp's digitizer business was expanded by the introduction of the 9000 series, which was adopted by "several major oems," including Synercom and Camsco. The digitizers are used in turnkey CAD systems.

CalComp's own turnkey CAD systems are designed for the architecture, construction, and engineering industries. The company's basic interactive graphics system (IGS) got a couple of new bells and whistles in the course of the year: a color interactive graphics workstation and an enhanced cpu. There was also new software: an application package that automates equipment layout and inventory management and keeps track of wiring, piping, and air ducts.

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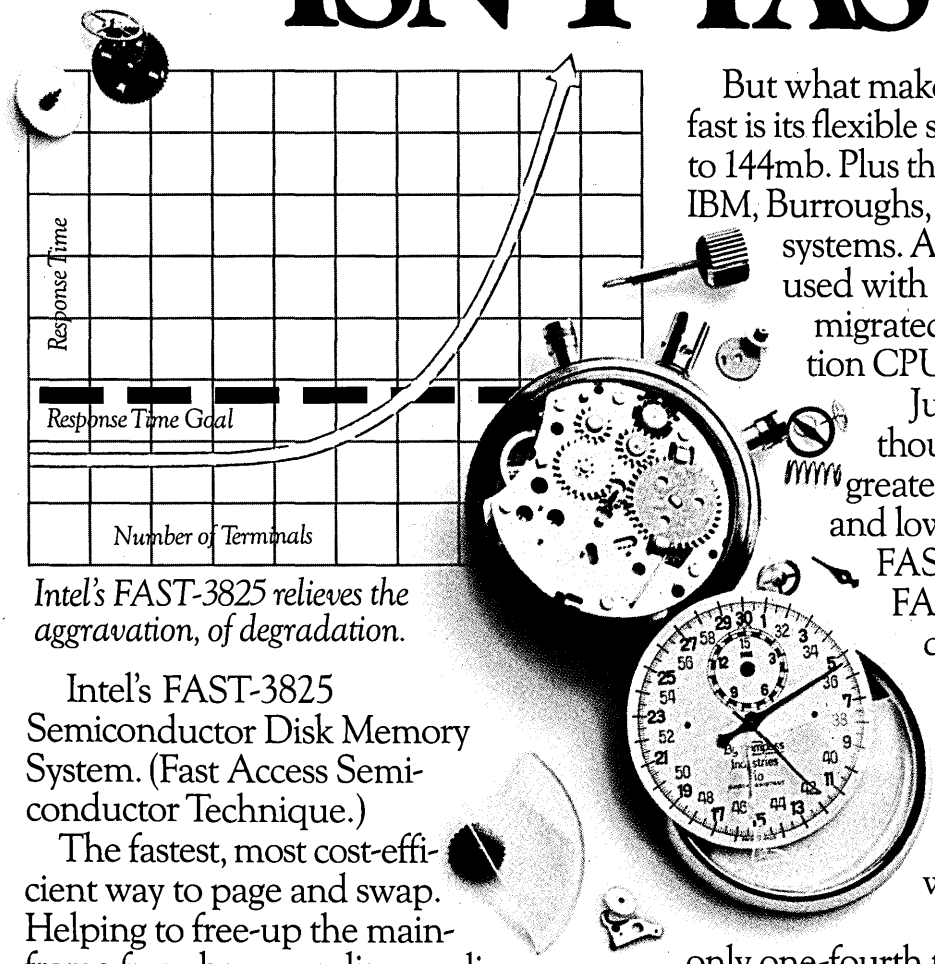

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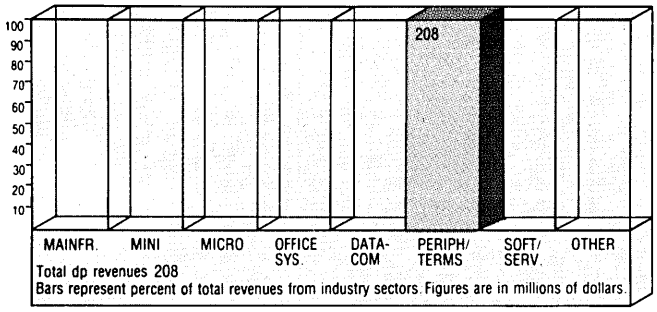

ANACONDA-ERICSSON INC.

7465 Lampson
P.O. Box 938
Garden Grove, CA 92642
(714) 895-3962

The offspring of a joint venture between the Swedish communications manufacturer LM Ericsson Telephone Co. and Atlantic Richfield's Anaconda subsidiary, Anaconda-Ericsson Inc. sells transmission and switching equipment and a growing number of office automation products.

The company was set up in 1980 as a means for Ericsson to further its interests in the U.S. market, where Anaconda had had fair success in selling cabling and related equipment to the telephone interconnect market. Through the 1981 acquisition of Axxa Corp. from Citicorp and the development of certain data processing equipment in Sweden, however, the company is attempting to become a recognized force in the office automation markets. Axxa was set up by Citicorp to develop and sell executive workstations, but the bank holding company ran afoul of banking regulations and was forced to sell its only product, the Axxa workstation.

The product has found a poor reception since it was delayed in coming to market and was far overpriced compared to competitive machines. It is estimated that only about 200 of the workstations have been installed so far, most of them at Citicorp itself.

The company is understood to be working on further enhancements to the Axxa technology, which combines word processing, data processing, and data communications in a single desktop unit. New products are expected to work closely with the firm's MD 110 digital PBX, which was introduced in the U.S. in early May. The MD 110, already available in Sweden, will be the basis for voice and data communications in offices.

For this survey, Anaconda-Ericsson's PBX business, which totaled $286 million in 1982, was excluded because the systems being sold previous to the MD 110 are analog. The firm's bank terminal sales, however, under the name Datasaab, are included.

LM Ericsson also plans to bring to U.S. shores in the near future a line of 3270-type computer terminals and cellular radio equipment that has already gained a good reputation and won the company major U.S. investments in its recently issued shares sold in the U.S. Cellular radio is expected to be a major growth area for the firm in coming years as it is applied to mobile telephone systems.

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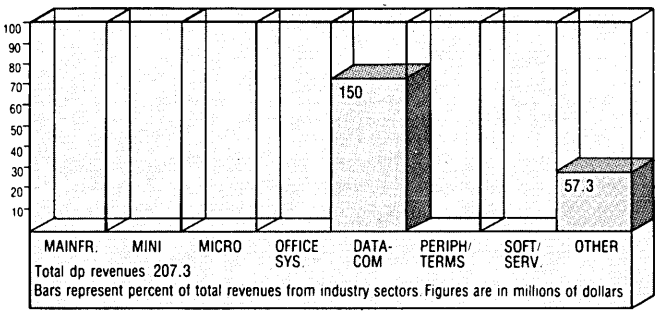


PARADYNE CORP.

8550 Ullmerton Road
Largo, FL 33540
(813) 530-2000

The year 1982 was one of Paradyne's finest. The data communications equipment company was flying high with record revenues, profits, and earnings per share. The good vibes were apparent on Wall Street, where Paradyne stock had become a star attraction.

Then came the Securities and Exchange Commission (SEC), alleging this March in a lawsuit that Paradyne had used fraud and deceit to win its March 1981 $100 million contract with the Social Security Administration (SSA). The SEC contended that Paradyne won the contract by putting its P-8400 brand name on a Digital Equipment Corp. (DEC) PDP-11/03 and by making an information-encoding machine that was "nothing more than an empty box with blinking lights."

Paradyne crashed immediately to earth, faster than any satellite. The thud was also heard on Wall Street, where in one day the stock lost 20% of its value and trading had to be suspended.

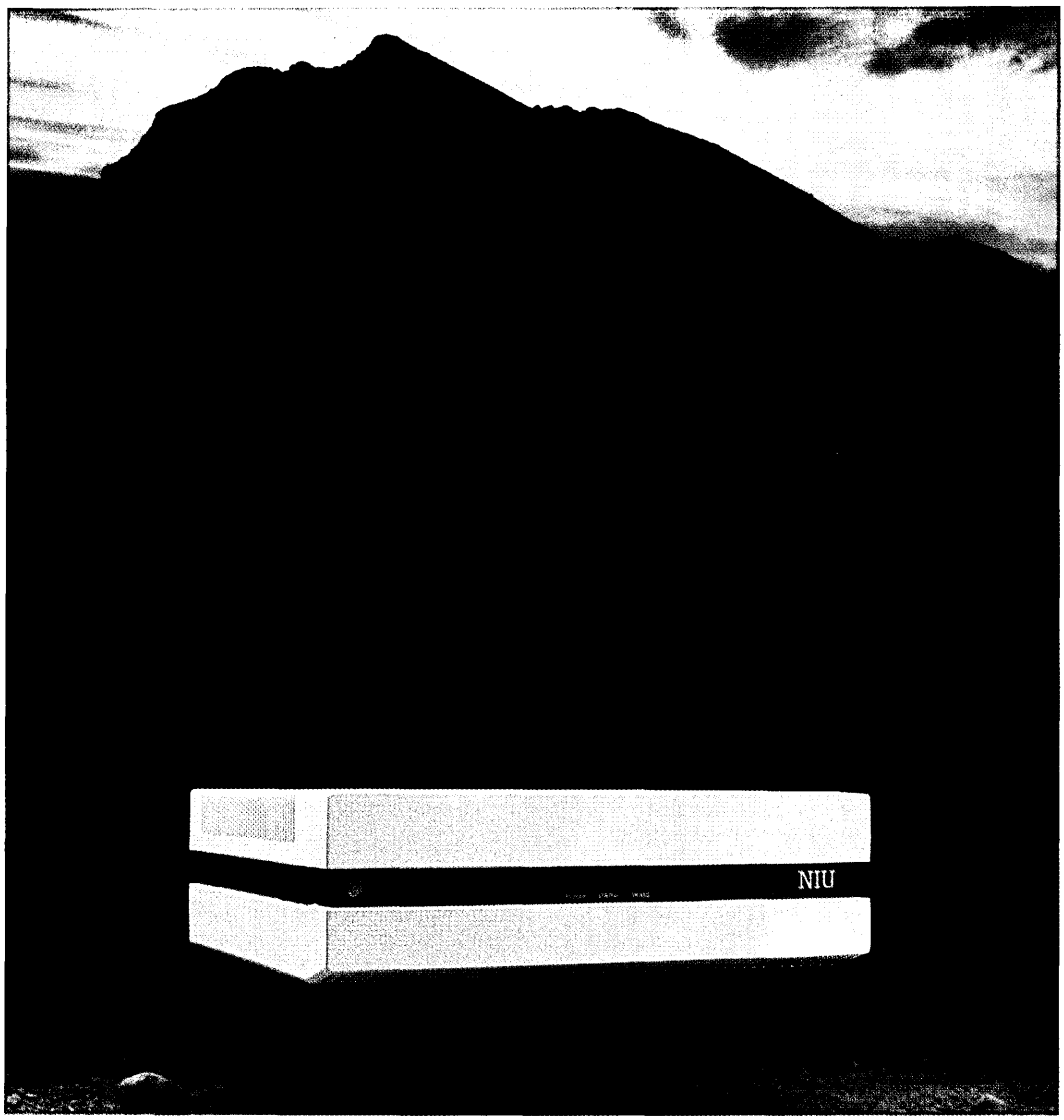
Forgotten quickly were the 49.1% increase in 1982 corporate revenues to $207.3 million, the 47% rise in profits to $26.9 million, and the 33.3% jump in earnings per share to $1.24. Shunted aside were Paradyne's proud statements that the SSA contract was "one of the key efforts of 1981" and "a major step in the company's ability to undertake large system contracts." The contract, calling for the installation of 2,000 to 3,000 intelligent terminals over eight years, was the largest ever awarded by the SSA and the largest ever won by Paradyne.

The situation grew bleaker for Paradyne. Because the contract was fraudulently obtained, according to the SEC, the company's financial statements to the SEC and to its shareholders since March 1981 have been "deceptive and misleading." So much for all those records in 1982, the SEC implies. An owner of 200 shares of Paradyne stock filed a class action lawsuit charging Paradyne and its top officers with conspiring to defraud the investing public by artificially inflating the price of its common stock. The suit also names the lead underwriter for the four offerings of Paradyne stock since the SSA contract award.

Only SSA officials remained in Paradyne's corner, defending their decision and indicating they might even exercise an option to buy additional equipment from the company.

Paradyne's only comments throughout the affair were that the charges were "without merit" and the company intends "vigorously to contest the allegations in court."

Wall Street, along with the entire computer industry, will be listening anxiously.



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Ungermann-Bass, Inc., 2560 Mission College Boulevard, Santa Clara, California 95050. Telephone (408) 496-0111.

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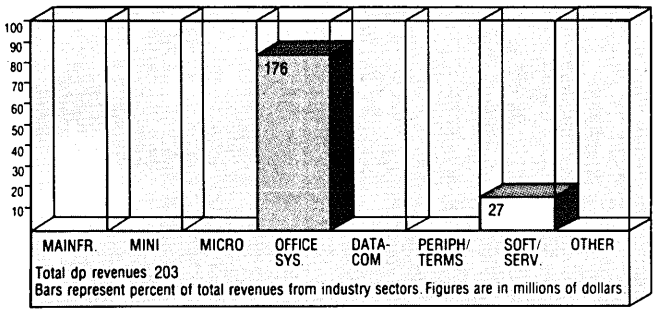

PHILIPS INFORMATION SYSTEMS INC.

4040 McEwen Avenue
Dallas, TX 75234
(214) 386-5580

Philips joined the Top 100 back in 1980 with the rank of 98, but in just two years it has cut that number in half. Revenues have grown from $68 million in 1980 to $203 million in 1982 for this word processing and office automation specialist.

Philips was formed back in 1979 when 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 firms. In 1981, Micom in the United States adopted the Philips name, but the Canadian operation kept the Micom name.

Since Philips is owned by the giant (1982 sales of $15 billion) electronics company, individual division profits aren't available. It is interesting to note, however, that the parent is experiencing problems with its office automation products, and states in the annual report that the worldwide growth rate of these products declined during 1982.

There was no decline reported from Dallas, however. Revenues for the word processing equipment grew 43% to $176 million. The bulk of these sales came from the model 2002 and 3003 families. The 2002 is a minimal dual crt system with a 128K byte processor and is expandable to a four-station system and programmable to handle dp functions. During 1982, this was expanded to handle eight stations: four terminals and four screens.

The model 3003, a standalone word processing system with graphics capabilities, was also upgraded during 1982. The model 3004, an integrated desktop multifunction word processor and personal computer with communication capabilities, was also announced. To capture more of this market, Philips announced this spring that the model 3003 would go on sale during a special two-month promotion. The price was dropped from $8,900 to $5,900.

By early 1983 the company began shipping its Information Facility, which is a store-and-forward message center or electronic mail system. This was met with enthusiasm by customers.

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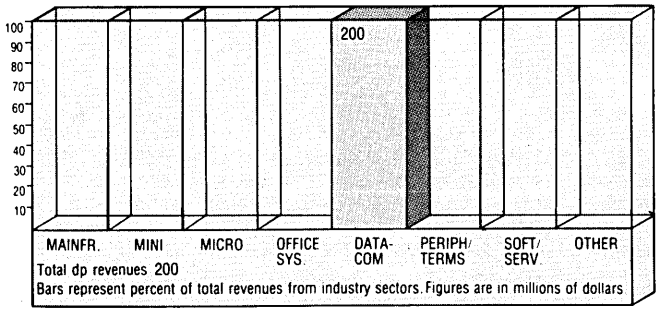


M/A-COM INC.

South Avenue
Burlington, MA 01803
(617) 272-9600

For a company that became a stock market favorite by increasing profit an average of 50% annually for five years running, M/A-Com encountered its first blip in a long time last year. Calendar year earnings were down 27.2% to $30.8 million from the year earlier's $42.3 million, and revenues increased only 17.8% to $610.9 million, up from $518.7 million in 1981.

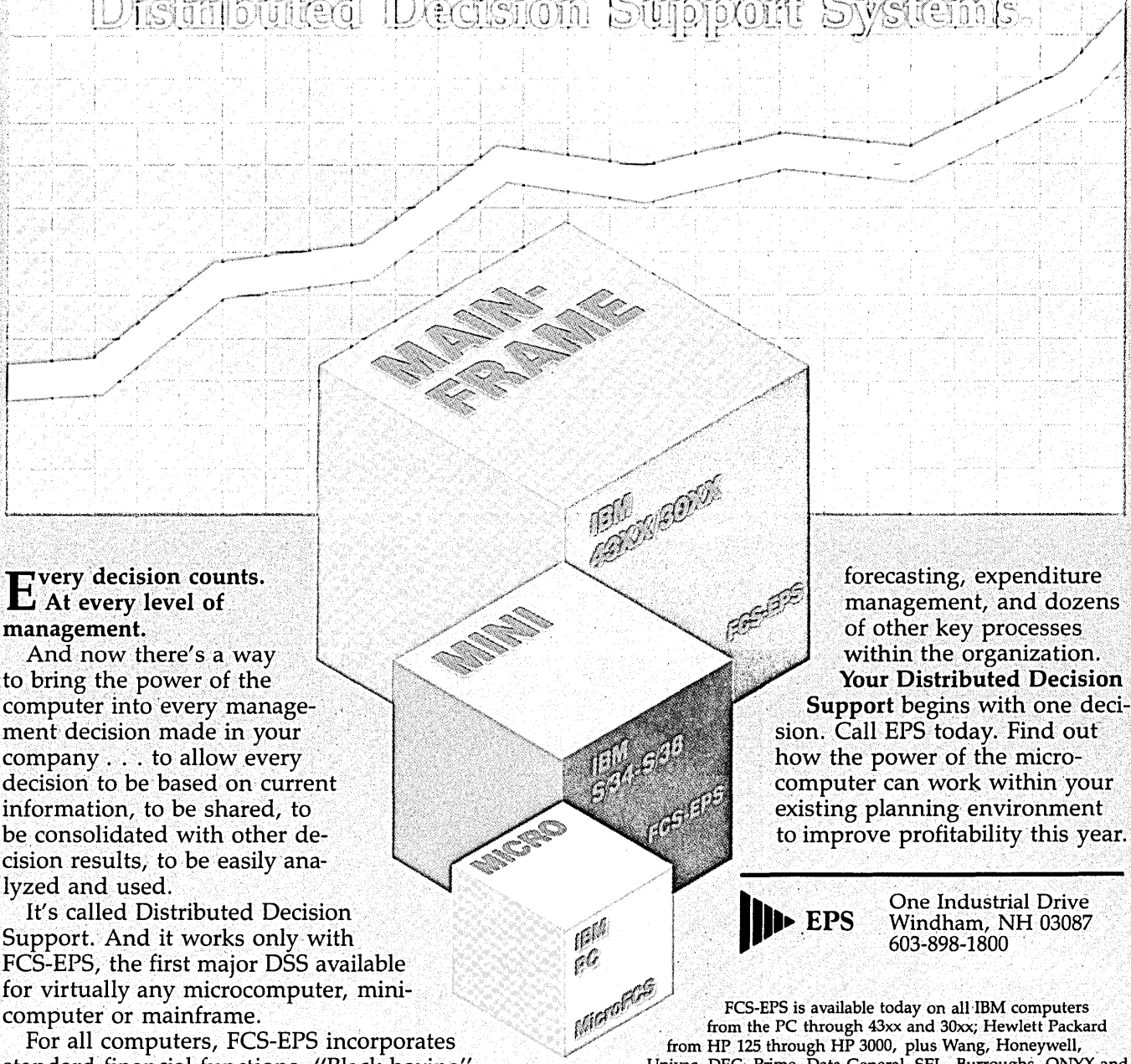
The picture looks brighter, however, when only dp-related revenue is examined, all of which is generated by datacom gear sold through the company's Integrated Digital Communications Group. Here, DATAMATION estimates sales climbed 43% to $200 million from the $140 million recorded for calendar year 1981. At its Oct. 2 fiscal year-end, M/A-Com reported that IDC's operating margin declined during the year to 10.3% from 12.4% in '81, resulting primarily from R&D expenditures that soared to $12.3 million in fiscal '82 compared with $4.3 million in fiscal '81. The 1982 number represented 54% of the total corporate-sponsored R&D.

The IDC group began to see its R&D efforts in digital termination systems equipment pay off last year as orders started rolling in from carriers both in the U.S. and overseas. Still the leading supplier of packet switching gear for both commercial and government applications, M/A-Com IDC entered into a joint marketing agreement during 1982 with the Large Computer Group of Digital Equipment Corp. to distribute the IDX-3000 data switch for local communications networks. IDC makes other datacom products such as modems, multiplexors, network controllers, circuit switches, and local area networks.

While the IDC group got a new president in Dr. Irwin Mark Jacobs last year, the biggest change in M/A-Com's management was made at the very top. At midyear Richard T. DiBona, the firm's 49-year-old president, was elected to the additional post of ceo, succeeding company founder Dr. Lawrence Gould, who remains chairman in name and strategic consultant in responsibilities. A scientist interested in technological development, Gould is largely responsible for moving the company from its early days as Microwave Associates Inc. into the miniconglomerate communications company by melding some 20 seemingly diverse companies into a well-rounded concern.

With M/A-Com's stock starting the year at 25¼ and dropping to 23⅛ by Dec. 31, analysts began speculating that the changes in top management signaled a shift in emphasis to marketing and away from technological development. While fiscal '82 R&D expenditures would seem to contradict that notion, as they increased 56% over fiscal '81 to $23 million, DiBona has indicated that FY '83 will see only a "modest increase" in that category.

MicroFCS: The Final Link in Distributed Decision Support Systems.



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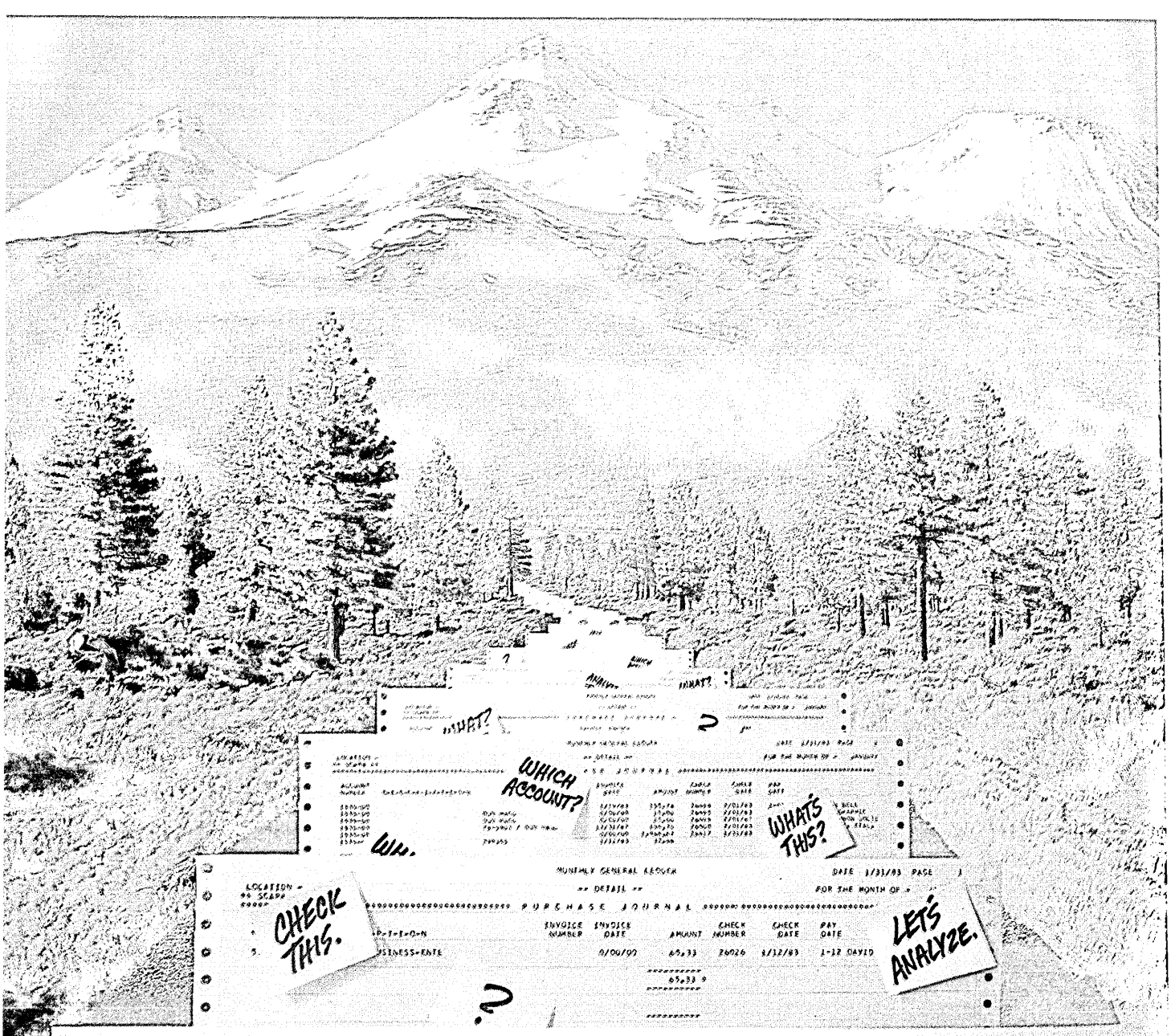

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51
TELEX CORPORATION
6422 E. 41st Street
Tulsa, OK 74135
(918) 627-1111

Terminal-maker Telex enjoyed a good year in 1982, as revenues and earnings reached new record levels. Total sales increased 27.7% to $256.1 million from the year earlier's $200.4 million. While earnings were up an astonishing 119.6% to $24.6 million from $11.2 million the prior year, the 1982 number includes $4.14 million in extraordinary credits.

Telex's dp revenues growth rate was also impressive, climbing 36.4% to $194.7 million from the 1981 total of $142.7 million. Most of these dp revenues come from peripheral product sales out of Telex Computer Products Inc. (TCP), headquartered, along with the parent organization, in Tulsa. In addition to three facilities in Tulsa, TCP has manufacturing facilities in Raleigh, N.C., and Addison, Texas.

TCP's healthy 1982 performance was primarily due to high sales of its terminal products line. To increase deliveries, Telex expanded its manufacturing capacity of its terminal communications division last year in attempts to double this division's output.

About 21% of Telex's revenues are generated by sales to oems, and last year the company saw increased shipments as well from TCP's oem/peripherals division. The down-sized tape drive experienced increased acceptance among major computer manufacturers. Sales of the mini-tapes, on the other hand, have yet to reach Telex's anticipated levels, but the company reported those sales also increased in '82.

While Telex's sales outside the U.S. dropped to 16% of revenues from the 22% in 1981, the company expects a turnaround in this market during 1983. These sales, which are primarily through foreign distributors, are handled by TCP's International Division headquarters in Dallas.

Last year represented TCP's first full year of operation with George L. Bragg at the helm. Elected president and chief executive officer of this subsidiary in November 1981, Bragg came to the company with extensive management experience gained at Memorex, Collins Radio, and North American Aviation. And with TCP's sales up more than 36% last year, the company looks forward to even greater results for the years ahead.

52
TELETYPE CORPORATION
5555 W. Touhy Avenue
Skokie, IL 60077
(312) 982-3100

Teletype Corp., the terminal manufacturing arm of Western Electric, spent 1982 getting ready for the real world. As part of the AT&T/Justice Department antitrust suit and the FCC's Computer Inquiry II, Teletype is on the verge of being set free from regulatory requirements that have hampered its growth in the past.

Last year was a bad year for Teletype. Total revenues declined to $372.9 million from $382.6 million in 1981. Earnings were off 4.5%, down to $23.7 million in 1982 from $24.8 million in 1981. These figures include Teletype's internal sales, which account for over 60% of its business. When these sales are removed, Teletype's revenues are $190.3 million for 1982 versus $175.8 million for 1981. This indicates that the Bell Operating Companies weren't buying as much during 1982 as they had in the past. Ironically, one reason for this falls back in the laps of the BOCs, as Teletype explains it.

The company's explanation for the less-than-spectacular showing in 1982 is revealing. Teletype has obviously not been doing well, and president John Pappas blames it on the sluggish economy, and more specifically on a delay by the Bell Operating Companies in getting three key new products tariffed. The models 4420, 4424, and 4430 display terminals were introduced in 1981. But during 1982, most of the BOCs' legal resources were devoted to the pending Bell breakup, Pappas explained. No one was available to shepherd the products through the tariffing process. "Owing to the tariffing delay, we had a substantial part of our forecast slip away because the equipment just sat there," he concludes.

With deregulation around the corner, Teletype gets out from under the uncertainty of being tariffed. But in the process, the company's relationship with its prime marketing arm, the BOCs, is also altered. As part of Computer Inquiry II, the BOCs cannot sell "new" customer premise equipment to commercial end users during 1983. "The key is 'new,' " pointed out Pappas. Teletype, however, is still permitted to offer additions and maintenance on its installed base of terminals. Another change will be that Teletype can no longer sell to end users directly, and the company must set up a separate entity or subsidiary for that market. It will probably take Teletype a while to work through all the legalese of its new franchise, but once the company does, it should be in for smooth sailing.

53
NORTHERN TELECOM LTD.
33 City Centre Drive
Mississauga, Ontario
Canada L5B 3A2
(416) 275-0960

In 1982 the annual reorganization of Northern Telecom's office equipment division occurred in September (after earlier reshuffling in 1979, 1980, and 1981). Now telecommunications gear sold to users as private branch exchanges—a profitable business where Northern has a significant marketing and technological edge—will be part of the Integrated Office Systems group. The IOS includes the sickly data entry terminal and distributed data processing products Northern acquired several years ago but still hasn't turned into a profitable operation.

Once again chief executive Walter Light had to report that the office systems business lost money—$98.5 million last year, after more than $100 million in losses over the past two years. Part of the red ink was due to write-offs for thousands of leased terminals considered obsolete. DATAMATION estimates that office systems dp revenues declined 17.5% to $134 million in 1982; service revenues declined modestly to $51 million. Total dp revenues dropped 16% to $185 million.

Northern's primary business prospered last year, easing the pain of the IOS losses. Total revenues increased 18% to $3 billion, with net income also advancing smartly—up 25% to $151 million. Sales south of the Canadian border were a big boost to the Toronto company's balance sheet, with U.S. sales up $308 million or 35%. Its digital PBX equipment gained market share from AT&T and other vendors. Technological cooperation agreements with important computer companies like Digital Equipment and Sperry further cemented Northern's role as a key telecommunications supplier to corporate clients.

As for office automation, the oft-expressed market goal of Northern's managers when the ill-fated dp acquisitions were made in 1978, the important new products are as much as two years away. Last year Northern announced that an improved Displayfone, a combined telephone and terminal, will soon be available with a screen and keyboard designed for adults, not Lilliputians. By 1985, the company said, it should have a complete line of OA products, including terminals, desktop computers, and distributed data processing systems. A new disk and tape memory system for oem as well as internal use was also announced. With research and development spending up 27% last year to $230 million, Northern is making the financial commitments to the office information processing marketplace, but whether it is too little, too late, remains to be seen.

54
TANDON CORPORATION
20320 Prairie Street
Chatsworth, CA 91311
(213) 993-6644

Since its humble beginnings in 1975, this former one-room "garage" operation has profited from a single and simple strategic aim—the best possible product at the lowest possible price. This must be the perfect combination for hitting the jackpot, because in calendar 1982 the disk drive maker's steady profit stream suddenly turned into a torrential river. Total revenues surged to $177.1 million to score the fourth largest percentage increase

on the survey (see Gainers table).

Tandon also registered triple-figure percentage growth in net income, earnings per share, and stock price. Total profits were up 206.4% to $19 million; earnings per share at 86 cents climbed 160.6%; and the company's stock finished the year at 31½, a gain of 121%.

Income wasn't the only thing expanding at Tandon in 1982. A new production plant in Singapore became operational in January to expand the manufacture of 5¼-inch floppy drives and was later doubled to include 5¼-inch Winchester rigid disks. In August Tandon broke ground on a new 61,000-square-foot facility in Thousand Oaks, Calif., that it says will triple its production capacity of 8½-inch floppy drives.

In midyear the company added seven new models of drives, both floppies and Winchesters, to bring its total to 20. Following the "smaller is better" principle, the new models are all 5¼-inch devices. Tandon attacked the price curve to produce a $50 floppy drive with 250KB for the home computer and electronic typewriter markets. The company also unveiled a 1MB floppy drive for $260; a 2MB floppy drive for $325 in oem quantities; and a 6.4MB (one platter) Winchester drive expandable to 12.8MB (two platters) and 19MB (three platters), priced at $400, $500, and $700, respectively. A 31MB closed-loop Winchester selling at $1,000 in oem quantities was also announced, but won't go into production for some time. Yet to be announced is a new 3½-inch drive that reportedly is similar to, but more powerful than, the Sony 437.5KB device announced over two years ago.

The key to these new products, and to Tandon's business in general, is its very high level of integration in the manufacturing process. Almost 80% of all parts and components—including the magnetic recording heads in which Tandon got its start—are manufactured in-house. As well as driving down production costs, such integration helps increase volume. The company is believed to have exceeded 90,000 5¼-inch and 12,000 8-inch floppy drives a month in 1982, and by year-end was shipping 5,000 hard disk drives a month. The company's client base, which is exclusively oem and numbers over 700, includes such big names in the personal computer business as Commodore, Radio Shack, and TeleVideo.

To accommodate this growing customer base, the company upped its staff to 2,500 from 1,400. And to anticipate future needs, Tandon's R&D spending soared 150% to $7.5 million for calendar '82. Following a two-for-one stock split in August, the company further strengthened its cash position by raising $90 million from a third public offering in November.

Although analysts warn that Tandon might eventually cut its own throat by persistent price slashing, for the present the company can rest assured that its seven new products will warrant a substantial volume build-up for at least the next year or two.

55

THE BOEING COMPANY

2810 160th Ave. S.E.
Bellevue, WA 98008
(206) 763-1650

While the Boeing Co. as a whole was down in revenues and profits for 1982, its computing services division saw revenues rise almost 19% to $171 million from $144 million the previous year. The aerospace company has apparently found success in capturing new government timesharing business and in developing new markets in recent years.

Set up as a separate subsidiary in 1970, Boeing Computer Services Co. supplies its parent corporation with computing services. Due to the oscillatory nature of the aerospace business, however, it has tried to insulate itself and seek profits from the outside marketplace. In doing so, Boeing Computer has capitalized on the engineering expertise its parent has developed and has sought new markets such as microcomputer software. The firm's marketing efforts currently concentrate on three main areas: financial accounting systems, data processing managment, and engineering. Each area has seen product enhancements in the last year, as new remote services, software packages, and hardware were introduced.

In engineering, the company had its first full year selling time on its Cray supercomputer, acquired in 1981. Designed to handle large-scale computation, the Cray computer is used in modeling and simulation applications. Boeing last year introduced an engineering workstation, based on Digital Equipment PDP-11/23 hardware, to help remote users prepare finite element modeling and structural analysis programs for execution on the Cray and other large-scale scientific processors located in Seattle, Wash.

In the financial systems area, Boeing introduced a resource accounting software package for the IBM mainframe user that keeps track of computer usage and bills users accordingly. Called Facts, the software is designed specifically for managing large, multi-user projects. The company unveiled enhancements to its EIS decision support systems, including advanced modeling, color graphics, and 3270 display support.

In data processing management, the company began offering Mathematica's Ramis II database management system and Rim, a relational database manager developed under contract with NASA. Both systems are offered as remote computing services while Rim is also available as a software package. In addition, an Interactive Program Development service was introduced to help users write applications programs for IBM mainframes.

Last year Boeing entered the microcomputer software market, offering a set of programs designed to perform common office tasks like word processing, spreadsheet, and data entry. Packaged under the name Bits, the software is being sold for the IBM and other personal comptuers.

Boeing declines to detail its commercial customer base, but said that in 1982 it won major awards for remote computing from the National Park Service, the Air Force, General Services Administration, National Bureau of Standards, and the Commonwealth of Pennsylvania.

The company claims to serve more than 2,000 customers in the U.S., Canada, and the United Kingdom and says it is the largest supplier of teleprocessing services to the U.S. government under its Teleprocessing Services Program.

In addition to remote services and software packages, the company offers consulting, customer programming, training, facilities management, database services, and specialized services for the thrift industry.

56

INFORMATICS GENERAL CORP.

21031 Ventura Blvd.
Woodland Hills, CA 91364
(213) 887-9040

Informatics General Corp. (formerly Informatics Inc.) experienced modest growth on almost all fronts in 1982.

Revenues were $170.0 million, up 13% from $150.3 million in 1981. Net income in '82 was $5.5 million, a 7.8% increase over the 1981 level of $5.1 million. Software revenues went to $68 million from $54.5 million, while services revenues moved to $60.3 million from $58.7 million. Professional services counted for $39.8 million in revenues in 1981 and for $45.4 million in 1982. Number of employees went to 2,600 from 2,470, and earnings per share to $1.49 from $1.47. Only R&D expenditures were down from 1981 levels, dropping to $5.8 million from $6.7 million.

During 1982, the company changed industry segment reporting to cover two categories, cross-industry and vertical markets. In the year, cross-industry revenue increased 7% while vertical market revenue was up 23% over comparable 1981 results.

Informatics is increasing its emphasis on vertical markets, particularly legal, insurance, distribution, and accounting. Toward the end of '82, the firm was anticipating loss of a few long-standing processing contracts but was banking on offsetting these losses with growth in law, accounting, and insurance markets.

The company changed its name in early 1982 "because the term 'informatics' was becoming generic for information science," and had even shown up in Webster's dictionary.

In midyear, Informatics General made an 850,000-share stock offering at $21 per share that, combined with positive cash flow from operations, brought its cash and short-term investment position at year-end to

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CIRCLE 99 ON READER CARD

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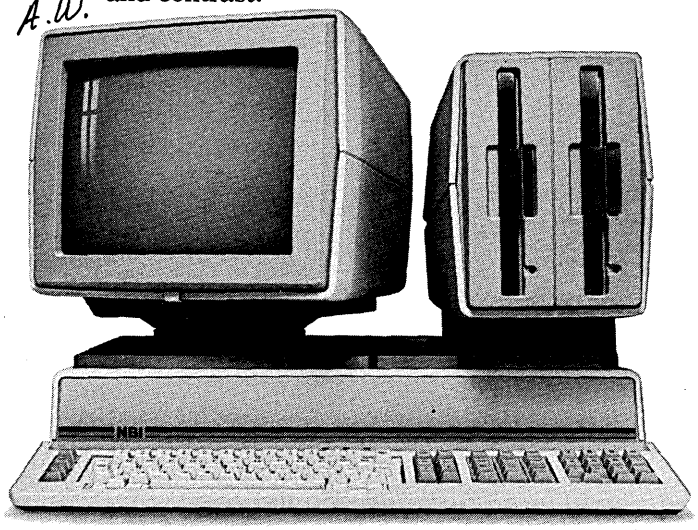

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The OASys 2000 eliminates the three most common shortcomings of standalone personal computers: isolation from other office devices, awkward storage and exchange of data and limited word processing capabilities.

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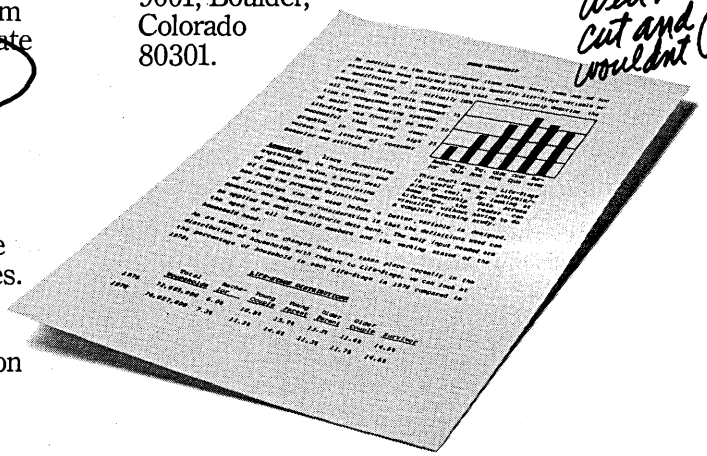

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CIRCLE 124 ON READER CARD

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CIRCLE 105 ON READER CARD

more than $20 million.

During 1982, Informatics became a value-added remarketer (VAR) to IBM with the signing of an oem agreement for quantities of the IBM P.C. to be offered along with Informatics software to Informatics' insurance industry customers.

57
SHARED MEDICAL SYSTEMS CORP.
P.O. Box 675
King of Prussia, PA 19406
(215) 296-6300

For the last 14 years Shared Medical Systems has made a good business out of supplying hospitals with computer processing services. Last year was no exception. While the Pennsylvania company fell short of matching the revenues of its major rivals, it outstripped the processing powerhouses of CDC, CSC, and EDS when it came to growth margins.

SMS's calendar year revenues of $165.7 million (all from processing services) were up 26% over 1981. Corporate profits also grew 25% to $41 million.

During 1982, SMS provided timesharing services and turnkey minicomputer systems to more than 600 acute care hospitals and physician groups. The timesharing services included both financial and database management. COMMAND, a patient database, is the company's main database service.

Its ACTION line of turnkey patient care systems, which have been on the market seven years, is based on Digital Equipment's PDP-11/70 and VAX minicomputers, as well as IBM 4300 and larger IBM mainframes. The application areas include laboratory, pharmacy, radiology, and medical records.

In the new product realm, SMS introduced a laboratory information system and a case-mix management system that serves as a decision support tool for hospital executives.

The firm's R&D expenditures have steadily risen over the years. In 1981 SMS increased its investment in R&D to $10.6 million. Last year R&D spending rose 29% to $13.7 million. This stepped-up spending reflects the company's desire to broaden its product base in the burgeoning health care market.

58
EXXON CORP.
1251 Avenue of the Americas
New York, NY 10020
(212) 398-3093

The world's largest oil company had some welcome relief last year from the precipitous decline in crude prices: Exxon Office Systems of Stamford, Conn., and its other electronics businesses showed a profit after incurring a $48 million loss in 1981. Known as "other operations" at Exxon, the old Vydec office terminals, Zilog semiconductors, and other components and systems posted $37 million in profits in 1982. One infinitesimally small blow struck for diversification.

DATAMATION estimates that Exxon office systems sales were $165 million in 1982, or about the same level as last year. While Exxon refuses to provide figures, it admitted that EOS was still losing money—only Zilog's successful microprocessors and other chips made money for "other operations."

The profit problem at EOS is due to the aging of the decade-old Vydec line, but that was arrested in mid-1982 with the introduction of the Series 500 workstation, or "information processor." This is the key building block to the EOS office automation strategy: over the next few years EOS will introduce add-on packages to upgrade the $6,500 standalone 500 into clustered workstation and personal computer configurations.

Early in 1983 EOS announced the migration path from standalone to clustered OA—the 8400 shared memory module. Several Zilog 16-bit microprocessors controlling up to 2 megabytes of fixed disk memory expand the meager workstation programming to include electronic mail and other advanced filing techniques. More elaborate word processing functions, such as pagination, headers, footers, and footnotes, and electronic cutting and pasting of dissimilar documents, are also included.

Exxon officials are optimistic that the new OA systems based on the 500 workstation will reposition the company in the mainstream after many years of watching other companies pass.

59
SIGNAL COMPANIES INC.
11255 N. Torrey Pines Road
La Jolla, CA 92037
(619) 457-3555

While many disk drive manufacturers were racking up fantastic sales increases, Signal Co.'s drive maker, Ampex Corp., was having problems. Dp revenues declined 8% to $163 million in 1982, mainly because of decline in sales of its 14-inch Winchester and 5¼-inch drives to the oem market. Though major customers such as Tandem Computers thrived last year, Ampex claims that the oem market growth was slower than anticipated.

Other dp product lines for the company had an upbeat year, the company reported. Shipments of Alar thin film media for high-speed disk drives doubled in 1982 and the company is doubling manufacturing capacity. That old standby, core memory, continues as a viable market for Ampex because of the military's interest in nonvolatility. A minor player in the flat video display terminal business, Ampex nevertheless introduced two new models.

Tough competition in Ampex's primary product lines, magnetic tape for the video and audio recorder markets, battered the company's balance sheet last year—overall Ampex operating profits fell almost 50% to $23.3 million in 1982. After taxes, write-offs, and overhead, the picture was even worse—net earnings collapsed to $1.2 million from $21 million in 1981. The company noted that much of the earnings decline was due to problems—the phase-out of certain products and factories, the dissolution of a Toshiba-Ampex joint venture, and the effect of a strong dollar in overseas markets.

Given the profit crunch, it should come as no surprise that the company laid off 19% of the work force. Ampex was able to protect the research and development budget, which remained flat at $31.8 million in 1982 compared to 1981.

60
GENERAL INSTRUMENT CORP.
1775 Broadway
New York, NY 10019
(212) 974-8700

While bettors may have lined their pockets using the information flashed over its AmTote wagering systems, General Instrument's Data Systems division barely finished in the money. If bettors had put something down on the division's performance, they would have just about broken even.

Hurt considerably by the frantic competition for lottery contracts in most states, the Data Systems segment of the company posted a 1.8% revenue increase over 1981. This was way below the overall company increase of 10.7%, since General Instruments just broke the $1 billion barrier, compared to 1981's $905 million. Total corporate profits reflected the overall success, jumping 23% to $103.3 million from $84 million. Earnings per share rose 20.6% to $3.27 from $2.71.

The company installed six new Totalisor Systems during the year, bringing the total to 33 serving over 60 of North America's largest racetracks. New business also included two jai alai frontons, an area of promising but limited potential due to the small number of frontons throughout the country.

General Instrument hit some winning numbers in state lotteries. New Hampshire selected the company to supply its on-line daily numbers lottery game. The Massachusetts Lottery commenced operation using an AmTote system. The Ohio Lottery has grown sufficiently to permit the installation of over 1,600 high-performance terminals. And New Jersey, home of the world's largest on-line daily numbers game, increased its number of terminals to more than 2,300.

Lest you think General Instruments leaves part of its fortune solely to chance, the company at the end of November acquired Energy Management Corp. of Towson, Md. Energy Management manufactures and distributes microprocessor-based energy management systems, marketing them primarily to major supermarket and retail store chains. The acquisition provides General Instrument

At last, manufacturing and business systems that work together. Only from MSA.

MSA introduces the Extended Closed Loop™ Manufacturing System- a new systems concept we've been working towards for more than 12 years.

Put simply, we've taken the classical Closed Loop model of integrated business functions and provided the integrated systems to make it work.

At MSA, we're committed to nothing less than the *total integration of business and manufacturing systems* to support the overall business plan.

In short, our goal is to provide the systems that can help make your company's business plan a manufacturing reality.

The Extended Closed Loop concept is vitally important for anyone using or choosing application software anytime in the next five years.

And it's even more important if you're looking at manufacturing systems *now.*

Here's why.

Only MSA has all the components

As the world's largest independent application software supplier, MSA—and only MSA—currently offers the components needed to implement the Extended Closed Loop System.

The Bill of Materials chart below shows how all of MSA's software products and service components work together to create the Extended Closed Loop System.

It starts with MRP II

The MSA Manufacturing System consists of a complete line of integrated MRP II modules, including: Manufacturing Standards, Historical Forecasting, Inventory Record Control, Master Production Scheduling, Material Requirements Planning, Capacity Requirements Planning, Shop Floor Control, Procurement Management and Cost Management.

These components, together with MSA's structured implementation methodology, are designed for *successful* Closed Loop MRP II.

So, if your immediate need is manufacturing software, you can choose the MSA Manufacturing System now, and easily add other Extended Closed Loop components as you need them.

Extending the Closed Loop: The Business Connection

At MSA, we offer the integrated business systems to make Extended Closed Loop manufacturing a practical reality.

For 12 years we've developed integrated systems with common architecture, including: Payroll and Labor Distribution, General Ledger, Accounts Payable, Budgeting and Planning, Fixed Assets Accounting, Accounts Receivable, Personnel Management and Currency Management.

And with more than 7400 systems installed worldwide, we offer something else that's unique: We call it 'inter-application expertise.' It's the understanding we've gained by integrating MSA applications to meet our customers' requirements.

Our people know the manufacturing industry (more than 1300 manufacturers use MSA systems around the world).

Our implementation techniques are thorough, practical, and field-proven many times over. We'll show you how to reduce overall implementation costs significantly.

We offer the most extensive customer training program in the industry (this year alone, MSA will conduct more than 100,000 student-hours of customer training).

At MSA, we provide the total software support to keep your systems up-to-date.

Not if, but <u>when</u>

In order to survive, your company must not only reach its goals of efficiency and increased productivity; it *must* remain profitable. And continued profitability can only be achieved with improved decision support information—the kind provided by total systems integration.

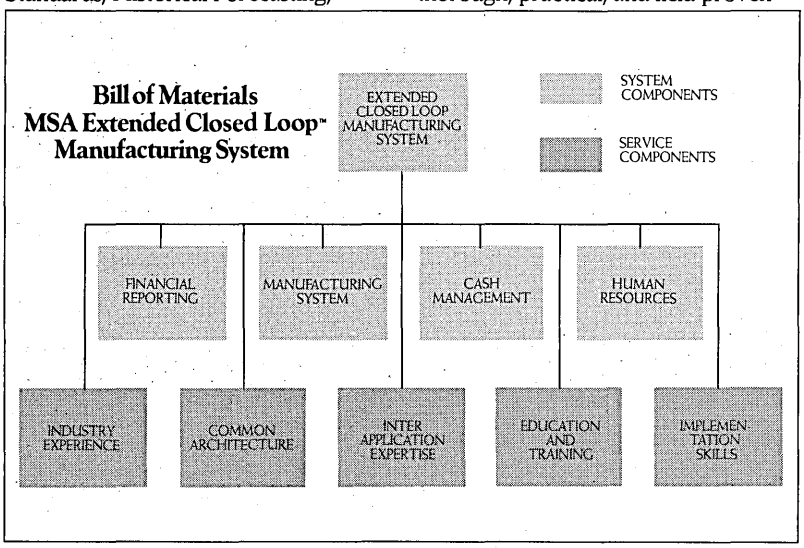
Industry experts consistently name MSA as the leader in systems integration.

And providing total systems integration is what the MSA Extended Closed Loop Manufacturing System is all about.

Send for free literature

We've prepared a brochure that further explains the MSA Extended Closed Loop™ System.

For your free copy, call Robert Carpenter at (404) 239-2000. Or clip this coupon.



Management Science America, Inc.
3445 Peachtree Road, N.E.
Atlanta, Georgia 30326

☐ Please send me free, detailed literature on the MSA Extended Closed Loop™ Manufacturing System.
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Computer Type/Model _____ /_____

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TITLE _____

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ADDRESS _____

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BUSINESS PHONE ( ) _____

MSA
The Software Company

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with an opportunity to enter the rapidly growing energy management market and at the same time, so the theory goes, offers value-added services that will build upon General Instrument's local area network (LAN) and microelectronics capabilities.

61
NEC INFORMATION SYSTEMS INC.
5 Militia Drive
Lexington, MA 02173
(617) 862-3120

This six-year-old subsidiary of the $6 billion Japanese conglomerate, Nippon Electric Co., appeared to thumb its nose at the recession in this country. Sales from its three product areas—small business computers, personal computers, and oem peripherals—jumped a total of 60% to end the calendar year at $160 million. Small business systems accounted for $18 million; microcomputers brought in another $42 million; and peripherals contributed the lion's share of the total with $95 million. Software revenues accounted for a small but growing $5 million.

The highlight of the company's product year was the unveiling of its 16-bit IBM Personal Computer challenger, the APC (for Advanced Personal Computer). This $3,300 entrant supersedes the earlier 8-bit PC 8000 and, like that machine, offers the large library of applications software surrounding CP/M. The company also announced the availability of a 12MB 5¼-inch Winchester hard disk for the APC. With APC shipments beginning in the summer, both the 8-bit and 16-bit micros proved revenue producers in '82.

A selection of new vertical software packages for NEC's Astra small business computers also debuted in '82. These included Astra LAW, a legal, accounting, and word processing combination; a client accounting audit assist program; and a software package for pharmacists. Another first for Astra: it was equipped with IBM 3270 emulation.

A steady stream of peripherals rounded out the flow of products last year. These included a new Spinwriter letter-quality printer with 15 new font styles, an 85MB 8-inch Winchester disk, and an 8½-inch half-height flexible disk.

All of these products were manufactured outside the U.S., but that situation could change this year with the opening of a new plant in Boxboro, Mass.

For the second year, employment was up; it increased 60% to 400 people.

62
CPT CORPORATION
8100 Mitchell Road
Eden Prairie, MN 55344
(612) 937-8000

This office automation specialist ended the calendar year in spectacular style by scoring its 42nd consecutive profitable quarter, maintaining its earning momentum.

It was a year that saw CPT unveil a new line of word processing systems; a new flexible office network scheme to tie together the dp and wp branches into what the company called the "one information processing stream"; and a year in which dealers and distributors were added in record numbers.

The whole ensemble of events suggested a strategic shift from word processing to the larger and more embracing office automation market. And the maneuverings were reminiscent of the earlier route taken by CPT's chief competitor, Wang.

Revenues climbed 28% to $158.5 million, with 34% of this coming from overseas business, principally in Europe. The growing importance of the European business was reflected in the pronounced ergonomic or human engineering design focus of the new four-model CPT 8500 wp family, and by the creation last February of European HQ in Leiden, the Netherlands.

The new 8500 series—selling from $6,990 to $10,990, excluding printers—features full-page, black-on-white displays, tilted consoles to minimize glare, and low-profile movable keyboards. Each model is fully upgradable and compatible with CPT's existing products. Late in the year the company also added a combination wp/personal computer, the 96K CPT 8505, listing at $4,990, and enhanced word processing software called "H."

Throughout the year, both sales and R&D expenses increased noticeably, with R&D climbing 53.7% to $8.3 million. These costs were reflected in net earnings, which grew by a more moderate 16.4% for the year, to $16.3 million.

While profit margins proved a bit of a disappointment, the year was also smudged by intensive internal management reshuffling, including the resignations of CPT's president, the vp of marketing, and the chief financial officer. These management uncertainties, allied with the less than explosive growth in net profits, were reflected in the company's stock, which ended the year down 0.7% at just below 18.

63
INTERGRAPH CORPORATION
One Madison Industrial Park
Huntsville, AL 35807
(205) 772-2000

Intergraph continues to grow by leaps and bounds in the CAD/CAM market. Its 1982 revenues rose 71% to $155 million, and profits went up 57% to $13 million. That represents the third straight year of enormous revenue and profit jumps; since 1979, both revenues and profits have grown more than 400%. This tremendous growth is also reflected in the number of employees, up from 765 in 1980 to 1,275 in 1981 and to 1,800 in 1982.

Intergraph has been able to position itself for this rapid expansion by presenting a full product line to the rapidly expanding architecture/engineering/construction (AEC) and mapping/earth sciences (MES) fields. Its graphics systems include a color display system, an entry-level interactive system based on the PDP-11/23, and a VAX native mode interactive system that allows users to integrate other applications with the CAD/CAM applications. In addition to the cpu, a typical system could consist of a file processor, tailored application programs, an oem printer or plotter, and microprocessor-based dual-screen workstations.

In the AEC area, 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.

Intergraph markets its products to end users through a direct sales force and to foreign end users through wholly owned subsidiaries in Brazil, Japan, Korea, and Europe. A major sale in 1982 was to the Hospital Corp. of America, the nation's largest chain of hospitals. The sale called for Intergraph to provide CAD/CAM workstations and systems with software tailored to hospital architecture. All of the systems will be tied to a central database, which contains diagrams of "ideal" layouts for every type of room in the hospital as well as information about which kinds of rooms need to be adjacent to which other types. The idea is to ensure that all new hospitals will have the same standard features.

The company's first public stock offering, in April 1981, resulted in sales of 1.5 million shares at $18 each. Since then, the stock has climbed to a 1982 closing of $47.75, with stock splits and new offerings yielding a total of 11.6 million shares outstanding. Proceeds from the stock offerings were earmarked for capital improvements and equipment purchases. The influx of cash also helped the company increase R&D spending $19.7 million, up 65% from 1981 and over three times the 1979 level.

64
UNITED TELE-COMMUNICATIONS INC.
2330 Johnson Drive
Westwood, KS 66205
(913) 676-3000

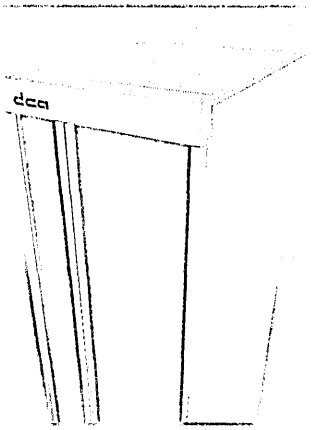
United Telecommunications Inc., an independent telephone company in eight states and a multifaceted telecom supplier and services company with total 1982 sales of $2.4 billion, earns its DATAMATION 100 ranking on the performance of its United Telecom Computer Group. In 1982 setbacks outweighed gains for the Kansas City-based UTCG.

Total corporate profits plummeted 18.7% to $201.6 million from $247.7 million. Computer services and software sales

DCA's SYSTEM 355 readily adapts to any size data communications requirement. DCA's flexibility makes the SYSTEM 355 right for simple networks and essential for the most complex networks.

Start with a SYSTEM 355 and your system can grow as your organization's network expands. Start with anything else and you're going to spend the next few years piecing your network together.

SYSTEM 355 is in a category by itself. Its superiority results from DCA's Integrated Network Architecture, which turns upgrading or repairs into simple matters of replacing or adding modules.



DCA sells networks... others sell pieces. If you want today's most adaptable network ...one that is ready for tomorrow...you want the DCA SYSTEM 355. Call toll-free (800) 241-5793. Digital Communications Associates, Inc., 303 Research Drive, Norcross, Georgia 30092

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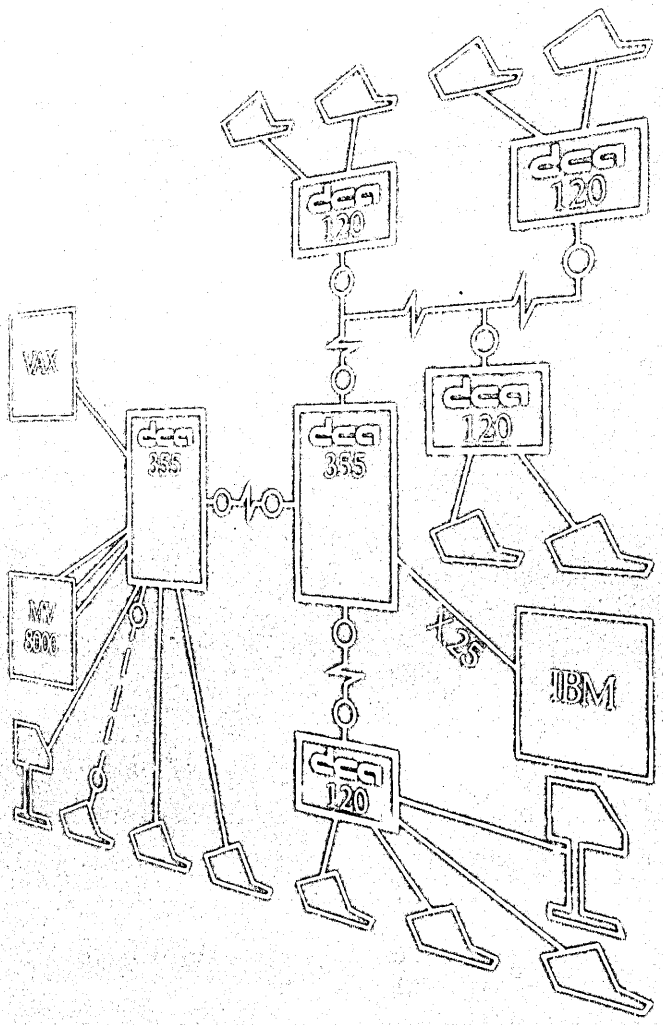


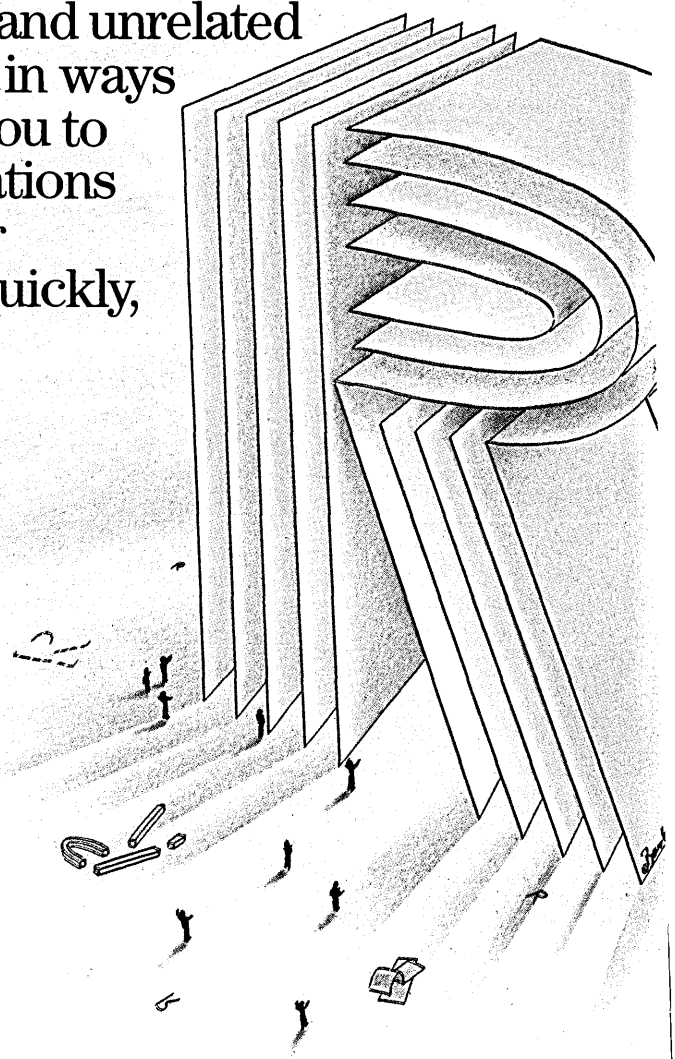
The one and only R.

Cullinet's relational database management system for IBM computers. It's called IDMS/R.

IDMS/R is a single solution to the two-sided problem of providing useful database applications for both end user and production tasks.

This is how it works:

As a true relational system, it allows you to select data from separate and unrelated files; join it, then project it in ways that make it possible for you to handle small-scale applications and unstructured end user requests for information quickly, directly and intelligently.



What's unique is that IDMS/R also allows you to handle high-volume, production applications with the proven network technology best suited for the job.

It's this marriage of architectures that makes Cullinet's relational DBMS stand apart. In fact, where others have tried to propose relational or pseudo-relational components that exist separately from the production database, Cullinet's is the only one that lets both work together. Thus serving the whole corporation by serving all of the needs within it.

IDMS/R.

To get everything out of the database that you've put into it, the answer is software.

And software is Cullinet.

Cullinet

©1983 Cullinet Software, 400 Blue Hill Drive, Westwood, MA 02090.

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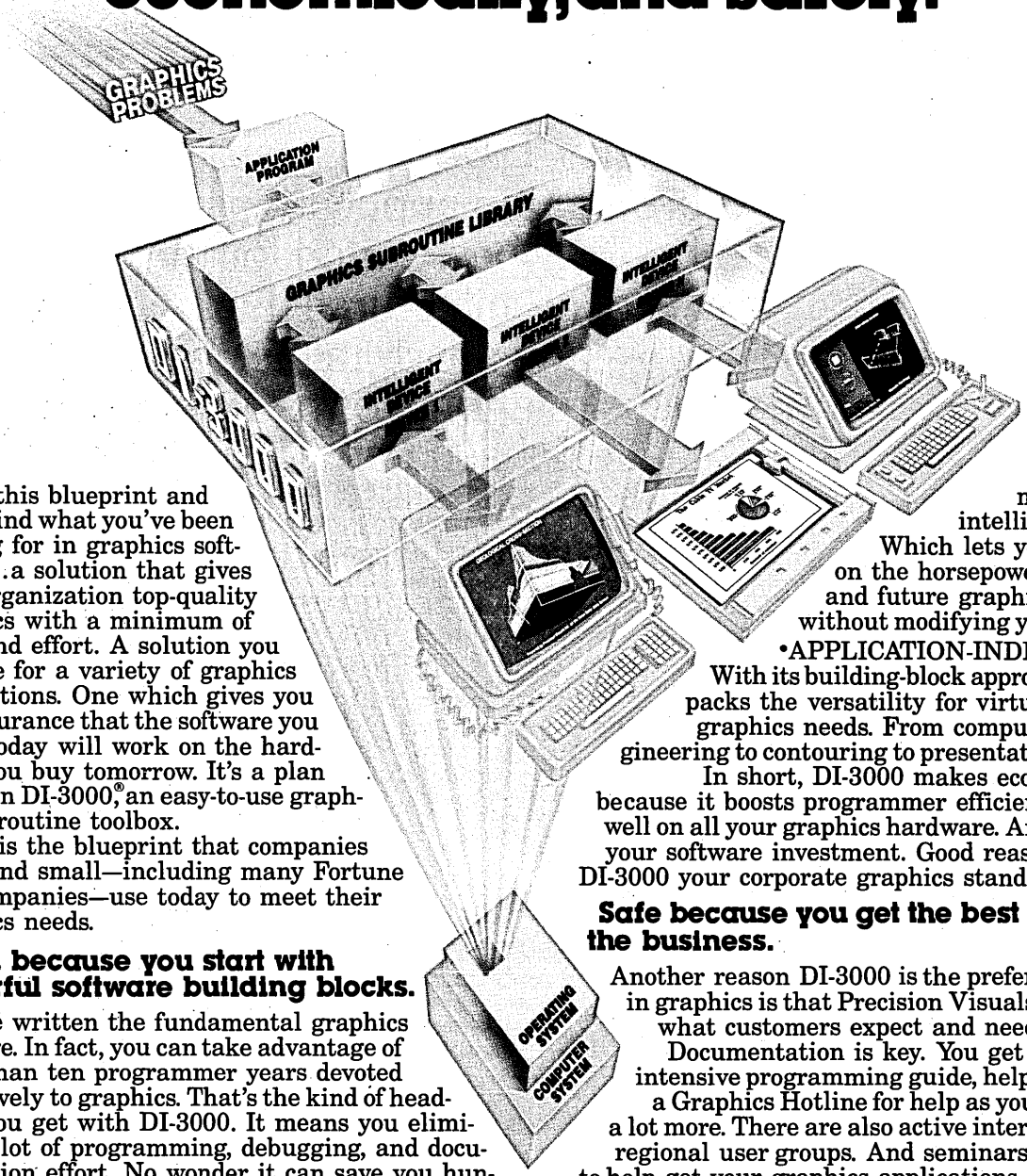
Here's your blueprint for getting into graphics...quickly, economically, and safely.



Study this blueprint and you'll find what you've been looking for in graphics software...a solution that gives your organization top-quality graphics with a minimum of time and effort. A solution you can use for a variety of graphics applications. One which gives you the assurance that the software you build today will work on the hardware you buy tomorrow. It's a plan based on DI-3000,® an easy-to-use graphics subroutine toolbox.

This is the blueprint that companies large and small—including many Fortune 500 companies—use today to meet their graphics needs.

Quick because you start with powerful software building blocks.

We've written the fundamental graphics software. In fact, you can take advantage of more than ten programmer years devoted exclusively to graphics. That's the kind of head-start you get with DI-3000. It means you eliminate a lot of programming, debugging, and documentation effort. No wonder it can save you hundreds of hours. And speed you to the graphics solution you've been looking for.

Economical because a little programming effort delivers a lot of software life.

DI-3000 will save you significant software development dollars. Because DI-3000 is:

- MACHINE-INDEPENDENT. Its modular structure works as well on a microcomputer as it does on a super-mini or mainframe. That means freedom from software obsolescence.
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- APPLICATION-INDEPENDENT. With its building-block approach, DI-3000 packs the versatility for virtually all your graphics needs. From computer-aided engineering to contouring to presentation graphics.

In short, DI-3000 makes economic sense because it boosts programmer efficiency. It works well on all your graphics hardware. And it protects your software investment. Good reasons to make DI-3000 your corporate graphics standard.

Safe because you get the best support in the business.

Another reason DI-3000 is the preferred solution in graphics is that Precision Visuals has learned what customers expect and need in support. Documentation is key. You get an example-intensive programming guide, helpful tutorials, a Graphics Hotline for help as you need it, and a lot more. There are also active international and regional user groups. And seminars and courses to help get your graphics applications operating on time and within budget.

This is the blueprint you can trust. It's been proven by companies both large and small who need top-quality graphics solutions...quickly, economically, and safely.

Call or write Precision Visuals for complete details.

PrecisionVisuals

6260 Lookout Road
Boulder, Colorado 80301
(303) 530-9000/TELEX 45-0364
TWX 910-940-2500

CIRCLE 103 ON READER CARD

were depressed by a weak economy, particularly in energy engineering and utility markets, and by declining demand for generic computing services. The UTCG revenues fell to $150.8 million in 1982, down from $160.5 million in 1981. This is minus internal sales of 9.5% or about $16 million each year.

On the positive side was the performance of Megatek Corp., the San Diego-based producer of interactive computer graphics hardware and software and one of three business units that make up UTCG. Demand for its products enabled that company to expand production capacity and increase sales to $33.8 million from $15.7 million in 1981 and $13 million in 1980.

The group in 1982 expanded its software and professional services capabilities with acquisitions and exclusive software agreements. It acquired Information Systems of America Inc. (ISA) of Atlanta; Seed Software (formerly International Data Base Systems) of Philadelphia; and United Computer Resources Ltd. (UCR) of the U.K.

ISA develops custom and packaged software for business and insurance applications. Seed Software is the developer of a dictionary-run database management system of the same name, and UCR is a professional services operation that develops custom software, primarily for IBM, ICL, and Wang hardware.

Under a joint marketing agreement entered into in 1982 with Intercomp Resource Development and Engineering Inc., the Computer Group is offering Intercomp's energy recovery software products exclusively, on a remote basis.

Last June the group introduced SUPRA Service, a repackaging and upgrading of its Cray 1 service offering, followed closely by introductions of UniMail, an electronic message system, and CommTrack, a telephone usage tracking service.

65
BASF SYSTEMS CORPORATION
Crosby Drive
Bedford, MA 01730
(617) 271-4000

BASF Systems Corp. is a tough nut to crack when it comes to pinpointing dp revenues. Based in Bedford, Mass., the company is the U.S. arm of $16 billion BASF, headquartered in Ludwigshafen, West Germany. This is the nucleus of an operation stretching around the world, embracing nearly 300 companies and employing 116,000 workers who produce more than 6,000 products for world markets, ranging from oil, gas, chemicals, plastics, and dyestuffs to consumer products.

BASF Systems, employing some 1,200 workers, is estimated to have accounted for less than 10% of the parent's 1982 revenues, or about $150 million in sales. That sum is almost 50% higher than BASF Systems' revenues in 1981.

It was BASF researchers who in 1934 developed the first practical method for magnetic media recording. It is on such a foundation that BASF Systems' media sales are built. Last April the company announced the availability of a full line of quad density FlexyDisks, individually certified to be error-free for all double density, 96 tpi applications. And in October, BASF Systems unveiled the Qualimetric line of computer media products, thus setting a new international standard of quality for the company's family of computer products. First to earn the Qualimetric seal was the FlexyDisk line. Not only are these disks certified 100% error-free, but each carries a lifetime warranty against defects in workmanship and materials. Eventually, BASF expects all its products to have earned the Qualimetric designation.

To further its quest for excellence in product quality and reliability, the company is investing heavily in a number of research projects, including a solvent recovery system that not only cleans the environment but also recycles purified solvent for reuse; a computerized tape coating system that uses the latest laser technology to ensure precise tolerances; a modern clean room that purifies room air 20 times per hour; and new plastic molding and cassette testing equipment and a special environmental testing chamber.

66
DIEBOLD INC.
818 Mulburry Road S.E.
Canton, OH 44711
(216) 489-4000

When you mosey on down to your friendly neighborhood 24-hour automatic teller machine (ATM) and push those buttons for some desperately needed cash, chances are you're using a Diebold product.

The company has made its name in the manufacturing of bank security systems, but it's beginning to make a significant share of its money through its TABS ATM units. TABS is one of the most prevalent ATMs in the proprietary and shared ATM networks around the country.

Doubters can check the 1982 performance results. DATAMATION estimates dp revenues leaped 66.6%, to $150 million from $90 million. That was far above the overall corporate revenues increase of 10.8% to $427.6 million. It also exceeded the 43% rise in total corporate profits, as well as the 42.4% jump in earnings per share. Those numbers were a big hit on Wall Street, where Diebold's stock began 1982 at 26⅞ and finished it at 74½.

More than 14,000 TABS systems were delivered in the U.S. during 1982. As the financial industry has changed with the times, so has the use of ATMs. No longer are the machines confined to banks. They are now installed in supermarkets, hospitals, airports, office buildings, and other centers of high consumer traffic volume. Everywhere the ATMs go, Diebold is sure to follow.

The company plans further penetration into the general ATM market, with specific attention focused on retail financial services delivery and nonfinancial institution settings. The former's potential lies in its cost containment prospects; the latter's attraction is its broadened ATM utility potential.

As part of its thrust into the international market, Diebold last September signed an agreement with Philips Data Systems, a subsidiary of N.V. Philips of the Netherlands. Under the agreement, Philips Data Systems will market and service Diebold's ATMs in 35 foreign countries. Philips Data Systems will also market Diebold's ATMs under the company's label.

With an expanding ATM market, Diebold's performance will be pushed even more in 1983.

67
ALLIED CORPORATION
P.O. Box 2245R
Morristown, NJ 07960
(201) 455-2000

Allied's presence in the Top 100 represents the specter of Bunker Ramo, which it gobbled up in 1981 for $347 million. Bunker Ramo was further digested this year as it was split in three, each part of which was then merged with other Allied segments to form a new corporate alignment. The result is that all of Bunker Ramo's dp operations are now a part of Allied Information Systems Corp., in Trumbull, Conn. AISC also includes fragments of the Eltra Corp. and the Mergenthaler Linotype Group, as well as some of Bunker Ramo's non-dp operations. AISC announced in October that it plans to build a $6 million, 66,000-square-foot headquarters building in Trumbull to house the merged entity.

Allied's Electrical and Electronics Group, of which AISC is a part, brought in $882 million in 1982, a 7% increase over 1981; profits tumbled 90% to $3 million. Allied Corp.'s total revenues decreased 3.8% to $6.2 billion, while its profits dropped substantially—22%—to $272 million. Allied Information System's dp sales climbed 14.2% to $147.1 million, but profits declined because of increased R&D expenditures and the startup costs involved with new product lines.

Bunker Ramo's primary dp-related products are information systems designed for the brokerage and banking industries. During 1982 the company introduced a new line of these products that has recently been renamed the Aladdin series. The Aladdin 40 (née Intellimation 10), which was announced in September, is a personal computer capability for Bunker Ramo's quotation terminals. The microcomputers enable stockbrokers to perform evaluations of customer portfolios, create and analyze graphics, do word processing, and perform other functions on the same terminal used for stock quotations and database queries.

A more powerful 68000-based micro-

computer, the Aladdin 20, was introduced in October 1982 and the multiple microprocessor-based Aladdin 30 was introduced this March. Deliveries were scheduled for the second quarter of 1983.

Allied Corp. continued its diversification into the dp arena in early 1983 with its piecemeal acquisition of Instrumentation Laboratory Inc., the maker of the Pixel line of graphics-oriented microcomputers.

68
DYSAN CORPORATION
5201 Patrick Henry Drive
Santa Clara, CA 95050
(408) 988-3472

Dysan had two main objectives in '82—to increase profitability and to expand the volume of its existing two- and three-year-old products. The magnetic data storage specialist came through with flying colors on both counts.

Net sales for the year that ended Jan. 31, 1983 climbed 37% to $142.8 million. Net income surged 76.4% to $9 million, despite a whopping 61.3% increase in R&D spending to $25.5 million, or 17.9% of sales.

Large increases in volume deliveries of both its rigid and floppy disk media enabled the company to drive down the cost of sales from 64.4% to 58.7%.

In its characteristic low-key, behind-the-scenes manner, Dysan continued to push for joint R&D ventures. In fact, last year the company pumped more money—$13.8 million—into the development activities of these venture startups than it did into its own internal R&D.

Most of this money went to Applied Peripheral Systems, which is developing (and has received initial orders for) a 412MB, thin film head, 14-inch rigid Winchester disk drive. Other funding has gone to the Amlyn Corp. for cartridge-type flexible disk drives and to Tabor Corp. for 3¼-inch flexible disk drives, as well as to others.

The motivating force for this funding is the long-term development of markets for new Dysan products, as well as second-sourcing and boosting of its product line. But there can be other benefits as well. Witness Seagate Technology, which has been so successful at creating a new 5¼-inch Winchester disk business that it had a growth rate of 150% and just missed the DATAMATION Top 100. At the end of calendar '82, Dysan's 25%-plus stake in Seagate, representing an investment of some $450,000, was worth $100 million.

Such success will herald a greater push away from external equity and debt markets by Dysan in the years ahead, and very little sale of its own common stock to the public.

One big question still concerns analysts and investors—namely the company's high ratio of oem to end-user customers, which stands at 75:25. One worrying note is that last year one client, Storage Technology, accounted for 20% of disk media sales, or $27 million. That's taking a big gamble. The company has addressed this concern with the creation of a new end-user sales force.

69
CRAY RESEARCH INC.
608 Second Avenue South
Minneapolis, MN 55402
(612) 333-5889

Seymour Cray likes to joke that "we sell a machine a month. We've always sold a machine a month." That's not quite accurate, but it's close enough. In 1982, the company bearing his name—he stepped down from its chairmanship in 1981 to concentrate on research—installed five new supercomputer systems, compared to 13 in 1981 and nine in 1980. Total revenues for the company were $141.1 million, excluding two systems installed in-house; that represents a slowing of the tremendous growth Cray saw in 1981, but was still an impressive 39% jump. Cray reached a milestone in November with the installation of its 50th new supercomputer system 10 years after the company was formed.

Despite the revenue jump, Cray's profits increased only 4% to $19 million, for several reasons. As crosstown rival Control Data's Cyber 205 became a formidable competitor to the Cray supercomputers, Cray was forced to cut prices up to 25% on its product line. The X-MP models, introduced in April, cost only $9 million to $11 million by year-end, compared to the $11.4 million to $14.5 million price tag at introduction. The Cray-1S model, which had cost in the $8 million to $13 million range, are being replaced by the Cray-1M, which costs half as much. The Cray-1M, introduced in September, incorporates metal oxide semiconductor memory to reduce system costs to a level that Cray expects a significant number of new users will be able to afford. Cray currently has 70% of the supercomputer market.

Cray's price reductions convinced seven installations to convert leases into sales in 1982, compared to only one such conversion in 1981. Nonetheless, this did not generate enough revenue to boost profits. Another negative pressure on Cray has been the demand for upgrades to previously installed systems, which generate less revenue than new installations. Cray was disappointed as well that of the four systems slated to be shipped to France in 1982, only two were installed; a third was installed in early 1983.

Cray's profits were also held down because of internal pressures. The company's R&D budget represented 20% of revenue in 1982, compared to 16% the year before and 13% in 1980. The $28.3 million Cray spent on R&D in 1982 was 74% more than it spent in 1981, the second straight year R&D expenditures more than doubled.

A large portion of the R&D budget in both years went to the Cray-2, the upcoming successor to the Cray-1 series. (The X-MP is seen as an intermediate machine.) The Cray-2 will be six to 12 times faster than its predecessors, using a four-processor architecture and liquid immersion cooling.

70
WYLY CORPORATION
UCC Tower-Exchange Park
Dallas, TX 75235
(214) 353-7100

Nothing went right for Wyly during 1982. While revenues from the software processing sectors increased, earnings were depressed. At the hardware end, Wyly found the going so tough that it simply couldn't stand the heat and took a $11.9 million loss to get out of the kitchen.

By November, the pressure was so great that president John Kason resigned, and the directors appointed J. Allen Hufft to the post. Hufft, a 14-year veteran of Wyly, stepped in and promptly announced the impending loss, which pushed the stock down and disappointed shareholders and analysts.

By the time year-end results were reported, the company had bad news indeed. All 1981 numbers were restated, so that revenues increased to $140.5 million from $118.8 million in 1981. Profits, however, took a nose dive to a loss of $7.8 million in 1982 from $9.7 million in 1981. (The net loss of $11.9 million was reduced by tax benefits.) Hufft explained it this way: "Application and systems software results were significantly better than last year but not enough to offset lower earnings in other businesses. The earnings decline in continuing operations reflects no growth in sales and lower margins in the turnkey systems business, along with increased reserves for doubtful accounts and inventory adjustments. Additionally, our computing services business had lower profits, partly in order to maintain our business upturn capability."

In 1982, Wyly strengthened its systems software business, which serves IBM and IBM-compatible data centers. Introduced were UCC Seven BASIC, an expansion of its automated data center production control offering, and UCC Eight, a product for management support systems.

Wyly entered the micro software business in early 1983 by buying the distribution rights to Contex Management System's popular MBA product. Contex Management is, however, still selling this product, and competition is expected to be stiff.

71
NIXDORF COMPUTER CORPORATION
300 Third Avenue
Waltham, MA 02154
(617) 890-3600

This U.S. subsidiary of the privately owned West German dp and office products con-

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CIRCLE 120 ON READER CARD

glomerate, Nixdorf Computer, AG, declined in the DATAMATION 100 rankings, falling 17 places.

U.S. revenues from the New England-based subsidiary fell 12.2% to $140 million. According to U.S. management, the decline was expected, and was part of a plan to get the company back in line with more realistic market objectives, which began with the shedding of around 12% of its employees in late 1981.

The company said that tighter controls over costs and expenses through 1982 had now moved its operation into the black. The net profit increase had not been disclosed when the DATAMATION 100 went to press. All financial details of the West German parent—whose revenues are closing on $1 billion—are kept under a veil of secrecy until their announcement at the vast Hannover Fair trade show in April.

The mainstay of last year's dp revenues—all minicomputer related—was the company's 600 series family of intelligent terminals, an upgrade to the old line of Entrex data entry devices that Nixdorf bought out.

Last spring two new products were announced to the U.S. marketplace. One was an IBM 4300 pcm offering, the 8890 series, which is aimed at IBM's DOS base and offers Nixdorf's own system software. Also unveiled was an SNA-compatible distributed networking family, the 8860, which drew an order for 50 systems from the National Education Association in Washington.

Details of a cooperative agreement with Spartacus Computers, Bedford, Mass., to develop a new virtual machine (VM) operating system for the 8890 pcm contender were also revealed during the year.

The U.S. subsidiary lost two of its key officers during the year: president Carl Janzen left for a senior position at Burroughs, and product planning and marketing director Mike Backler left to join a new venture.

The company didn't lay off a large number of employees in 1982 as it had in 1981, and ended the year with some 1,700 persons on the payroll.

72
CONTINENTAL TELECOM INC.

245 Perimeter Center Parkway
Atlanta, GA 30346
(404) 391-8000

The U.S. Department of Justice's agreement with AT&T had a profound effect on Continental Telephone Co., which supplies phone service to 37 states and the Caribbean, with more than 2 million customers. An early signal of the impact came in May 1982, when Continental changed its name to Continental Telecom and started using the acronym Contel. This change was followed quickly by the acquisition of STSC Inc., a processing service company that specializes in the APL program language. Following up that acquisition was the purchase of Cado Computer Systems, which was 88th on the DATAMATION 100 in 1982. These purchases bring Contel to 72nd place in 1983. During this time Contel was buying shares of MAI, which has turned into a very profitable investment (see MAI profile, No. 31).

To end 1982, Contel and its partner Fairchild increased their ownership of Space Communications to 50% each by buying out Western Union in late December.

Cado, meanwhile was having a difficult year. Revenues dropped 7.7% to $60 million because of the poor economy. During the year, it introduced a modular 16-bit product line called the Cado Tiger. Cado markets its products through a network of full-service independent distributors in 175 cities in 40 countries.

Contel is obviously going to become a very aggressive competitor in the dp market and the datacom war looming on the horizon.

73
CENTRONICS DATA COMPUTER CORP.

One Wall Street
Hudson, NH 03051
(603) 883-0111

Centronics had yet another poor year in 1982. While revenues climbed 16.4% to $138.4 million, the troubled printer manufacturer lost $32.3 million—47.4% more than it lost in 1981. The company has not turned a profit since 1980.

The poor showing is particularly disappointing to Centronics because the company undertook several major structural changes to bring it back into the black. The company closed its facilities in Stevenage, England, and Dorado, Puerto Rico, and reduced the work force in its Ireland manufacturing facility to 25 from 175.

The company finally concluded a pact with Control Data Corp., NCR, and International Computers Ltd. that provided Centronics with a significant cash infusion. Under the agreement, a company called Computer Peripherals Inc. was merged into Centronics in exchange for 4.9 million shares of Centronics common stock. The owners of Computer Peripherals—CDC, NCR, and ICL—also gave Centronics $25 million in cash. The 4.9 million shares were divided in such a way as to give Control Data 35% of Centronics, and ICL and NCR 4.7% each. The agreement took effect July 1, and Computer Peripherals' revenues for the second half of 1982 are included in Centronics' 1982 revenues.

Computer Peripherals manufactures a series of line printers that is faster and more expensive than Centronics' line of dot matrix character printers. The entire merged product line now bears the Centronics name.

During the year, Centronics quietly terminated research and development on the Quietwriter stylus technology; it had been expected on the market in product form in 1981, but snags ensued and the product never made it out the door.

Centronics has apparently decided instead to concentrate on its Printstation 350 series of dot matrix printers and on conventional line printers. Three models were added to the Printstation family last month at the National Computer Conference. Centronics also indicated that it intends to fill the gap between the Computer Peripherals high-speed line printers and the Printstation series with a family of low-speed line printers, the first of which was also introduced at the 1983 NCC. The 350 products and the new line printer are gradually replacing the aging 700 series and the 6000 series printers.

Centronics does 75% of its business with oems, and one sign that the company may finally be turning around is that it signed almost 100 oem contracts in the last six months of 1982, including major agreements with Burroughs, Paradyne, and Redshaw. These are particularly welcome signs because Centronics has lost several oem contracts to Printronix recently. Hopefully, the company has turned the corner.

74
PLANNING RESEARCH CORPORATION

1500 Planning Research Drive
McLean, VA 22102
(703) 556-1000

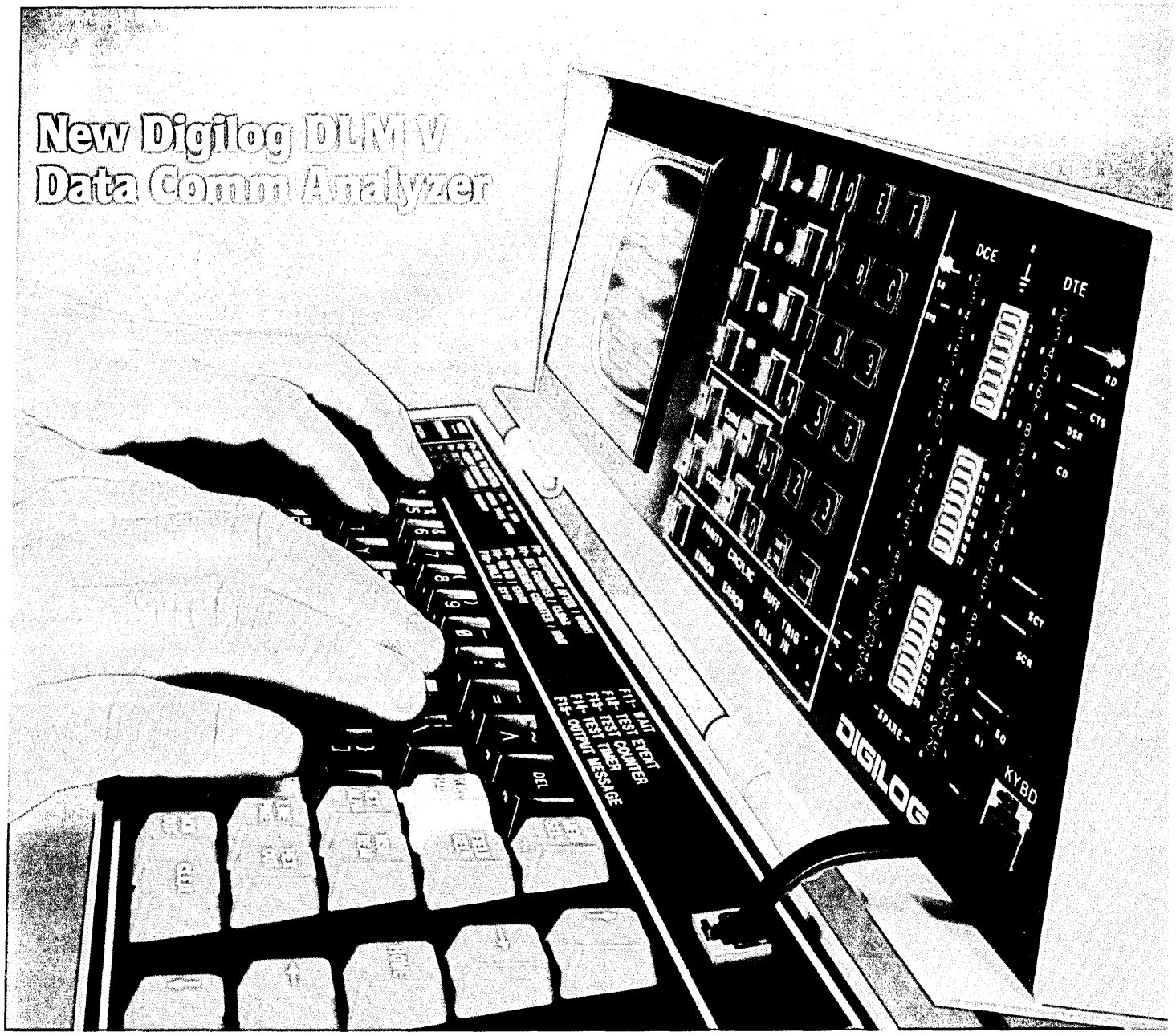
While the data processing revenues from Planning Research Corp. still constitute less than half the company's total revenues, the dp segment (representing two of PRC's four operating units) is experiencing a greater growth rate than the engineering side of the house.

PRC's dp revenue producers include PRC Government Information Systems, which serves primarily government agencies, developing software and systems and managing computer facilities; and PRC Computer Systems, a leading supplier of computerized real estate multiple listing services.

During calendar year 1982, PRC's dp revenues increased 30% to $138.4 million from 1981's $106.6 million—and that in a year when total corporate revenues climbed less than 1% to $320.7 million from $319.1 million. The bulk of 1982's dp revenues came from software sales (representing $103.8 million), while $23.7 million came from processing services revenues and another $10.9 million from sales of turnkey systems.

On the profit side, PRC finished 1982 with a net income of $7.8 million, up from $2 million in 1981. The unfavorable earnings report for 1981 was due primarily to closure of the company's unprofitable international computer software operations and its domestic property appraisal activities. But once it entered fiscal 1983, which began July 1 of last year, the company clearly had its feet once again on firm ground.

PRC Government Information Systems' largest award last year was a $5.2 million, one-year extension of its contract to



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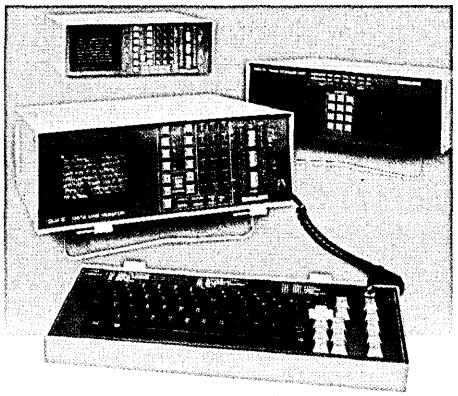

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CIRCLE 121 ON READER CARD

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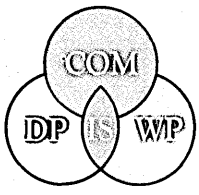

Four-Phase unites data and word processing with powerful communications capabilities to bring you complete information systems.

designers and engineers.

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CIRCLE 122 ON READER CARD

manage and operate the National Aeronautics and Space Administration's Scientific and Technical Information Facility near Baltimore, Md.—a facility that PRC has managed since 1980.

Despite the condition of the real estate industry during 1982's sagging economy, PRC Computer Systems in September obtained eight new contracts and renewals totaling $12.6 million for computerized multiple listing services.

But while PRC won many competitive bids, it also lost some big ones. In midyear the company had announced its intentions to joint venture, or team up with other companies, on bids to win larger contracts. Those efforts had yet to pay off by year-end. A team of Burroughs Corp. and PRC Government Information Systems was not selected after a 26-month competition for a major Air Force contract to replace computer systems at 115 air bases around the world—although the competition itself provided PRC with more than $20 million in revenue. Also, a joint venture of PRC and other major companies was not awarded the major base operations contract it was seeking at Kennedy Space Center.

Despite these disappointments, PRC feels confident that 1983 will see it win at least its "fair share" of government work. In the meantime, the company's dp divisions continue to have success in obtaining new work.

75
DUN & BRADSTREET CORPORATION
299 Park Avenue
New York, NY 10171
(212) 593-6800

As the largest disseminator of business information in the private sector, Dun & Bradstreet is a large user of computer technology—using it to develop and deliver nearly 2,000 products and services to more than 2 million customers worldwide. But D&B is also a provider of computer technology.

While dp revenues still constitute a small percentage of total corporate revenues, which last year were up 9.8% to $1.5 billion, dp is nonetheless a business area targeted for expansion. Last year saw dp sales slip 1.3% from 1981's $134.1 million to a 1982 total of $132.4 million. (The figures have been reduced by 4% in 1982 and 2.1% in 1981 for the purposes of this survey, as these amounts represented sales to internal divisions.) The primary dp revenue producers are National CSS, the Wilton, Conn.-based provider of timesharing services for industrial users and packaged software programs for use on in-house installations; and Zytron, which provides dissemination and storage of computerized information through its computer output microfilm services.

Reporting a slight decline in 1982 results, NCSS found itself the victim of the economic slowdown, as did many computer services companies. A major cost-reduction effort was instituted last year, including the reorganization of production and sales activities, in the hope that the company would round out 1983 as a leaner, more aggressive timesharing contender. Aiding that effort in '83 will be Multiple Funding Services Inc., the small software company NCSS acquired last June. Its software packages are aimed at the life insurance industry.

A major product announcement for NCSS during 1982 was the Nomad2 Information Center, which can be incorporated into customers' own computer systems to help make better use of internal dp capabilities. The offering also allows NCSS to participate in the growing in-house market for Nomad-like products. The Nomad database management system continues to enjoy good reception in the remote processor software market.

While NCSS found the going rough in 1982, Zytron's experience was quite the opposite. The company reached the Dec. 31 finish line with record revenue and operating income. Zytron's COM service centers continued to show strong revenue gains, and the transfer from in-house production to Zytron services by several large clients accounted for a significant portion of the revenue increase.

Signaling its commitment to expanded dp offerings, D&B in March of this year acquired Needham, Mass.-based McCormack & Dodge, the privately held supplier of financial accounting software packages. M&D, which had 1982 earnings of $2 million on sales of $38.5 million, was purchased for $50 million in cash plus a pay-out plan based on sales and earnings over the next three years. The company will report through NCSS.

76
LEAR SIEGLER INC.
901 East Ball Road
Anaheim, CA 92803
(714) 774-1010

The relatively mature dumb terminal market, as well as the prolonged recession, caused Lear Siegler to struggle through 1982 with mixed results. The Data Products Division of this diversified company sold more terminals than ever before, but strong competition from TeleVideo, Applied Digital Data Systems (ADDS), and others forced prices down. While lower component costs and manufacturing efficiencies eased the burden caused by the lower prices, margins were still trimmed. Consequently, 1982 represented the first year in a decade that dollar volume and earnings have been off, as the division's sales revenues dipped from $150 million in 1981 to $130 million last year.

Moreover, the pressures on the Data Products Division helped cause corporate revenues to drop 4.8% to $1.4 billion. Corporate profits dropped 21.1%, to $61.7 million from $78.2 million, and earnings per share dropped to $3.55 from $4.55. This corporation-wide decline was aggravated by two factors that did not affect the dp division. First, the devaluation of the Mexican peso hurt, since several divisions of the company maintain facilities in Mexico. Second, other corporate divisions are mired in industries ravaged by recession and maturity, such as automotive, machine tool, and aviation groups.

The dp divsion introduced several new products in 1982, which served to broaden its potential base in the competitive terminal market. Among these is the company's first printer, a color dot matrix unit that can produce near letter-quality or draft-quality output.

Other products introduced in 1982 include the ADM 22, 23, and 24 terminals. The ADM 22 retains a mixture of the features found in Lear Siegler's biggest seller, the ADM 3A, and in competing terminals. It is compatible with some direct competitors, including the ADDS Regent 25 and the Hazeltine 1500. The ADM 23 and 24 add different degrees of intelligence to the terminal.

The company is counting on this line of terminals and on the printer to improve the division's—and the corporation's—performance in 1983. The other divisions, because they are in more mature industries, are not expected to contribute as strongly as they have in the past. Nonetheless, the fourth quarter was the year's worst, indicating that the needed turnaround had yet to occur.

77
MARTIN MARIETTA CORPORATION
6801 Rockledge Drive
Bethesda, MD 20817
(301) 897-6000

Starting out as an in-house dp department only 10 years ago, Martin Marietta Data Systems hit the big time in 1982. Its earnings growth of 25% annually for the past few years drew nods of approval from corporate officials and brought official recognition. In 1982 Martin Marietta granted the Data Systems Division full company status equivalent to its other operating companies. This means MMDS now gets as much space in the annual report as the other operating companies, a fact that reveals that MMDS had gross profits of $11.2 million in 1982. Besides more space and attention, MMDS is slated for expansion.

A beginning example of such expansion came in early 1983, when MMDS bought American Management System's suburban Washington, D.C., data center. MMDS bought the machines and accounts and plans to keep the employees. This gives MMDS three large data centers (the others are in Denver and Orlando).

MMDS provides a full range of computing services including timesharing, application software packages, and professional services. It maintains a nationwide data communications network and has a substantial presence in the manufacturing, distribution services, and government sectors.

MMDS is the producer of the popular MAS or Modular Application Systems, which easily integrates the functions that most manufacturers need, including master production scheduling, inventory control, and purchasing control.

Compared to Martin Marietta's total revenues of $3.5 billion, MMDS' $122 million is small potatoes. But given its new clout within the big corporation, there's little doubt that MMDS will expand its horizons in 1983.

78
QUOTRON SYSTEMS INC.
5454 Beethoven Street
Los Angeles, CA 90066
(213) 827-4600

Founded in 1957, Quotron was the first company to offer brokers an electronic stock quotation system. Today the California-based company is one of the leaders in its industry, supplying on-line financial information services to more than 4,800 customer locations on a monthly fee basis. Customers include brokerage firms, banks, and insurance companies, as well as security, option, and commodity exchanges.

The past year was a period of solid growth for the company. Revenues continued their sustained growth and reached an all-time high of $120.9 million, up 37.2% from $88.1 million in 1981. Financial Information Services (FIS) revenues recorded a 39% rise to $110.4 million. Net income for 1982 rose 36% to a record $17 million ($1.05 per share) from $12.5 million (78 cents per share) in the prior year.

The information that Quotron's subscribers receive reaches them by way of the company-operated communications network. Last year Quotron upgraded its shared communications network (CARS) by installing a multiple Central Network Switching Center in New York City. This system offers customers increased connectability, improved response time, and additional capacity to support their own host computer applications. This year, the company will also offer a host computer-controlled printing capability. This service will support the production of hardcopy reports at remote branch locations using the CARS service.

During 1982, Quotron first demonstrated its financial office services system, the Quotron 1000, which provides customers with a full range of office services to support broker-related activities on their existing Quotron terminals. This new system enables users to perform such applications as analytical functions, client files and positions, text editing, electronic mail, data management, local personal processing, and calendaring. Based on the Unix operating system and using multiple Motorola 68000s, the Quotron 1000 offers a multiple bus structure that is expandable to support a full range of disk and tape drives, communications controllers, printers, office automation workstations, and graphics terminals. By year-end, beta sites had been established, and the company now looks forward to greater user acceptance of this new offering in 1983.

79
REYNOLDS & REYNOLDS
800 Germantown Street
Dayton, OH 45407
(513) 443-2000

Reynolds & Reynolds sells computer systems and services tailored to automotive dealerships, a niche that has come upon hard times in the past few years. And, paralleling the slow growth of the auto industry, R&R came out of 1982 only slightly ahead of 1981. In fact, considering the inflation rate, the company actually lost ground. Corporate revenues inched to $224.2 million from $217.3 million, a 3.1% gain, and dp-related revenues crept to $120.5 million from $115.2 million, a 4.6% increase.

This modest growth was not sufficient to make up for the lackluster 1981 performance, because the company fell short of its 1980 record of $121.5 million in dp revenue. In addition to slow revenue growth, earnings were also squeezed by a 14.8% increase in R&D spending, to $5.4 million. Nonetheless, the company was able to post $7.9 million in earnings, up 6.7% from $7.4 million in 1981.

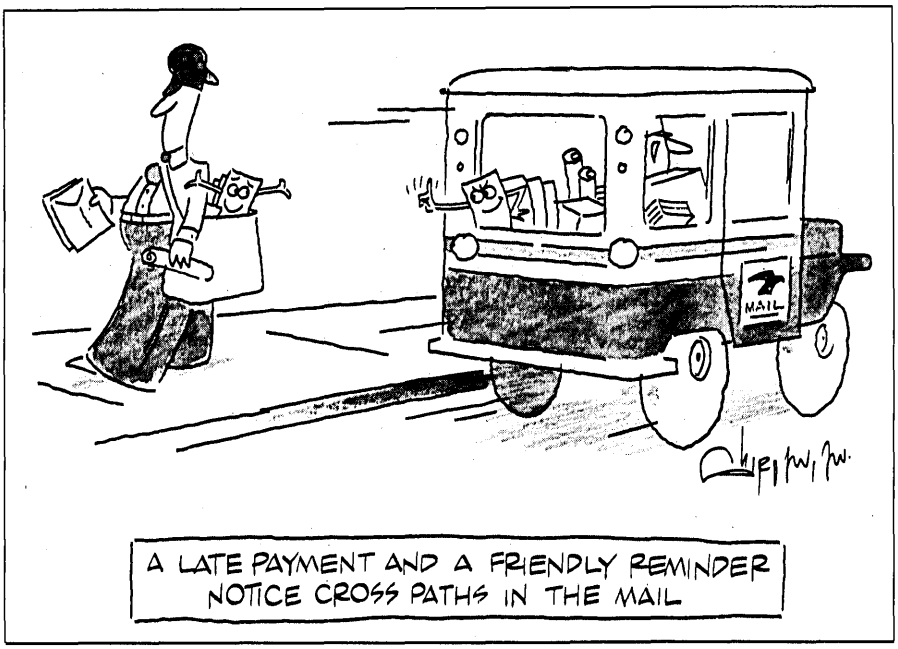
The company's bread-and-butter products are still turnkey computer systems customized to the automotive industry, and these contributed $58 million in revenues in 1982, compared to $52 million in 1981. In late September, the VIM/NET system was added to this line; it is a micro-based system, unlike the minicomputer VIM III system already in place.

The company tried to diversify its product line late in 1981 with the Expansion 6000 series, geared to service contractors and to the medical group practice market. The company hoped to be successful by capitalizing on a base of customers who already buy Reynolds Business Forms (the company's other major product line). Modifications and enhancements late in the development cycle stalled this product, although the company hopes it will begin generating revenue in 1983.

While R&R has offered an on-line computer processing service for auto and truck dealerships who can't afford their own computers, this operation suffered declining revenues for the third straight year. By comparison, the company's batch processing services enjoyed a small increase in revenue; overall, the company's processing services grew 2% to $37.9 million.

One bright spot for the company's dp operations was the success of the new Reyna Financial Corp. This subsidiary provided financing for over 70% of the company's U.S. computer sales in its first year of operation. It was immediately profitable, contributing about 9% of the company's earnings per share.

Another high point was the corporation's successful conclusion of examinations by the Internal Revenue Service and Revenue Canada. In December, Robert G. Timberlake, the company's president and chief operating officer, died. He was replaced by executive vice president Terry D. Carder.



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CARTOON BY VAHAN SHIRVANIAN

80
NATIONAL DATA CORPORATION
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Corporate Square
Atlanta, GA 30329
(404) 329-8500

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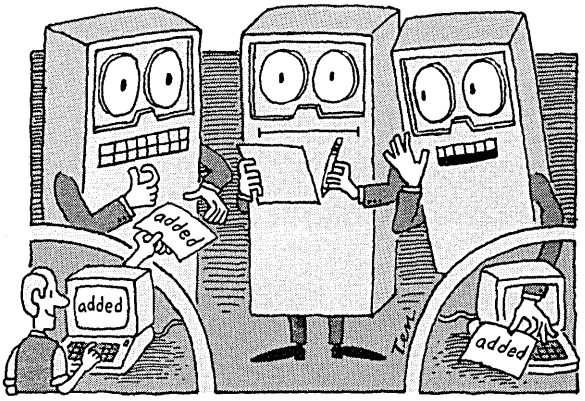

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As part of a distributed processing system where six or eight computers around the country share the load, they can efficiently communicate in their own language as if they were all in the same room. Without the chance of conversion error. While minimizing downtime, and virtually eliminating continued retransmission and customer network supervision.

To handle high volumes of data, Bell has both digital and analog High-Capacity Channels that can "bundle" your data, voice and image transmissions for better efficiency, performance and economy.

For analog transmission, Bell's Expanded 800 service allows you to predesignate the routes your data will take. Your unique network within the Network allows you to distribute dial-up traffic for maximum efficiency.

To find out how Bell can help you tailor a high-performance data system, large or small, that puts the Network to work for you, call **1 800 821-2121.**

Communication Concepts from the Bell System

Expanding your ability to communicate.

versus $111 million for the same period in 1981. Earnings were up slightly to $10.6 million from the $10.2 million in 1981.

One reason for this slow growth is National's loss of its longstanding and highly profitable contract with Atlantic Richfield for credit card processing. National's president, L.C. Whitney, stated in the May 30 annual report that he expected the company to have a 10% to 15% rise in revenues and a 15% rise in profit by fiscal year-end, May 1983. Halfway there, however, the company lost ground.

The general economy had a lot to do with the slowdown in business, as did the coming of micros, which has hit many processing companies very hard. National has been hitting back with its program of developing microcomputer systems designed to link small and medium-sized businesses and home computers into a bank's network of services. These Cash and Credit Management Systems have been the major source of revenue for National Data, and the company is hoping that the micro connection will bring back the profits.

In another important market, NDC introduced the first of the new generation of pharmacy computer systems. NDC's newest product is unique in that it provides the benefits of both standalone and on-line systems and technology. The new product can also interface with NDC's network of cash management and credit card services to provide pharmacies with unmatched payment authorization.

81

NBI INC.

P.O. Box 9001
Boulder, CO 80301
(303) 938-2795

NBI Inc. had a big growth year in 1982, with revenues climbing 56% to $119.6 million from $76.7 million and profits up 44% to $13 million from $9 million.

The office systems manufacturer underwent a management reorganization early last year that decentralized authority and decision-making and streamlined operating functions. Founded in 1973, the company today has 1,667 employees (up from 1,349 in 1981) and 166 sales and service locations in 16 countries.

NBI's success stems from a family of word and information processing systems, including the Docuwriter and OASys (Office Automation System) series. The Docuwriter, NBI's lower-priced system designed to simplify the production of documents used in many office environments, is upgradeable to the more sophisticated OASys line. NBI users can expand from entry-level systems to clusters to networks linking workstations, peripherals, and storage devices—all without discarding existing equipment or retraining. The Colorado company stresses the upgradeability and compatibility of its systems, claiming that this migration path protects customers against obsolescence.

The OASys 3000 and 3000S can be operated as standalone systems or can be connected as workstations to larger shared resource systems. NBI's shared resource products, the OASys 8 series and the OASys 64 series, serve the needs of offices that require more storage or shared storage available to multiple operators.

NBI also produces software packages for its systems that provide the information processing capabilities most needed in the office, including statistical math, equations, records processing, forms processing, and personal computing. In 1982, the company more than doubled its R&D expenditures from $3 million to $6.2 million.

Since its initial $12 million common stock offering in December 1979 (600,500 shares at $20 per share), the company's stock has done well, trading at 68½ at the time of a three-for-one stock split in February 1981. Last year it went from 31½ in January to 37 in December.

Early this year, NBI announced two 3270 communications products that will make it possible for its OASys products to communicate interactively with IBM mainframes by emulating IBM's 3270 products.

82

BRADFORD NATIONAL CORP.

67 Broad Street
New York, N.Y. 10004
(212) 530-7890

Problems still plagued Bradford National in 1982. The troubles began when the company went on a diversification binge into the health care services and the insurance business. Neither move was particularly profitable, but both were very costly to get out of. Bradford started to climb out in 1981 by selling some of the health care services, and took a $10 million loss for that year. Again in 1982, however, the health services were still haunting Bradford, and the company had to charge $496,000 against earnings. The sale of its insurance subsidiary produced a loss in 1982 of $578,000. These losses caused earnings to drop to $408,000 or 10 cents a share, not good, but better than the $10 million loss reported for 1981.

But while the results look bad, Bradford is actually in much better shape than the numbers show. Returning to its core business of supplying services to the investment community, Bradford has made considerable headway. The company is the leading independent bond clearing agent and now serves more than 300 broker-dealers and banks as well as all the major underwriting firms.

Another area where Bradford is excelling is the Securities Custody and record-keeping business. Bradford now has over 3,000 publicly held companies as customers for this service.

In January 1983, Bradford president James L. Mann resigned for personal reasons, and the company appointed Roy B. Simpson as his successor. Simpson had been a senior vice president at American Can before moving to Bradford in 1981. The company he took over was finally free from its diversification nightmare and ready for clear sailing.

83

RECOGNITION EQUIPMENT INC.

2701 E. Grauwyler Rd.
Irving, TX 75061
(214) 579-6000

REI had its worst year in history during 1982, with a 15% decline in revenues and a net loss of $10 million. The picture at year-end, Jan. 31, 1983, showed sales had slid to $110.9 million from the $126.1 million of 1981. Total corporate losses improved slightly, from a $14.9 million loss in 1981 to a $9.6 million loss in 1982.

On the management front, William Moore was named president and chief executive officer in March '82. Moore, previously with Perkin-Elmer, moved quickly to bring in other new blood. In April he lured George O'Brien away from P-E to become REI's chief financial officer, and in May he enticed Robert Reedy to leave IBM for the marketing vp post at Recognition Equipment.

The new management moved on all fronts. The number of employees was reduced by 30% to 1,924. Inventories were reduced, as well as short-term borrowings by 33%. And product lines were thinned to meet current demand. Management's gamble was that a return to the company's core business would also result in a return to profitability—and early indications signaled success.

What's ahead? The best indication comes from Moore himself: "There must be improvement of profit margins by concentrating our efforts in selling a higher volume of standard products as opposed to the higher priced but one-time specials. In the past the company tended to be a high-technology job shop, preventing it from spreading the substantial research and development investment over large product runs to produce acceptable unit margins."

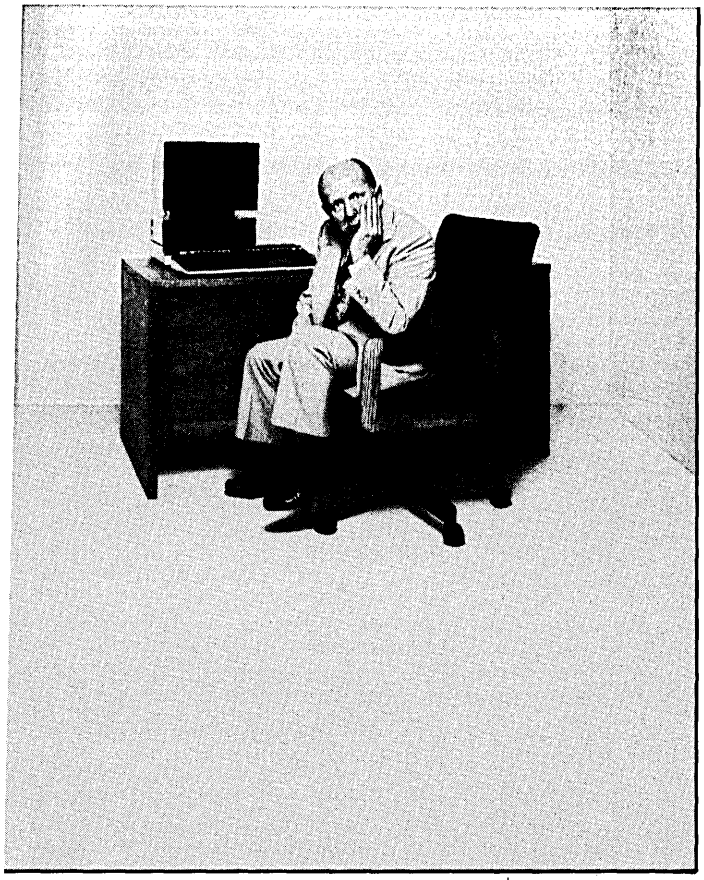
With that in mind, we can expect REI to stay the course in data acquisition and document handling equipment.

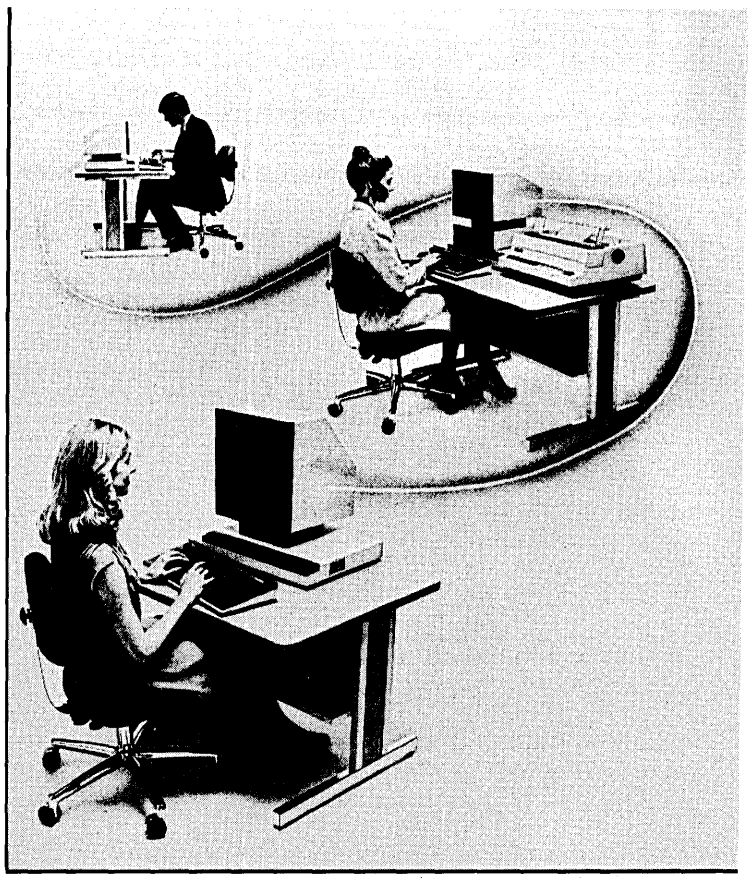
84

GERBER SCIENTIFIC INC.

83 Gerber Road West
South Windsor, CT 06074
(203) 644-1551

The bad economic news in the rest of the world made it an unpleasant year for Gerber. It sold more, but made less. Total dp revenues increased 5.2%, to $107.2 million in 1982 from $101.9 million in 1981. Overall corporate revenues picked up very slightly, to





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OmegaNet® from Compucorp

People have always worked better when they could communicate. So why should they have to put up with work stations that are isolated?

Compucorp doesn't think they should. That's why Compucorp invented OmegaNet.® It's a local area network that allows you to connect your information processing work stations together in a single system. What goes in one terminal can come out another. Your work stations can share information from common files. And they can share common resources, such as printers.

OmegaNet® can utilize Compucorp's own Data Base Management System, one of the most sophisticated software systems ever developed. You can find individual records in a flash – even if there are tens of thousands of them. It makes very complex tasks very simple to achieve. And with our communication packages, you can connect your work stations to most brands of main frame computers.

Compucorp's 745 diskless work station – specifically designed for OmegaNet® – is less costly than many other work stations. And all Compucorp information processors can operate as part of OmegaNet.®

Compucorp was rated Number One in the National Datapro survey of word processor users in both 1981 and 1982. Now the people at Compucorp have applied their award-winning technology to their network. For more information about OmegaNet®, send in the coupon today.

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CIRCLE 125 ON READER CARD

WHAT THE HECK IS AN EXECUTIVE WORKSTATION?

A lot of people have the wrong idea of how you should use a personal computer. And fancy phrases like "executive workstation" only hide the benefits of personal computing under a cloud of tech-babble.

The fact is, instant information and a computer on every desktop don't always mean bigger profits and more efficient workers.

Because when "non-computer people" use personal computers in business, the *software* they use is always more important than the hardware that's used with it.

But sometimes this software's just too hard to use, or can't do the job. Or it's already out-of-date. All of which confuses the same people it should be helping.

We'd like to clear up some of that confusion.

THE CONTEXT MBA™ IT TURNS EXECUTIVE WORKSTATIONS INTO "EXECUTIVE THINK-STATIONS."

The Context MBA is software that lets you use the personal computer as a creative tool for better business decisions.

We've combined the five most useful business functions of all personal computer software - electronic spreadsheet, graphics, information management, report writing, and communications - into one easy-to-use, *integrated* product. Designed for businesspeople, not programmers.

This means you only need one software package to make your personal computer do everything it was designed to do in the first place. And then some.

TURN BUSINESS DATA INTO BUSINESS INTELLIGENCE. INSTANTLY.

By building five major functions into one software package, the Context MBA helps you to make better decisions from the large amount of data that's unique to your business.

With the MBA, for instance, you can connect a personal computer to your company's main computer to retrieve business information. Like sales figures, operating expenses, or product reports. In minutes.

Store, edit, sort, or modify this information on your personal computer and use the MBA's electronic spreadsheet to create a "model" of your business. Develop plans and forecasts in a fraction of the time it would take to do them by hand, or by using a single-function software package.

While using the MBA's spreadsheet function, you can instantly graph and chart vital figures on the same screen. So, as you make cost or revenue assumptions, you can see immediately how the result would affect your business - this year, and five years from now.

And when you've made your decision, use the MBA's executive report writer to put words, numbers, and graphs together in a clean, printed report.

It doesn't take a computer to tell you that this kind of control over business facts, figures, and alternatives gives you an edge on the competition and a head start on each new day.

SEE IT NOW.

The Context MBA can be used on the IBM Personal Computer, the IBM PC-XT, and the Hewlett-Packard Series 200 personal computers.

Call us at *1-800-437-1513* (in California, call 1-800-592-2527) for the name of your nearest Context MBA dealer and a copy of our tell-it-like-it-is brochure, *Software Explained.*

If you have an IBM PC, we'll also be glad to send you a free copy of our Context MBA Sampler Disk that gives you a live demo of the MBA.

Context MBA™

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23868 Hawthorne Blvd.
Torrance, CA 90505 (213) 378-8277

Personal Computer Software for Business Decisions.

CIRCLE 134 ON READER CARD

$115.8 million from 1981's $115.6 million.

The increase in revenues did not show up as profit, however. Corporate earnings declined 25%, to $3.5 million last year from $4.7 million in 1981. Earnings per share fared equally poorly, falling 26%, to 55 cents per share from 75 cents per share. Employees felt the pinch as well, as their total decreased to 1,300 from 1,700.

The difficult worldwide economic conditions severely affected Gerber. The sales increase, the result of expansion of the company's products and customer base, was negated by strong competitive pricing in the marketplace for turnkey interactive graphic systems and pattern grading and marker making systems. Expected order entries were reduced for Gerbercutters, the major product of Gerber's wholly owned Gerber Garment Technology (GGT). GGT is the world leader in the development of automated systems for cutting, pattern grading, and marker making for the apparel, aerospace, and automotive industries.

Most severely damaged by the recession was Gerber Systems Technology (GST), the company's 80%-owned subsidiary. GST was pounded by the recession for the first five months of 1982. The company responded with a series of changes in GST's structure and reduced its personnel significantly. Positive results ensued almost immediately, as GST posted two consecutive profitable quarters in the latter half of the year. GST also adopted a more aggressive posture in the computer aided design and manufacturing (CAD/CAM) markets overseas. As part of this thrust, GST introduced a high resolution color raster graphic workstation, a PC-800 model 3 with advanced color graphics, a laser-directed photoplotter, and a printed circuit board photoplotter.

Gerber remains convinced the bad news will become good news very shortly.

85

COMMERCE CLEARING HOUSE INC.

4025 West Peterson Avenue
Chicago, IL 60646
(312) 583-8500

CCH's data processing operation, which pulled in a little more than one third of the company's total revenues in 1982, suffered from a sluggish performance during the last calendar year. While dp revenues were up 36.6% in 1981, the growth rate shrank to 13.7% last year on sales of $104.5 million at the Chicago-based publisher of tax and business law periodicals. Overall revenues, which jumped 23% in 1981, rose only 12% to $350.1 million last year.

Among the company's key dp subsidiaries are CCH Computax Inc. and CCH Computax Systems Inc. CCH Computax provides computer processing of income tax returns. (The Multi-Tax Division also offers on-line tax compliance processing and planning services to professional tax return preparers such as accountants and lawyers.) The bulk of CCH Computax's revenues are accumulated during the first half of the year, when income tax processing work is at its peak. During this period, sales totaled approximately $76 million, compared to $65 million in 1981. Overall processing service revenues were up to $92.9 million, about 21% from $77 million in 1981.

Things were not as rosy at the publishing company's other dp offshoot, CCH Computax Systems. This operation, which continued its plunge deeper into the red in 1982, provides accountants with minicomputer and microcomputer hardware, software, and supplies. Mini sales sagged from $9 million in 1981 to $3.3 million last year. Software revenue was also down, but not as much, falling to $4.9 million in '82 from $5.8 million in '81. Meanwhile, micros, which were not in the sales picture at all two years ago, pulled in $3.4 million in revenue.

CCH hopes to turn this operation around in the near future. It also hopes to capitalize on Automatic Data Processing's computerized tax processing business, which it took over last year.

86

MANAGEMENT SCIENCE AMERICA INC.

3445 Peachtree Road N.E.
Atlanta, GA 30326
(404) 239-2000

Ever since MSA made that "peachy" acquisition back in 1981, the company has had a different look. From a small, privately held firm that sold software strictly for mainframe computers, MSA has grown into a $100 million-plus public company that offers not only software for mainframes and micros but also software that ties the two extremes together.

In MSA's history, 1982 will go down as the year the company broke the $100 million mark in revenues. Sales climbed 38% to $101.2 million from the previous year's $73.1 million. Earnings were up an impressive 63%, soaring from $5.5 million (41 cents a share) in 1981 to $9 million (62 cents a share) last year. Such results didn't go unnoticed on Wall Street either. MSA's stock rose from a January opening of 11⅛ to a December closing of 19¼.

Interestingly, MSA's healthy bottom line was achieved in ways other than what proved to be industry norms last year—employee cutbacks and reduced R&D spending. To the contrary, MSA upped its work force 34.5% to 1,348 employees and increased its R&D expenditures 33% to $21.8 million. And in a year when many dp companies saw overseas sales slip below year-earlier levels, MSA witnessed a 5% boost in foreign sales, which topped $23.7 million or 23% of total sales.

MSA's Peachtree Software acquisition has proved the catalyst for much of the change. Now, almost everything is coming up peaches. Last August MSA announced that its micro/mainframe dream had come true—it had combined the power of the mainframe with the convenience of the micro. This January it began delivery of the door to this interface—Executive Peachpak, a set of micro products for color graphics, financial modeling, word processing, and communications with other micros. The key to this door is PeachLink, micro software that allows selection and data capture from any MSA on-line screen for subsequent use with other applications in the Executive Peachpak.

The micro's effect on the mainframe is almost like the fable of the mouse rescuing the lion by gnawing through the ropes that bound it. And the desired effect of the micro/mainframe integration on MSA is clear: the company wants customers to consider it the one source for software.

87

VERBATIM CORPORATION

323 Soquel Way
Sunnyvale, CA 94086
(408) 245-4400

Lucky 13! That's how Verbatim viewed last year's performance. In the fiercely competitive and fast-growing market for flexible disks, Verbatim stands tall. Competing against such market heavyweights as IBM, 3M, Memorex, and BASF, this California company has managed in a mere 13 years to capture almost a quarter of the market.

In a year when the industry lid was lowered on company growth rates, squeezing profit margins and reducing the number of employees assigned any given job, Verbatim proved an exception. Sales soared 43.7% in calendar '82 to $98.6 million from the year earlier's $68.6 million. Net income increased tenfold to $11.5 million ($1.10 per share) from $1.1 million (45 cents per share), during the same time when R&D spending catapulted to $6.7 million from the 1981 total of $2.1 million. And the work force was expanded 20.4% from 1,487 people in '81 to 1,790 strong by year-end '82.

As often happens to a company such as Verbatim that generates over 50% of total revenues from oem sales, a sometimes competitor emerged as a somewhat compadre. In the fourth calendar quarter, Verbatim reached agreement in principle with IBM to establish a cross-license to share flexible disk technology. This agreement resulted in a $619,000 reduction in cost of sales for amounts previously expensed but not paid.

Back in 1981, Verbatim began investing in major production automation projects to allow it to continue meeting the growing worldwide demand for flexible disks through increased production capacity. These productivity improvements contributed significantly to an increase in gross margin to 41% and 47% of net sales, respectively, during fiscal '82 (ended July 2) and the first half of fiscal '83, as compared to 28% and 39% for the prior comparable periods. And for a total market estimated to grow at a compounded annual rate of 35%, such results are far from shabby.

Datapoint has installed more than 5,000 local area networks.

That's more than anyone else!

When you look for a local area network to enhance your information system, remember there's safety in numbers. Datapoint is the leader in local area networks, with more installed than any other vendor.

So while others struggle to perfect their local area networks, Datapoint is installing them. And has been for *six* years. That means more experience and performance.

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DATAPOINT

CIRCLE 111 ON READER CARD

©Sperry Corporation, 1983

The computer system that made mothers' eyes glisten and management faces glow.

A special bouquet of flowers says love in a way that nothing else can.

Ask the more than 1,000,000 mothers who received them from distant sons and daughters through the floral network of Florists' Transworld Delivery (FTD) this Mother's Day.

It was a big job for FTD,® and this sort of peak surge could strain an ordinary computer system to the breaking point. But FTD doesn't use an ordinary system. They use a Sperry 1100 Series central computer, backed by the Mapper System. There is other equipment involved, but Mapper provides for very special applications to handle the very special needs of FTD.

When your flower order is sent via this network, the florist who will be making the delivery has all the information quickly, and in printed form. Eliminating the possibility of error.

You can't expect Florists to become computer experts, and that's why this system was designed to be so easy to use. Non-DP people can master it in a day. And it's all in plain English.

An advantage of Mapper, according to FTD Executive Vice President, William Maas, is that, "Complicated internal analyses and customized management reports can be designed and tested in less than half the time it takes to write a program in COBOL."

The Sperry Mapper System also allows FTD management to provide inventory control and telemarketing to its floral members.

In the words of Bill Maas, "Our task would be far more difficult without Sperry...without the Mapper System."

Mapper. The system that brings joy to mothers and management.

SPERRY

We understand how important it is to listen.

FTD and its emblem are registered trademarks of Florists' Transworld Delivery Association. Mapper is a trademark of Sperry Corporation.

CIRCLE 112 ON READER CARD

Verbatim's success is built on the continued introduction of new products as well as the ever-enhanced reliability and durability of established product lines. The first half of '82 marked the introduction of the Datalife brand of flexible disks to the European market. For the first time in Verbatim's history, the company advertised in languages other than English. (The company derived about 31% of '82 revenues from foreign sales.)

At 1982's National Computer Conference, Verbatim announced a new generation of high-density flexible disks, the HDX series. Initial volume orders from oems confirmed the product line's success. Then in the third calendar quarter, Verbatim announced two new brands of flexible disks—the Verex and the Optima Series, with Verex representing the lowest-priced line and Optima the highest. In addition to new durability standards, the Optima products feature a reinforced hub, high temperature capability, precision recording performance, and reusable packaging.

In keeping with its market leader objectives, Verbatim chairs the Microfloppy Industry Standards Committee, a worldwide group of 20 companies that is coordinating efforts to establish an industry standard for the new 3½-inch disk—a market in which Verbatim is bent on being the leader.

88

TELEVIDEO SYSTEMS INC.

1170 Morse Avenue
Sunnyvale, CA 94086
(408) 745-7760

TeleVideo Systems has come a long way since introducing its first product—a video game monitor—back in 1977, when its revenue was just under $1 million. Corporate revenues vaulted to $98.5 million in calendar '82, a 175% increase that made it third on our Gainers table. The fiscal year (ending Oct. 31, 1982) figures were even more impressive, with year-end sales surging nearly 300% to $101.7 million.

TeleVideo, which makes its debut in the DATAMATION 100 this year, produces non-IBM compatible crt terminals and CP/M-based microcomputers. It also sells supporting applications software and add-on peripherals. Last year, the company's terminal and peripheral sales were up 79.4% to $61.2 million over the prior year. Meanwhile, micro revenues went through the roof, skyrocketing 2,094.1% to $37.3 million.

The company's burgeoning business reflects the boom in the micro market—a market that seems to recognize no national boundaries. About 35% of TeleVideo's 1982 revenues come from outside the U.S., which proves that the micro movement has indeed become global.

Homing in on the market between personal computers and minicomputers, TeleVideo has concentrated on beefing up the micro—a move other microcomputer vendors have also made. And like other manufacturers, the firm has stressed multi- or shared-user configurations for the professional and business customer. The company considers its main micro rivals to be IBM, Digital Equipment, Convergent Technologies, Altos Computer Systems, and Apple.

To help combat such competition, TeleVideo relies on its sales force. The company, which sells through independent distributors, also markets its gear to oems and system houses. For maintenance, the firm depends on GE's Instrumentation & Communication Equipment Service Center to service its crts and on TRW for its small business micros.

Last year the company took the wraps off two 8-bit and two 16-bit small business micros. Other products are in the works as attested to by the company's R&D spending, which rose 153% to $2.7 million in 1982. During fiscal '83 TeleVideo plans to start volume production of five new micros and one new terminal. A new printer for use with the company's products is also under development.

A privately held company with less than 10% outside ownership, TeleVideo pulled in a remarkable 953% increase in profits during 1982. The company has high hopes of stretching that $12.7 million net to new heights this year, and will be aided with development capital from its initial public offering this spring.

89

CONVERGENT TECHNOLOGIES INC.

2500 Augustine Drive
Santa Clara, CA 95051
(408) 727-8830

Convergent Technologies enjoyed a spectacular year of tremendous growth, as the company's revenues soared 636.6% to $96.5 million from $13.1 million. This growth record made Convergent the biggest gainer on the Gainers table. Earnings were still more impressive, a 1,387% increase to $11.9 million from $800,000. The company, which was founded in August 1979 with $2.5 million in venture capital, went public in May 1982 with an initial offering of 4.4 million shares of stock.

One major reason for the company's sudden success is the Burroughs B20 small business system, which is manufactured by Convergent. Burroughs alone accounted for 48% of the company's 1982 revenue. Other long-term oem agreements have been concluded with NCR, Thomson-CSF, and C-3 Inc. As these and other oems join the 100-plus customers Convergent already has, the disproportionate influence Burroughs has on the company is expected to diminish.

Convergent established itself by manufacturing clustered, multifunction workstations. The workstations are designed as oem building blocks; they are totally modular and have multiple upgrade paths. Thus, a standalone system can be upgraded to a node in a local network with no software modifications; up to 16 workstations can be combined in a distributed intelligence network. Each workstation uses the CTOS operating system and supports five languages and various communications protocols. The product line now is divided into two families: the low-end application workstation (AWS) and the high-end integrated workstation (IWS).

The company has had to up its work force to 450 employees from 90 to keep up with the accelerating demands made by the company's fast growth. In addition, manufacturing and storage space was tripled in 1982 to 90,000 square feet.

The company effected a three-for-two stock split on Dec. 31, 1982, and plans to introduce a wide range of new products in 1983. Among those are the already announced SNA support; electronic mail; and the CP/M, MS/DOS, and Xenix operating systems support.

90

MODULAR COMPUTER SYSTEMS, INC.

1650 West McNab Road
Fort Lauderdale, FL 33310
(305) 974-1380

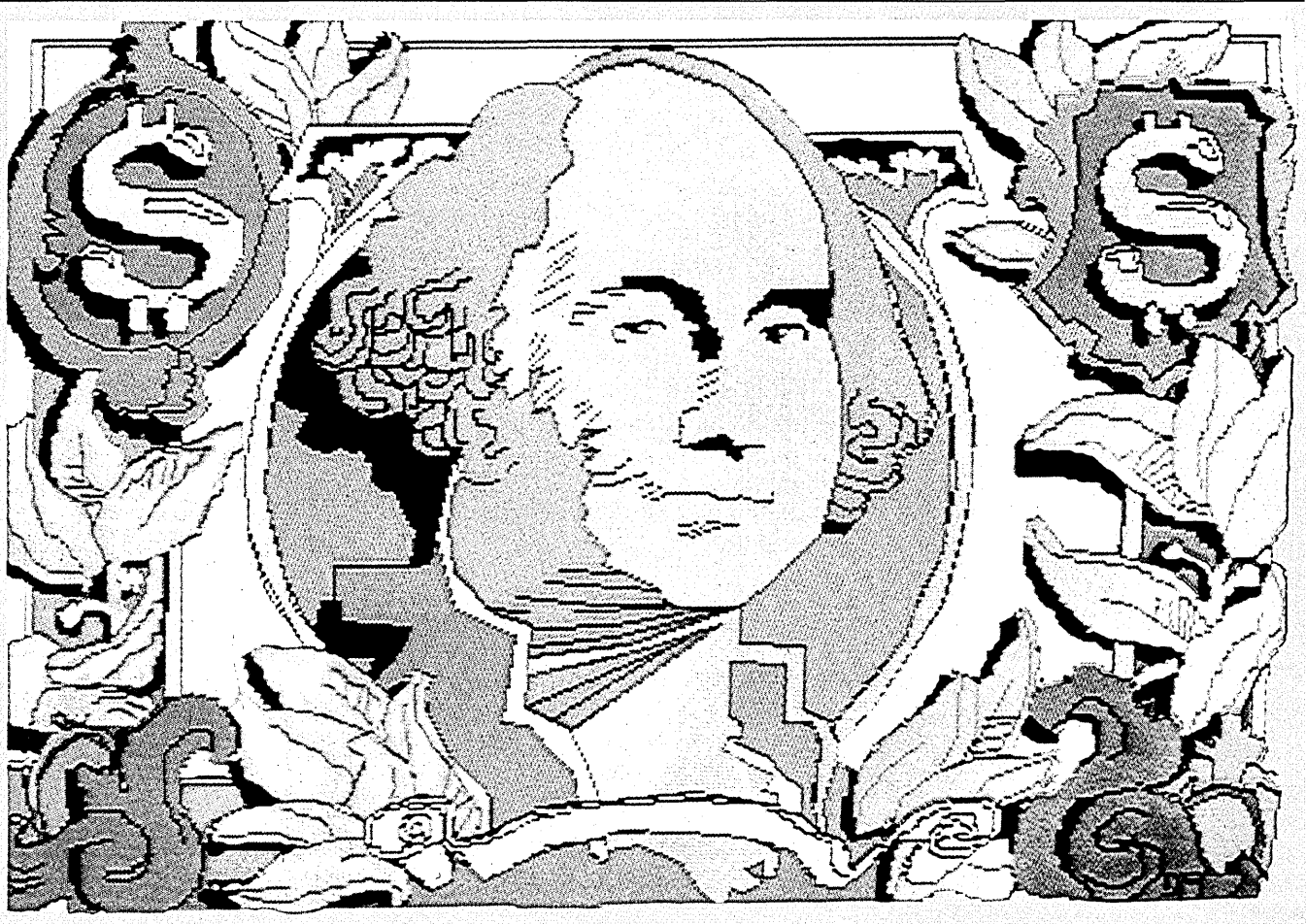
Modcomp's profits have been limping along for the past couple of years, but at least they limped upward in 1982. The past few years have been tough for this supermini maker. And, as the result of an order slowdown at the end of '82, Modcomp will probably continue to have difficulty maintaining its earnings upswing during '83.

Earnings were up in 1982 by 50% over the previous year, to $1.8 million, but from a very low base of $1.2 million. Earnings per share reflected a similar increase, rising to 34 cents in '82 from 22 cents, a 54.5% jump. Modcomp's revenues took a 6.4% change for the better, moving to $92.8 million in 1982 from $87.2 million in 1981. Minicomputer revenues from the Modcomp and Classic series rose 5.8%, to $72.8 million in '82 from $68.8 million in '81. Maintenance and repair revenues accounted for the balance of $20 million (up 8.6% over the $18.4 million in '81).

Modcomp minis are used by a variety of customers: NASA uses them as part of the launch processing system for the space shuttle; Avis uses them to keep track of check-ins, checkouts, and reservations; and even the Dallas-Fort Worth airport's driverless, computerized "people movers" that shuttle passengers between airport buildings are run by Modcomp's minis. The systems are usually sold rather than leased, and are priced at $50,000 to $150,000 each.

No doubt the mini's segment of the dp world is becoming smaller as micros and mainframes continue to squeeze it from both sides. Modcomp seems to be branching out a bit to strengthen its hold. Earlier this year, the company entered an agreement with Telcon

How to get a lot more color for your money.



Actual unretouched photo taken directly from screen.

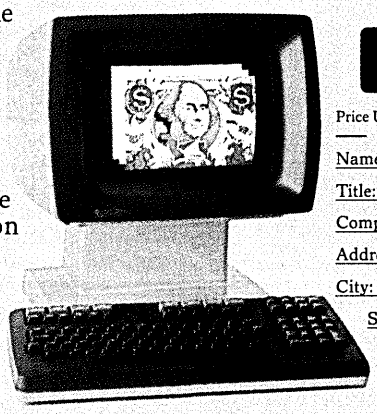
Introducing the HP 2627A Color Graphics Terminal.

Now you can have a bright, sharp image that's easy to read. For only $5,975. Which means our compact new color graphics terminal is setting completely new price/performance standards.

You get 8 basic colors, plus hundreds of additional user-defined ones. Including colors that match our plotter pens. On a black screen with 512 x 390 line resolution. You get raster display technology for fast, selective screen updates. You get vector graphics and polygonal area fills, a combination that makes it easy to create complex shapes, symbols, and even typestyles. In a lot less time. With a lot more precision.

Of course, it's also software-compatible. In addition to HP's DSG/3000 and Graphics/1000-II software, the 2627A runs PLOT 10 from Tektronix, SAS's SAS/GRAPH, Precision Visual's DI-3000 and GRAFMAKER, ISSCO'S DISSPLA and TELL-A-GRAF.

But that's not all; the 2627A has user-definable softkeys and graphics edit keys that make this one of the easiest-to-use terminals on the market. It even gives you complete alphanumeric capability. In a separate memory. So whether you're interested in business or technical applications, just return this coupon and we'll send you more information. Or call your local HP sales office. We're listed in the white pages.



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In 1876, we had an idea that changed the way America does business. The telephone.

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.magine. You are perfecting a revolu-ionary operating system. In about two ears, it will be the system of choice or 16-bit microcomputers.

It will be called the UNIX operating ystem.

But the breakthrough features of this perating system are going to make tringent demands on the computer.

The microcomputer developed speci-ically for the UNIX operating system nore than two years before its commer-ial distribution is called ONYX.™

ONYX will live up to every demand nd expectation.

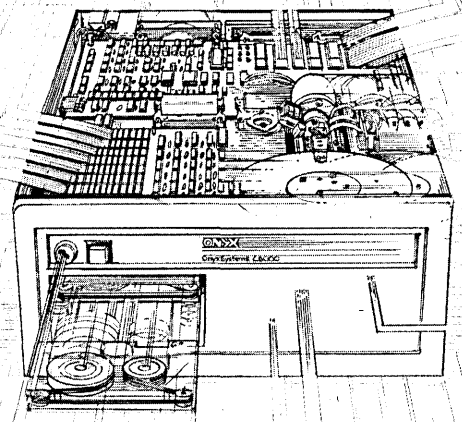
To achieve the ultimate flexibility, implicity, efficiency and productivity, he UNIX operating system will incor-orate a file system of highly uniform ets and sub-sets of directories, arranged n a tree-like hierarchical structure.

And flexible directory and file pro-ection modes, allowing all combina-ions of *"read," "write,"* and *"execute"* ccess, independently for each file or irectory, or for a group of users.

But these advantages will require ntensive disk access, and superior nemory management. In simple lan-guage, disk access must be as fast as ossible, and the disk must have an nusual capacity to maintain complex ile systems on-line at all times.

Floppy disks with their low capacities nd high access times won't do.

Winchester disk drives that utilize low-moving stepper motor head posi-ioning 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.

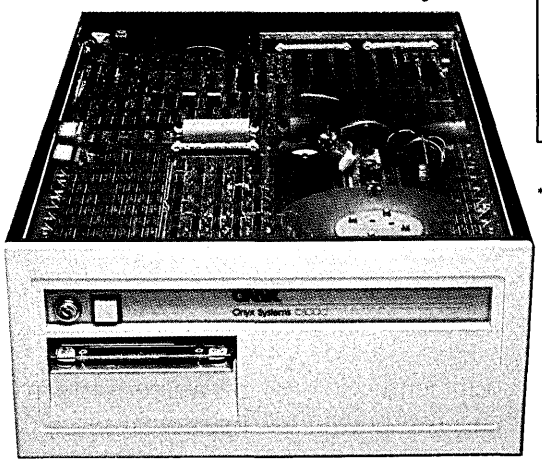
And, as developed, the ONYX C8002 features expandable memory up to 1 Mbyte, and disk storage up to 160 Mbytes on-line. Its cartridge tape back-up offers cyclical redundancy checking on every backup. Both the Winchester disk storage system and the cartridge tape backup are *internal.*

In the UNIX operating system environment, the disk becomes an extension of main memory. *"Swapping"* programs between the disk and main memory increases the number of operations that can run concurrently. ONYX's memory management system utilizes *"scatter"* instead of *"contiguous"* allocation, and the more efficient swapping minimizes demand on the disk channel. That's why ONYX assures a highly efficient environment for the UNIX operating system.

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.

ONYX has installed over 1500 UNIX systems.

Today there are a lot of systems being developed to operate UNIX (and *"look-alike"*) operating systems. But there are many reasons why you should consider ONYX and the UNIX operating system as inseparable.



System III available now for immediate delivery.

Phone this special number: (408) 946-6330 Ext. 251. Ask about these System III enhancements, including:

- Multi-key index sequential files under RM COBOL;
- "Term Cap" capability that supports a wide variety of terminal interfaces;
- Enhanced printer handling capability;
- SCCS to maintain edit histories in text management applications.

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ONYX UNIX

OPERATING SYSTEM

Onyx Systems Inc., 25 East Trimble Road, San Jose, CA 95131

CIRCLE 130 ON READER CARD

Industries Inc. to begin manufacture of Telcon's Zorba personal computer.

91
FLOATING POINT SYSTEMS
P.O. Box 23489
Portland, OR 97225
(503) 641-3151

In a down year for many high-tech companies, Floating Point performed swimmingly. The company enhanced its position as a leading manufacturer of array processors. These are special purpose computers that perform complex mathematical calculations at high speed for what the company advertises as a low cost. Array processors receive information from a host mini or mainframe, perform the calculations faster than 100 Einsteins, and return the results to the host computer.

Demand for array processors clearly exceeds supply. Floating Point seemed to set records last year every time it crunched a number. Revenues rose to $89 million from $64 million, a 39% increase. Best of all, profits were up 49%, to $11.3 million from $7.6 million. All this money coming in allowed Floating Point to increase its R&D expenditures 11%, far less than the 92% increase in 1981 but enough to develop three major enhancements to its FPS-164, introduced in late '81 but fully produced last year.

Floating Point's products had nearly a 50/50 oem–end user balance for the company's first 10 years. Courtesy of the FPS-100, which is aimed at the oem market, oem sales rose to 54% of total revenue. The balance is expected to swing back, however, with the advent of the FPS-164, which is targeted toward end users.

Floating Point's main oem market and largest single contributor to the company's financial success is X-ray tomography, AKA CAT (computerized axial tomography) scanning. This market accounted for 40% of 1982 sales and is expected to increase this year. One reason for the expected increase is that Floating Point has another business that's on the downswing. The company's other major market, the seismic industry, experienced serious weakness in the latter half of 1982. There are no major seismic booms forecast for the first half of 1983, which indicates that Floating Point will sink somewhat during that period. Increased deliveries of the FPS-164 are expected to partially offset the seismic downturn.

But by year's end, Floating Point expects to be riding high in the water again.

92
MANNESMANN-TALLY
8301 South 180th Street
Kent, WA 98032
(206) 251-5642

Mannesmann-Tally, producer of both serial and line printers for micro- and minicomputer systems, boosted its total 1982 revenues to $125.5 million. With $37.5 million of that total representing internal sales, the company's dp revenues, on which its DATAMATION 100 ranking is based, grew by 12.2% to $87.5 million from $78 million.

The company—formed in 1979 when West German Mannesmann A.G., a maker of serial printers, acquired Tally, a U.S. line printer firm—grew in '82 by 100 employees to 1,600.

In June of '82 the company introduced a new multipurpose line printer family with speeds of 300, 600, and 900 lpm which, it says, offers the applications versatility of correspondence-quality printing, bar code, OCR, and special symbol printing. Called the MT 600, the printer can be used for word processing and for high-resolution graphics output.

In July Mannesmann-Tally joined the support group initiated by Intel, DEC, and Tektronix for the adoption of ANSI graphics standards, NAPLPS, and VDI, and began to take a more active role in the X3 (computers and information processing) Standards Committee effort.

A company spokesman said at the time that a graphics standard would allow peripherals manufacturers to deal with a common language and interface and thus they could develop products that would be compatible with off-the-shelf software packages.

In October the company introduced the MT 160 dot matrix printer for microcomputers, which offers dot addressable graphics, permitting a user to produce bar charts, pie charts, curves, or other images created on a video screen.

The 80-column impact printer features a high-density 40 × 18 matrix character printed at 40cps. In a data processing mode it uses a 9 × 7 matrix character for 160cps. It is compatible with all popular makes of microcomputers.

The company gets financial backing, managerial direction, and serial printer products from its West German parent.

93
GENERAL AUTOMATION INC.
P.O. Box 4883
Anaheim, CA 92803
(714) 778-4800

General Automation is still on that long hunt for a turnaround begun when Leonard N. Mackenzie took over as chairman, president, and chief executive officer back in May 1980.

It didn't end in 1982. The company's sales dropped 27% to $84.1 million from $115.6 million. Employment was trimmed from 1,830 to 1,428. It lost $4.9 million for the year compared to earnings of $100,000 in 1981 and its loss per share was $1.90 compared to earnings per share of 5 cents.

GA has sold off its Lamination Technology Inc. subsidiary, which provided multilayer materials for printed circuit fabrication. More recently it sold a 9.3-acre parcel of land with a 108,000-sq.-ft. building that formerly housed its headquarters and a 10.6-acre parcel with a 130,000-sq.-ft. building that it is leasing back for its administrative offices.

High hopes for its new family of minicomputers, called the Series 900, which was introduced in April 1982, were dashed as sales proved slow. The Series 900 is priced 12% below GA's 16/200 and 16/400 Solution Series processors and is designed for industrial, communication, process control, and commercial applications. It will run under Unix System III as well as the company's own Control operating system.

The firm has termed "satisfactory" the customer interest generated by its latest announced offering, GA's first microcomputer line, named Zebra. And the company is optimistic about a machine it is building called Vulture, which will run under the Pick operating system and will attach to any Pick-based machine to increase its speed. Designed by the operating system's author, Dick Pick, it is touted as being able to turn a micro into a full 12-bit virtual machine.

GA will support Zebras and Vultures with its existing network of sales and service facilities and is negotiating with potential new distributors. The firm has seven sales and 60 service facilities in the U.S., plus sales and service locations in 42 other countries.

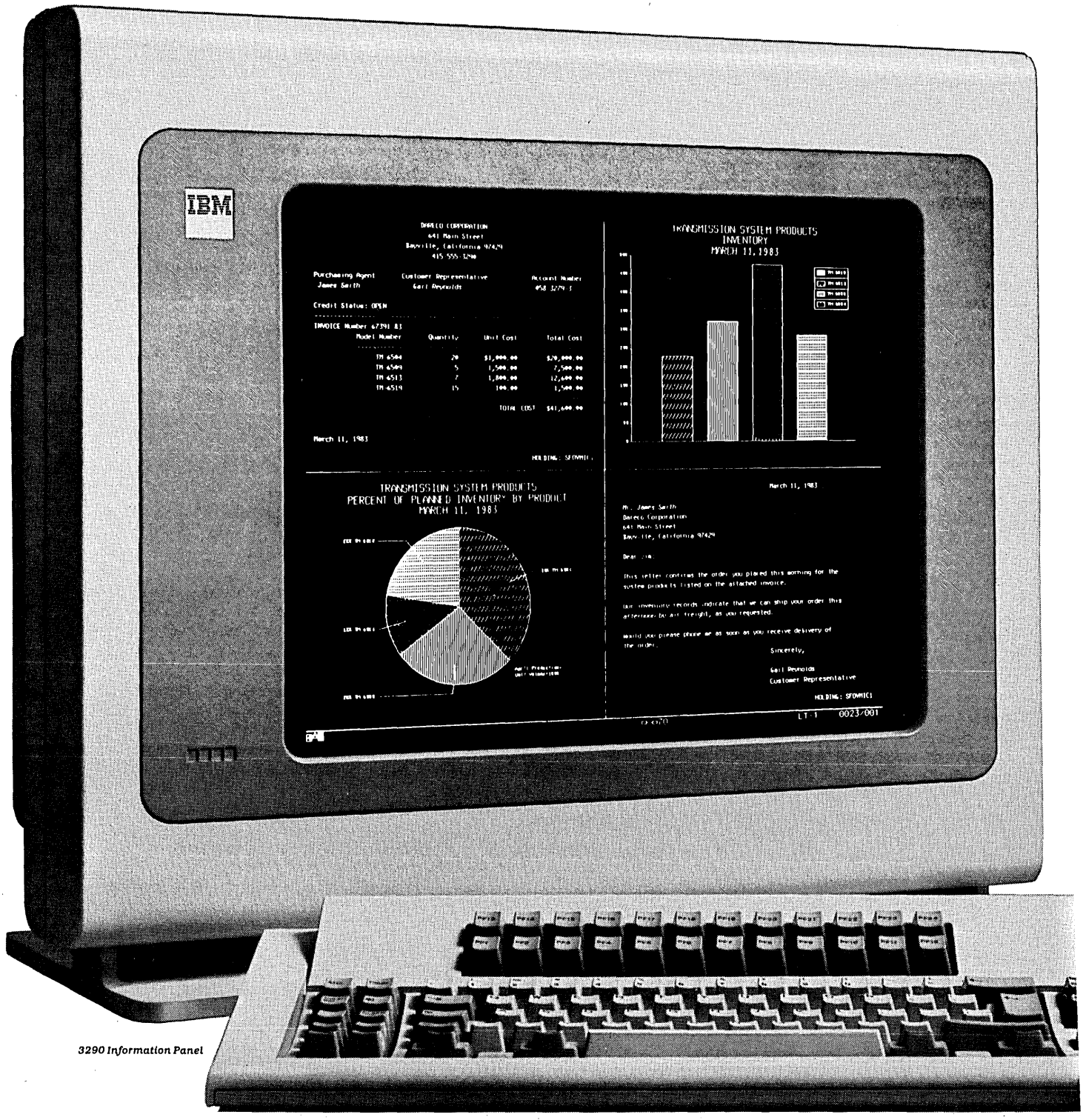
94
ANACOMP INC.
11550 N. Meridian Street
P.O. Box 40888
Indianapolis, IN 46240
(317) 844-9666

Wheeler-dealer Anacomp made its way back into the DATAMATION 100 with a 50.9% surge in dp revenues to $82.4 million from the previous year's $54.6 million. Total revenues for the Indiana-based provider of computer and data center services increased 37.5% to $150.8 million from the $109.6 million recorded in calendar 1981. The profit picture, however, was not as pleasing. Net income was down 29.1% to $6.1 million in '82 from $8.6 million in '81. But what really hurt Anacomp in '82 was that much of its wheeling and dealing soured some investors in the company.

Anacomp is notorious for sponsoring R&D partnerships, and partnerships in which the company's own executives often invest. Then, a few years after a product is well on its way to market, Anacomp buys out the partnership—and at a nice profit for its involved execs.

Meanwhile, the company keeps its R&D spending to a minimum. A case in point came last June when Anacomp purchased for $16 million a new software system called CIS (Continuous Integrated System), developed by Anacomp for RTS Associates, a limited

Our new displays are you've never



3290 Information Panel

ouilt to show you what seen before.

Announcing new IBM displays, new personal computing power and new standards of price/performance.

Personal Computer XT

The goal of any information system is to show you new relationships between different kinds of data. And better, faster ways to get things done.

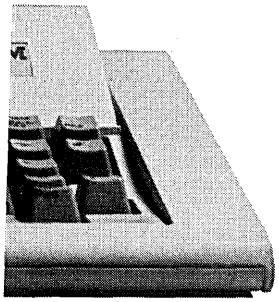
IBM's new display systems and work station products make this easier and more efficient.

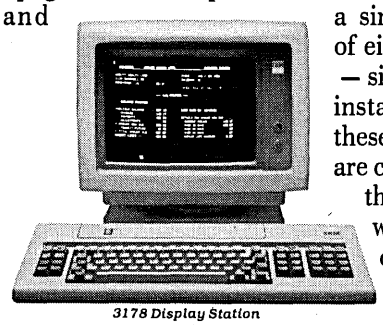
The first is the extraordinary IBM 3290 Information Panel shown above. Its state-of-the-art flat gas panel can display up to 9,920 characters of data and a wide range of graphics, line drawings, charts and sketches.

Even more important, the distortion-free screen can simultaneously display four applications from one or more computers.

It means, for example, you can see a customer's file, your inventory levels, production status and the text of a letter acknowledging an order — all at the same time.

Next is a new version of IBM's highly successful Personal Computer: the IBM Personal Computer XT. It can be linked with large host computers, and it comes with its own fixed disk drive that can store more than 10 million characters — which is the equivalent of 5,000 pages of text or 100,000 names and addresses.




3178 Display Station

Then there's the IBM 3270 Personal Computer Attachment which does exactly what its name implies. It converts any 3278 display tied to a central computer into a personal computer, simply by pressing two keys.

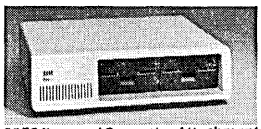
There's also the new IBM 3178 Display Station, an attractive, low-profile terminal that provides the most popular functions of the widely used 3278 Model 2 display at a significantly lower price. The 12-inch screen can display up to 1,920 characters and swivel or tilt for easy use.

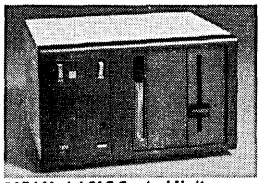
Four new models of the IBM 3274 Control Unit offer dramatic price/performance improvements in directing communications between a host computer and display terminals and printers. Features include a faster, more powerful microprocessor and 50 percent more control storage than previous models — all at the same or lower cost.

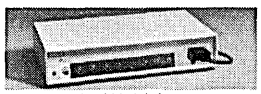
Last, but not least, is the new IBM 3299 Terminal Multiplexer. It connects as many as eight terminals or printers to the 3274 Control Unit with a single cable — instead of eight individual cables — significantly reducing installation costs. When these last three products are combined in a system, the average price per work station is significantly reduced.

Our newest work station products also come with a host of financial incentives. New volume discounts, attractive financing packages and improved availability make them easier than ever to acquire.

And, all of these products are available through your IBM marketing representative, who is ready to work with you in evaluating the best solution to your overall work station needs.


3270 Personal Computer Attachment


3274 Model 61C Control Unit


3299 Terminal Multiplexer

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partnership formed in 1979. When RTS sold out to Anacomp, the executives' $567,000 cash stake in the partnership turned into a $2.9 million return.

Amidst cries of "conflict of interest" from analysts and investors alike, Anacomp retorted that this and all similar deals had been "clean, arms-length transactions." Nonetheless, the company's credibility took a beating with analysts as they questioned whether the partners' presumably risky investments, for which they got tax deductions, had really involved any risk, since some of the executives/investors held the key to Anacomps's decision to buy them all out at a gain. Meanwhile, Anacomp was doing well with CIS; by last September, the company had contracts to license out CIS for $11 million in fees.

Another partnership was dissolved in June as well, when Anacomp purchased for $2.3 million BANKSERV 10000, a system to provide banks with a new level of electronic transaction switching and processing capabilities. Anacomp had also developed that software system from an investment partnership.

Despite some shareholder pleas to the contrary, the company continued to bank on these R&D deals. In the third calendar quarter, funding for another partnership was completed with the closing of the final portion of $26.25 million in partnership interests. The partnership will contract with Anacomp to develop CIBS (Corporate International Banking System), a software system for use by large banks and other financial institutions engaged in international business.

Perhaps the intricate workings of these R&D partnerships would have escaped the critical eye of Wall Street had it not been for Anacomp's noted and noticeable successes. Apart from its steadily rising revenues, visibility was further increased with its first-time listing last April on the New York Stock Exchange. And with a surge in stature comes a surge in scrutiny.

95

SCI SYSTEMS, INC.

5000 Technology Drive
Huntsville, AL 35805
(205) 882-4800

SCI Systems is not exactly a household word, but approximately 41.4% of its 1982 dp sales (up from 18.7% in 1981) came from none other than Big Blue. Dp revenues rose from $15 million in '81 to a high of $80 million in '82, mostly because of its slice of the IBM pie. SCI assembles the electronic circuit boards for IBM's P.C., and due in part to this somewhat symbiotic relationship, the company has joined the ranks of the DATAMATION 100 and become number two on our Gainers table. Its total corporate revenue was up from $67.6 million in 1981 to $133 million in 1982.

This company was founded in 1961 as an engineering firm with NASA as its prime contractor and customer. SCI's earliest efforts were subsystems for the Saturn-Apollo program, which then expanded into NASA's satellite programs, followed by military missile and satellite programs. SCI's present military aircraft business evolved from its space program activities. Among other government contracts, SCI works on MX missile guidance computer memories, the F-16 aircraft management computer, an acoustic data processor for the P-3C aircraft, and several military satellite applications.

Although many firms experienced layoffs and reduced profits during this recessionary period, SCI added 835 employees and watched its profits rise from $3.3 million in '81 to $5 million in '82. Earnings per share also reflected a good year for SCI, reaching $1.13 compared with 84 cents in 1981.

The government is currently SCI's second largest customer. Because the company does a lot of work for the Defense Department, details on R&D and dp segment revenues are kept secret and were not available for this survey.

In addition to government contracts, SCI announced in June '82 an agreement with one IBM division that may offer up to $158 million in sales through December '83.

The future looks positive for SCI. The firm is expanding its facilities to "accommodate continued revenue growth." According to chairman Olin B. King, emphasis during 1983 "will be placed upon successfully translating a large order backlog [$318.7 million in '82] into substantially higher sales and earnings in a difficult economic climate."

96

COMSHARE INC.

3001 South State Street
Ann Arbor, MI 48104
(313) 994-4800

The entire services industry has been wrestling with the onslaught of micros, and some of these companies have been more successful than others at holding their own. Comshare, however, has been pinned to the mat for the past two years, and the company claims it's a direct result of those micro heavyweights.

During 1982 Comshare's revenues dropped 4% to $78.6 million, while earnings (from continuing operations) fell to a mere $825,000 from $4.4 million a year earlier.

Not to be out of the contest, Comshare has made various stabs at a comeback for two years running. In 1981 the company sold a portion of its income tax preparation operation, and the rest of that group was sold in 1982. The company also bared plans last year to discontinue its Trust Management Systems, a minicomputer-based accounting system for bank trust departments. Comshare indicated this phase-out would take about a year.

Besides getting rid of marginal operations, another of Comshare's strategies has been the realigning of its staff. The research and sales departments have been beefed up, while the rest of the company has been pared down. Research and development costs have been padded for the past two years, and hit $7 million in 1982.

These R&D efforts brought some additional product punch to 1982. Planner Calc was released to compete with similar novice business planning systems, and it is upgradeable to a professional modeling system called Target Financial Modeling, also introduced last year. Comshare's master plan is to gain a strong foothold in the market for personal computer software by keeping prices low and by integrating these products into the broader decision support framework, including linkage to large mainframe systems.

For its traditional timesharing clients, Comshare is now producing a version of each of its principal timesharing products for clients' in-house use. The first in-house version will be System W, a high-powered financial modeling package for IBM machines. The company is hopeful that this shift in direction will help it regain some of its former financial muscle.

97

MICOM SYSTEMS INC.

20151 Nordhoff Street
Chatsworth, CA 91311
(213) 998-8844

A newcomer to DATAMATION's Top 100 this year, Micom Systems Inc. had revenues of $78 million in 1982, up 49.1% over $52.3 million for 1981.

Profits for 1982 were up a whopping 69.8% from $7.3 million to $12.4 million. Per-share earnings went from $1.06 to $1.70. Organized in 1973, Micom made its first stock offering on June 19, 1981. Opening price for stock in January 1982 was 28½; closing price at year-end was 49¾.

Considered the dominant supplier of low-end statistical multiplexors, Micom, with more than 50,000 installed systems, continues to experience growth in all of its product and market sectors. Its fastest growing product is its Micro600 Port Selector, which represents about 17% of revenues and is growing at an 80% rate. The company has an installed base of 700 of these devices, which stands at the heart of a long-term strategy to penetrate the low end of the local area network (LAN) market.

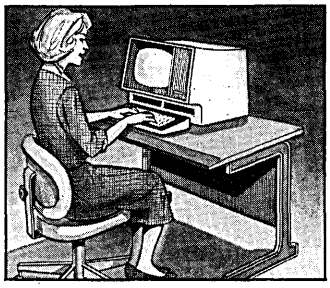
Micom grew 40% in number of employees in 1982 from 652 to 915. Research and development expenditures were up 71.8% from $3.2 million to $5.5 million.

During the final quarter of calendar 1982, the company introduced a number of new products including the Instalink469 data/voice multiplexor, the second in a series of "Insta" products for LANs. This lets data and voice share twisted-wire pairs and can be installed with existing phone installations.

Micom is identified in the data communications industry with its "fruity" advertisements. It all started with oranges. When the company introduced its Micro800 Data

TECHNOLOGICAL BREAKTHROUGH IN BUSINESS COMPUTERS!

CADO introduces world's first tri-level, 16-bit supermicro... all the power you need to support up to 64 users at incredible speeds!

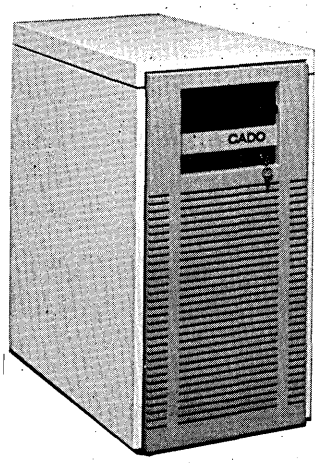


New CADO TIGER family has up to 14 processors in a three-level architecture that share the work load and give you the power and response to do *all* your processing jobs at the same time.

First, there's the Transaction Processor. The workhorse of the system, it interfaces with user terminals, printers, modems and other peripheral devices. Alone, each Transaction Processor has more computing capacity than many complete computer systems.

Secondly, the Intranet Processor takes on the long processing jobs to free up the Transaction Processor.

Finally, the Control BiProcessor interfaces to the disk-and-tape-storage devices to speed up disk access and memory-to-memory transfers.



CADO TIGER ATS

Three levels of processors working *together* give you more power and faster response than any other micro—or mini—computer can match.

CADO makes it easy to grow with your TIGER, too. You start with a few peripherals and 15 million bytes of storage. And you can end up with 64 devices and 1.1 billion bytes of data storage!

Whether it's your first or next system, chances are this CADO TIGER will be all the computer your business will ever need.

And you'll be amazed at how little all this power costs. No more than lesser micros. And much, much less than minicomputers.

CIRCLE 123 ON READER CARD

Now part of the $3.9 billion Contel organization, CADO has been a leader in business systems technology for seven years and is sold and serviced by over 180 distributors worldwide.

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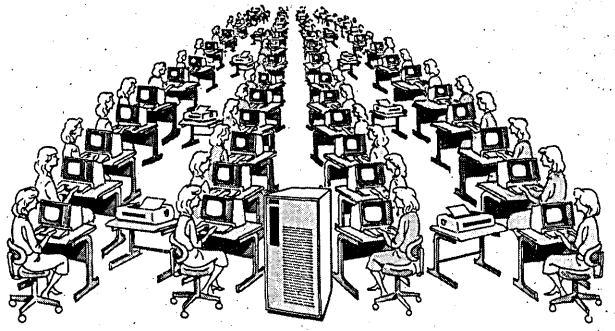

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D-6

Concentrator in 1977, it advertised this product by asking the question, "Still squeezing data the old-fashioned way?" The answer was illustrated with an orange juice can: "Concentrate. It's cheaper."

98

PRINTRONIX INC.

17500 Cartwright Road
Irvine, CA 92713
(714) 549-7700

Despite the 1982 slowdown of oem sales in general, Printronix came through with increased sales and earnings. The printer manufacturer, which garners about 60% of its revenues from the oem market, saw sales climb 28.7% to $77.4 million. Earnings increased 12.2% to $5.5 million from the $4.9 million of a year earlier.

Printronix didn't pin all its hopes on existing products to pull it through a tough year. The California company came out with a new printer, the MVP, that diversified it from the minicomputer market into the small business system and office automation marketplace. Smaller, quieter, and cheaper than Printronix's classic models, the MVP produces dp output at 150 lpm, wp at 80 lpm, and compressed print at 200 lpm. Initial orders were strong, and the company indicated it would increase production facilities this year.

By midyear, another new product hit the street—a graphics processor that can transform any Printronix printer into a graphics printer. Early orders indicated this too would be a promising product during 1983.

Expectations for an even stronger 1983 were raised when Printronix announced in early '83 its acquisition of Data Printers, the Massachusetts-based printer maker. A privately held company, Data Printers had 1981 sales of about $35 million. This acquisition will no doubt push Printronix over the $100 million mark in revenues for 1983.

99

SCHLUMBERGER, LIMITED

277 Park Avenue
New York, NY 10172
(212) 350-9400

What does it really matter that Schlumberger's $6.3 billion in revenue in 1982 represents a 5% increase over 1981, or that its profits climbed 6% to $1.3 billion? Schlumberger's four entries in the data processing market—Applicon, Manufacturing Data Systems Inc. (MDSI), Benson, and Rixon—together are barely a drop in the oil giant's bucket. The problem is that Schlumberger does not publish detailed information on the many individual drops in its bucket, so no figures are available concerning divisional profits, R&D, revenues, employees, etc. The figures in the Top 100 table represent DATAMATION estimates for Applicon only—although Applicon and MDSI are grouped together within Schlumberger as the Computer Aided Systems division.

Applicon is the largest of the four, with revenues in 1982 of $76.2 million. (This excludes $19 million in internal revenues.) Although sales dropped some 2% in the U.S. in 1982, a 39% gain in international sales was sufficient to raise Applicon's revenues 14% over 1981. Applicon introduced the Series 4000 modular CAD/CAM system in the second quarter. The 32-bit system is composed of compatible hardware and software modules that can be configured to meet many users' requirements and be upgraded later in the field. Users can implement communications between Series 4000 systems so that design and manufacturing operations can share information. DATAMATION estimates that R&D within Applicon leading up to the Series 4000 and future products amounted to 14% of its total sales, or $13 million.

MDSI also introduced new products in 1982. The N/C Graphics system permits users to describe part shapes and tool motions graphically using a color display screen, reducing the time and complexity involved in producing N/C tapes.

Benson, a privately held company acquired in October, recorded an increase in its sales of pen and electrostatic plotters, as several new products were added to its line. Rixon's revenues declined owing to strong competition in the high-speed modem market.

Schlumberger's motives in acquiring these companies—three in the last two years—seem to be geared more to improving in-house capabilities than to developing new markets aggressively. But the acquisitions may give the company a stronger base from which to pursue the market for collection and interpretation of industrial data.

100

DECISION DATA COMPUTER CORP.

100 Witmer Road
Horsham, PA 19044
(215) 674-3300

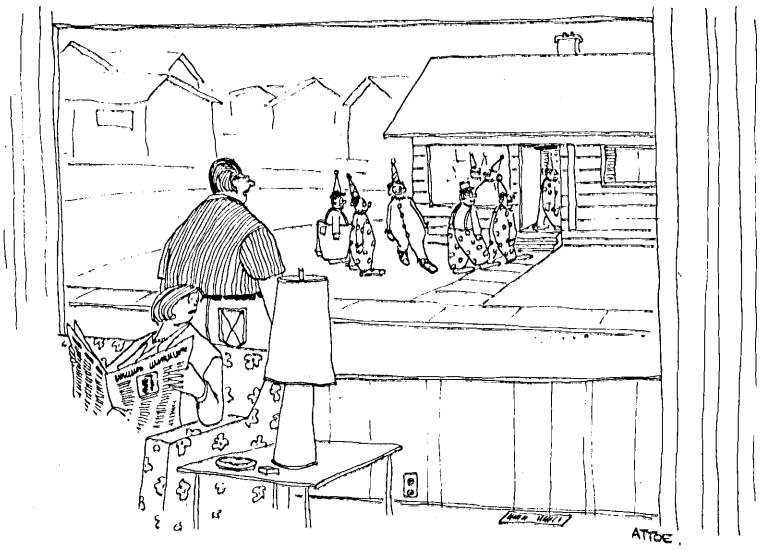
This peripherals and service company's 1982 results were good enough to propel the firm into the DATAMATION 100 for the first time. Corporate revenues rose 48.3%, to $74.3 million from 1981's $50.1 million.

The company's core business—printers, controllers, data entry equipment, and a workstation for the IBM System/34-38 market—accounted for a good chunk of the improvement. Revenues in this area rose 62%, to $46.5 million from $28.7 million. The star performer was DDCC's crt workstation, first shipped in January 1981. The company delivered over 14,000 of these units in '82, nearly quadrupling the 1981 figure. DDCC also introduced three new products in 1982: a 300-line-per-minute matrix line printer, a line of high-speed band printers, and a communications controller permitting remote connection of up to nine of the company's workstations and/or printers to IBM hosts. Most DDCC products can also be interfaced with equipment from HP, DEC, and other manufacturers.

In addition to selling and leasing to end users, DDCC participates in the oem business in two ways: by selling to systems houses, and by configuring systems itself, most notably for the U.S. government.

The other major segment of the company is its maintenance business, which saw revenues grow 43% over the previous year to $22 million from $15.4 million. The growth resulted from DDCC's larger installed base of equipment and from its increased participation in the third-party service business. DDCC started servicing other manufacturers' equipment in 1980. In October 1981 it purchased the maintenance division of Atlanta-based Computer Usage Corp. In June of 1982, DDCC announced it had acquired the field service business of Ramada Inns Inc.'s International Micor Services Unit.

DDCC's total corporate profits in 1982 were $3.8 million, up 90% from 1981's $2 million.



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CARTOON BY STEVE ATTOE

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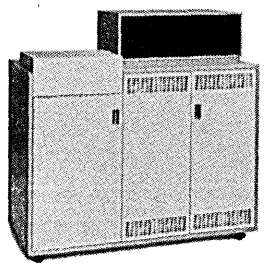

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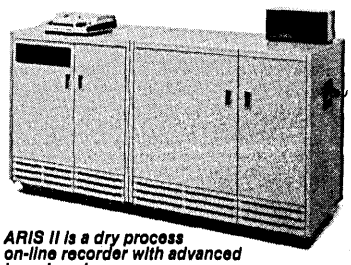

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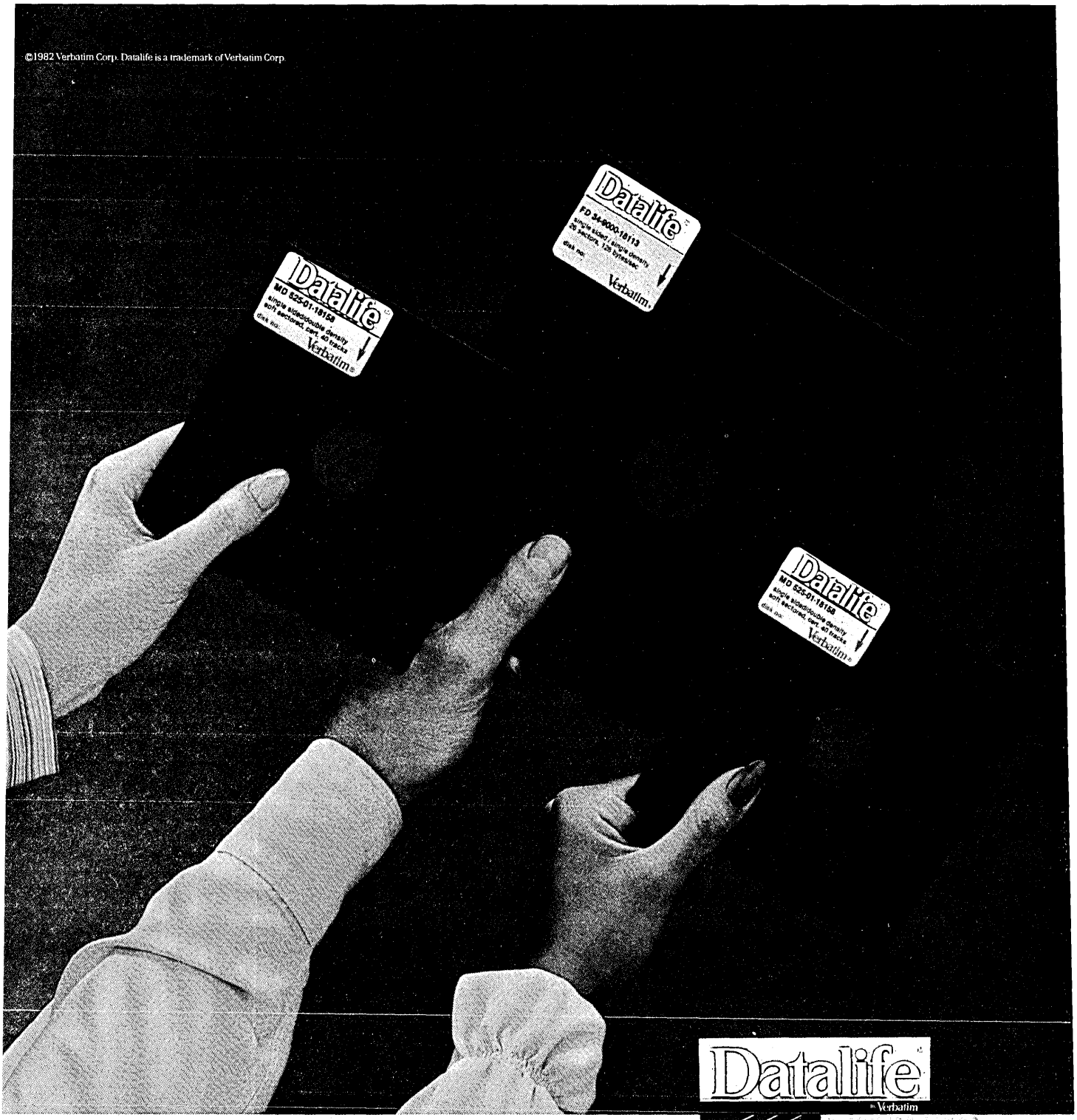

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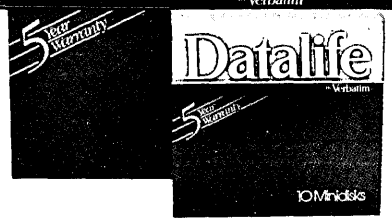

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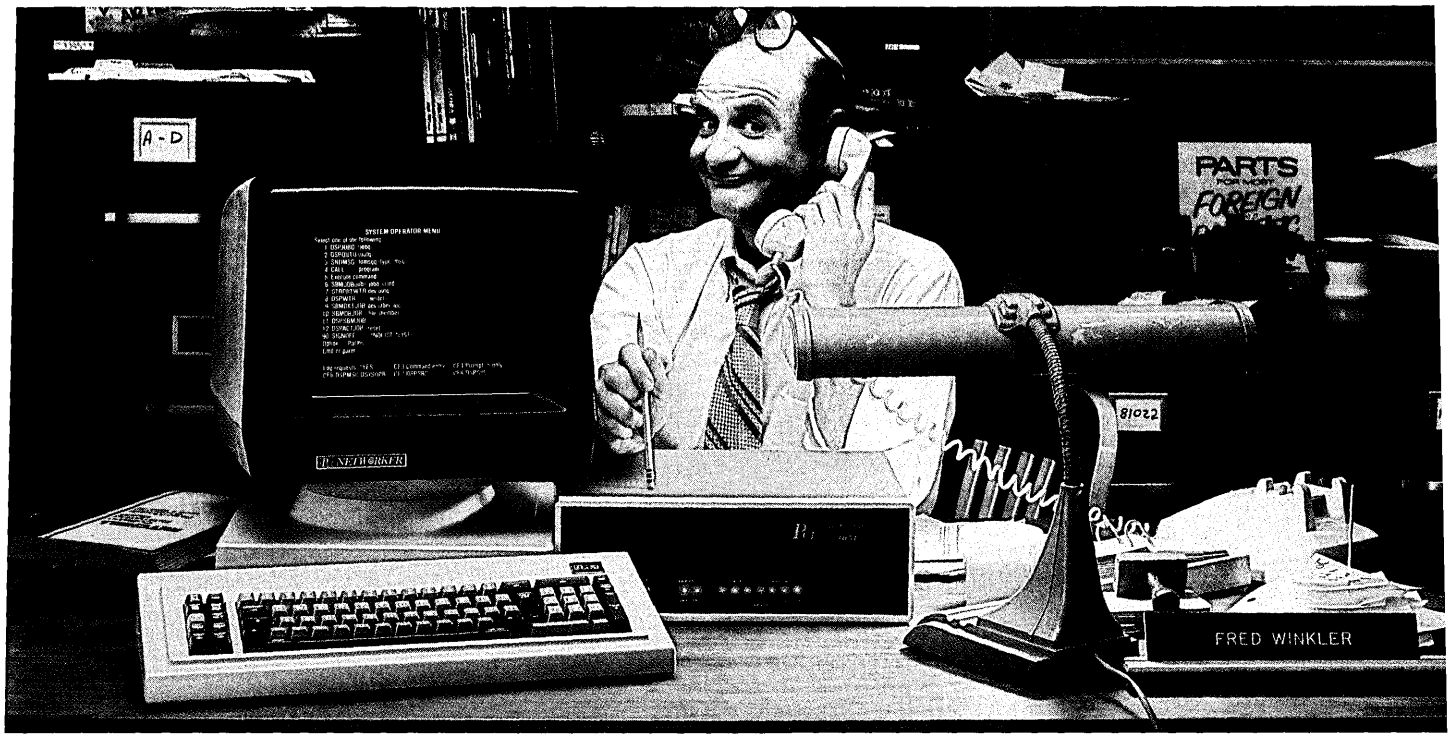

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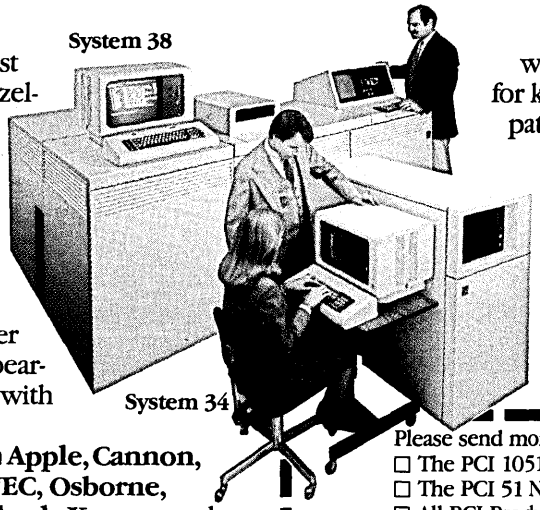

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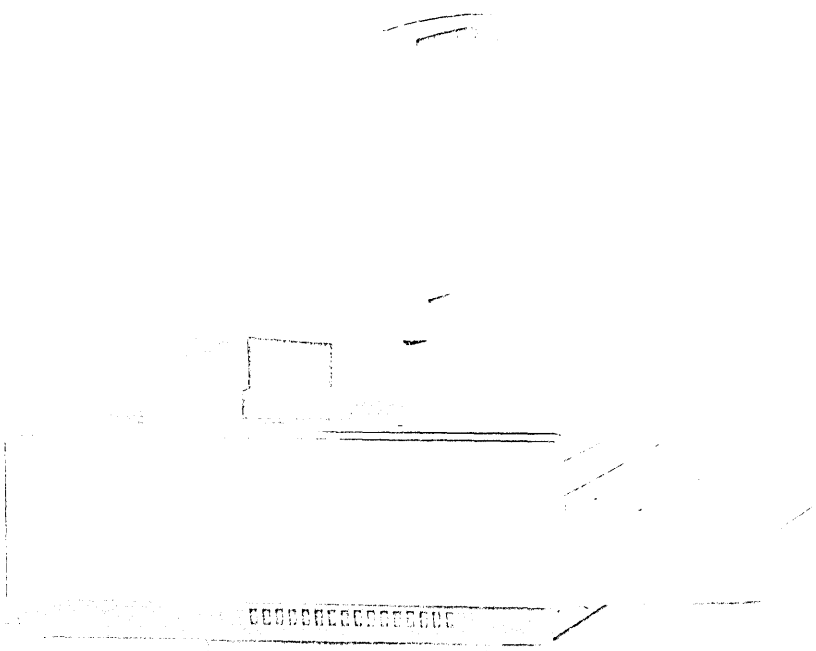
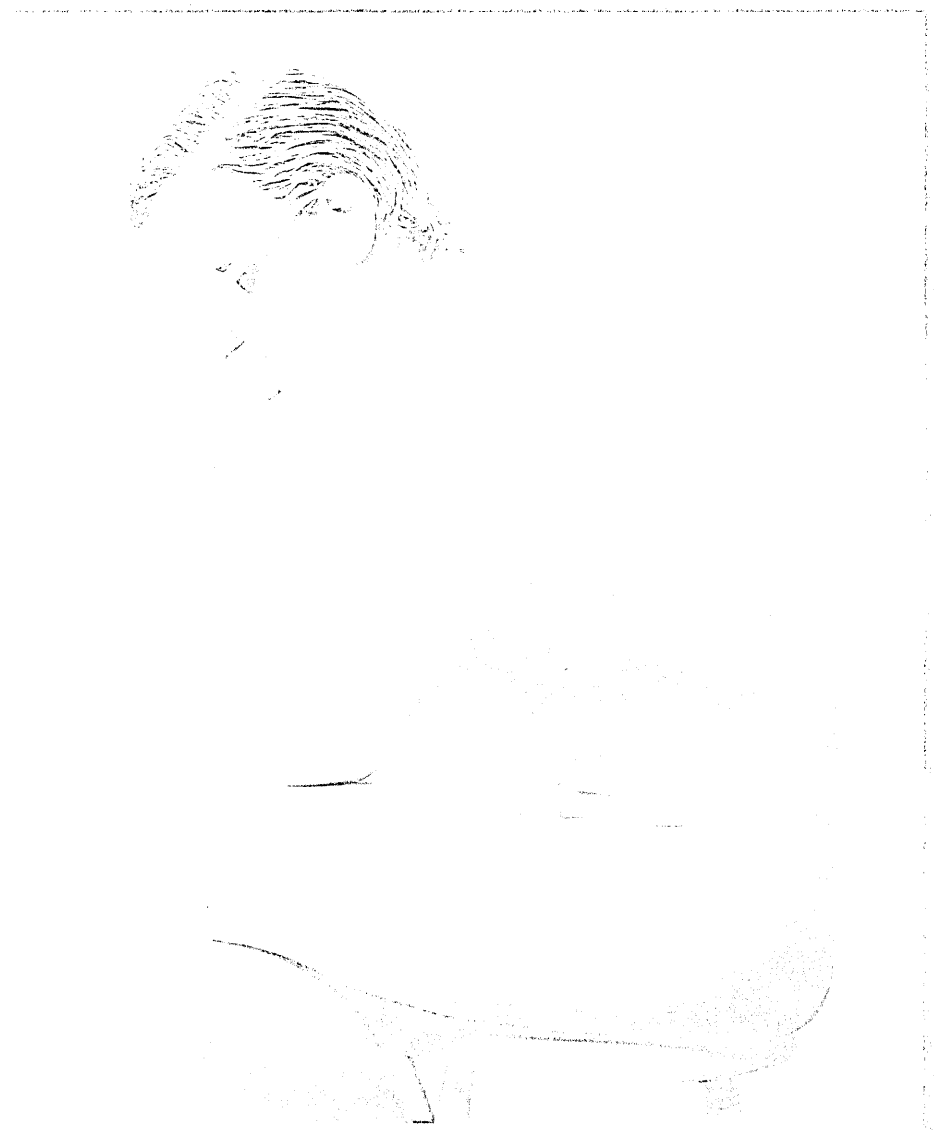




A do manager's guide to implementing decision support system.

TECHNOLOGY FOR THE EXECUTIVE THINKER

by Richard T. Denise

Little known and less understood, the decision support system (DSS) is nevertheless catching on fast. Executives and managers with little knowledge of data processing are personally using computers for assistance with critical decision making. Not only does the DSS give managers the means for managing and retrieving the bewildering amount of information available to them, but it also enables them to utilize that information in a manner suiting their special needs.

More often than not, however, executives in search of specific solutions to their business analysis problems do not approach their departments with detailed requests for comprehensive decision support systems. Rather, they make a wide variety of

PHOTOGRAPH BY STEVE COOPER

Even with a growing body of applications software and increasing processing power, personal computers often don't match expectations.

demands—some of them specific, and some of them extremely vague. Their requests might range from production of sales and financial forecasts with business graphics for management presentations, to help with pricing decisions, to a general desire for new analytical tools to better understand the competitive environment.

It is left to the data processing manager to discover exactly what kinds of decision support capabilities top management actually wants and needs, and then to implement a cost-effective, computer-based system that will satisfy those needs. Success in this endeavor depends on three things. First, the dp manager must find out what information and analysis capabilities management really wants. This requires familiarity with how the organization itself actually works—which means tracking the information flow through the management structure and understanding how decisions are made. Who are the key players in the decision-making process, what kinds of data do they rely on, and how do they make decisions?

Next, the dp manager must become familiar with all the products that supply decision support capabilities to management. This is an increasingly difficult task. Nearly every hardware and software vendor claims to offer "white-collar productivity tools" in one form or another, and separating the wheat from the chaff in this complex marketplace is a demanding job in itself.

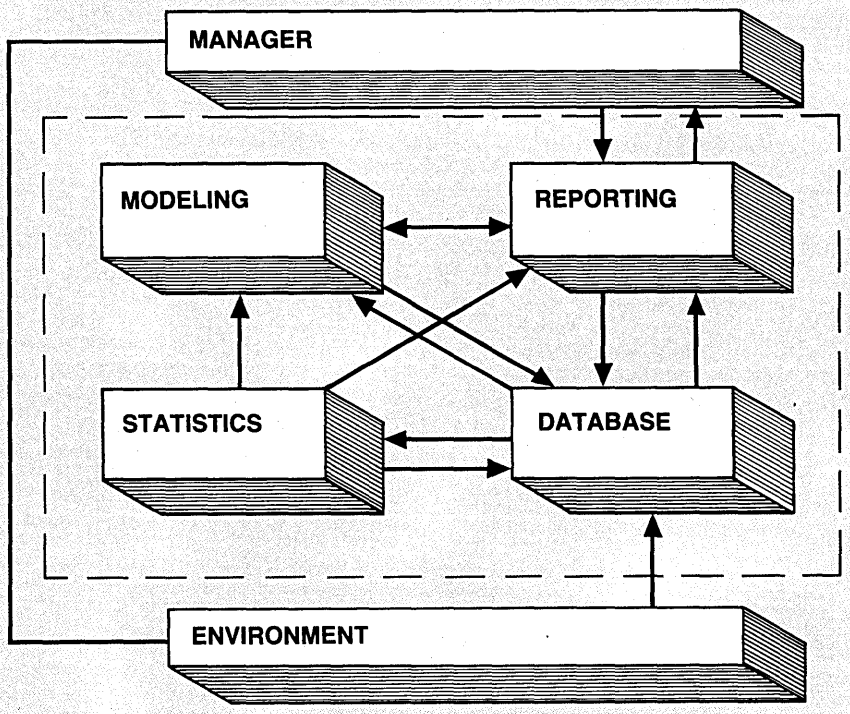
Finally, the dp manager must match the available products to the specific management needs of his organization. That might mean the introduction of a single, specific application or combination of applications for one manager or analyst; or, it might require installation of a comprehensive, integrated decision support system providing varying analytical capabilities to a broad range of executives drawing upon the entire corporate database.

Every large organization is unique, with its individual management structure and its own set of values and norms popularly known as "corporate culture." But in assessing top management's need for analytical and information management capabilities, there are some common guidelines that provide a frame of reference and starting point.

Executives are concerned primarily with obtaining and analyzing management data, as opposed to operational data. While dp management is often concerned mostly with vital operational data—meaning payroll, accounts receivable, sales records, inventory, and other data processing tasks integral to every company's management information system—senior management is looking for much more. When an executive does need operational data, he doesn't want to see the level of detail these systems were designed to produce.

FIG. 1

THE FOUR MAJOR COMPONENTS OF A DSS



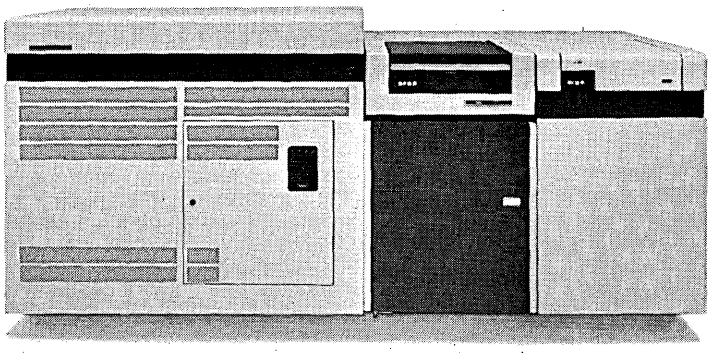
Senior management needs to monitor numerous operations in relation to each other for more effective analysis of overall business performance. Executives seek an understanding of those factors, both internal and external, that drive the business. To reduce the risks of choosing alternative courses of action and enhance their potential rewards, managers need to learn what is likely to occur in the future. Once decisions are made, they need to test the possible results of those decisions under a range of future scenarios.

INTEGRAL SOFTWARE FUNCTIONS

There are identifiable software functions that best satisfy these management needs. The first is a database management system that organizes data in ways relevant and useful to executives. It must provide ready access to the user and also be capable of collecting and storing data from many sources—transactional systems, MIS databases, outside data vendors, data entered on-line by executives, etc. It should be easy to enter new data and to change the relationships among the data. This is important when the organization goes through structural changes or reporting relationships are altered. The second software function integral to decision support is a range of preprogrammed, statistical analysis techniques for manipulating the information organized in the database and determining the underlying relationships between the various data elements. These elements might include financial, marketing, economic, and operational data. Next, the manager often needs the ability to create models to forecast future events, analyze the potential impact of decisions, and assess the effect of possible changes in various business conditions. Finally, the manager needs a variety of graphical and report-writing capabilities to view the data and effectively communicate the output of any modeling or analysis.

A decision support system, then, is ideally a comprehensive computer software system encompassing everything a manager needs: highly flexible, adaptable database management; powerful modeling capabilities; a wide range of easily accessible statistical and mathematical techniques; presentation-quality graphics; and report writing—all in one user-friendly, interactive DSS available through a desktop terminal (see Fig. 1).

There are many available solutions that perform some or all of these functions. Depending on the information needs of senior management, some are better than others. These solutions range from the many



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For an integrated set of solutions to diverse problems, top management often discovers it needs a comprehensive DSS.

relatively inexpensive software packages available with the currently popular desktop personal computers to more powerful forecasting and modeling applications packages for minicomputers and mainframes to comprehensive, integrated in-house decision support software provided by a limited number of vendors.

The successful implementation of any of these DSS solutions depends not only on choosing the right system for an organization's needs but on other factors as well. In addition to fundamental agreement about goals and methods between dp management and the executive suite, there must be a commitment to the creation of an internal support staff to maintain and build the system. There also must be active, ongoing involvement and support from top management.

Choosing the right solution depends on an accurate analysis not only of current needs, but also of the future decision support requirements of the organization. As executives become comfortable working with decision support applications, they invariably want more. As familiarity with the system spreads throughout the organization, demand from individuals seeking access to DSS tools grows geometrically. Handling this potentially explosive situation requires a flexible system capable of organic expansion of both processing power and the number of DSS applications it can support.

EXECUTIVE STATUS SYMBOLS

The first DSS alternative most managers become aware of is the personal computer. Ever since VisiCalc and other spreadsheet programs spurred the boom, personal computers have not only become executive status symbols but in many quarters have also taken on the mantle of the ultimate executive productivity enhancement tool of the '80s. Indeed, personal computers have had and will continue to have an enormous beneficial influence as a means of introducing non-dp-oriented executives to the value and practical applications of information processing. They have certainly provided the dollars-and-cents benefit of offloading some of the applications in the data processing department backlog.

But even with a growing body of applications software and the ongoing increase in storage capacity and processing power, personal computers often don't match expectations. Executives all too often are confronted with the limitations of their personal computers well before all their information management and analysis needs have been satisfied. Personal computers are useful in relatively simple situations but are limited in the size and amount of data they can handle. And they are far from performing applications that many executives routinely require to make decisions, such as pricing analysis or corporate consolidation.

More important, personal computers are limited in their ability to take advantage of the corporate-wide database. Although a small number of interface programs are available that enable personal computers to draw down data from mainframes in a format ready for desktop processing, they still are not yet capable of doing enough number crunching to perform sophisticated modeling and forecasting applications. And, when managers ignore the corporate database entirely and use their own data with their own personal computers, there is the potential for serious trouble if important decisions are based on inaccurate or contradictory data.

This is not to say personal computers have no place in corporate decision support systems. They increase productivity in certain specific cases and make managers comfortable working in an interactive environment at computer terminals. Moreover, they will soon be capable of easy integration into the corporate mainframe computer to serve as very intelligent terminals.

The evolution of touch-screen technology, the user-friendly mouse, and other techniques eliminating the need to deal with syntax or type at a keyboard will make it easy for nontechnical executives to enter or access data in the mainframe. And as split screens, extensive menus, and other "help" facilities become available to users, the personal computer might well evolve into the primary window through which managers access integrated decision support facilities.

The next option available, and currently the most popular, is the line-item modeling language. These software applications packages for minicomputers and mainframes give the manager or financial planner the ability to work with large numbers of variables interacting with each other to come up with models of potential economic and business behavior. By changing or inserting a new variable in a large spreadsheet of information, the analyst can look at the effect on every other item in the model. These programs are available from a large number of vendors and, because they perform specific, circumscribed functions, they are priced low enough to be attractive to dp managers who are starting to test the DSS waters.

MODELING LANGUAGES LIMITED

For specific applications, these modeling languages can provide more than enough functionality for planners and analysts. But if the manager seeks a broader view through more sophisticated manipulation of information available in the corporate database, these packages too have their limitations. For instance, line-item modeling languages working in two dimensions are unable to perform cross-sectional analyses of data such as sales across regions and salespeople in a number of product lines at a given point of time.

Another omission is database management capability. Some of the products available are starting to integrate elementary forms of data management. But getting data into and out of these systems—without having to go through the artificial steps of creating flat files from a dp system extract—can still be burdensome. In any case, they eat up the time of non-data processing professionals—assuming those executives have even chosen to take the time to learn to use the system in the first place.

To overcome these hurdles, in some instances dp managers find it cost effective to marry with their line-item modeling languages another category of product—database management languages such as NOMAD, RAMIS, FOCUS, and others that operate in a DSS environment. These products do an adequate job of extracting data from transactional processing systems and of organizing data via the traditional select, sort, and print. But even these, for the most part, lack preprogrammed, analytical capabilities and other kinds of sophisticated modeling and simulation capabilities.

In other words, they do a good job of monitoring and displaying past performance but have limited ability to use that information in more sophisticated decision support applications. Moreover, because they are a combination of two or more separate software packages that weren't originally designed to work together, they require users to learn two or more languages. Therefore, financial planners and other managers who begin their quest for a DSS with a cost-effective, line-item modeling language alternative often find that, sooner or later, they outgrow it.

Another cost-effective way to get started with DSS is through on-line timesharing services providing specific forecasting or modeling capabilities. One example is the external subscription database—from vendors such as Chase Econometrics and Data Resources—which can be extremely useful for managers who need to relate internal financial analyses to external macroeconomic forecasts and models.

Moreover, some of these service vendors offer customers the capability to manipulate external data with programs that can be used in-house. Products such as XSIM (International Data Corp.), EMS (National CSS), or TSAM (Cybernetics) are powerful, a preprogrammed statistical and analytical routines with both line items and procedural and operational kinds of modeling capabilities.

These were originally designed primarily for time-series analyses, however, and are not designed to be integrated easily

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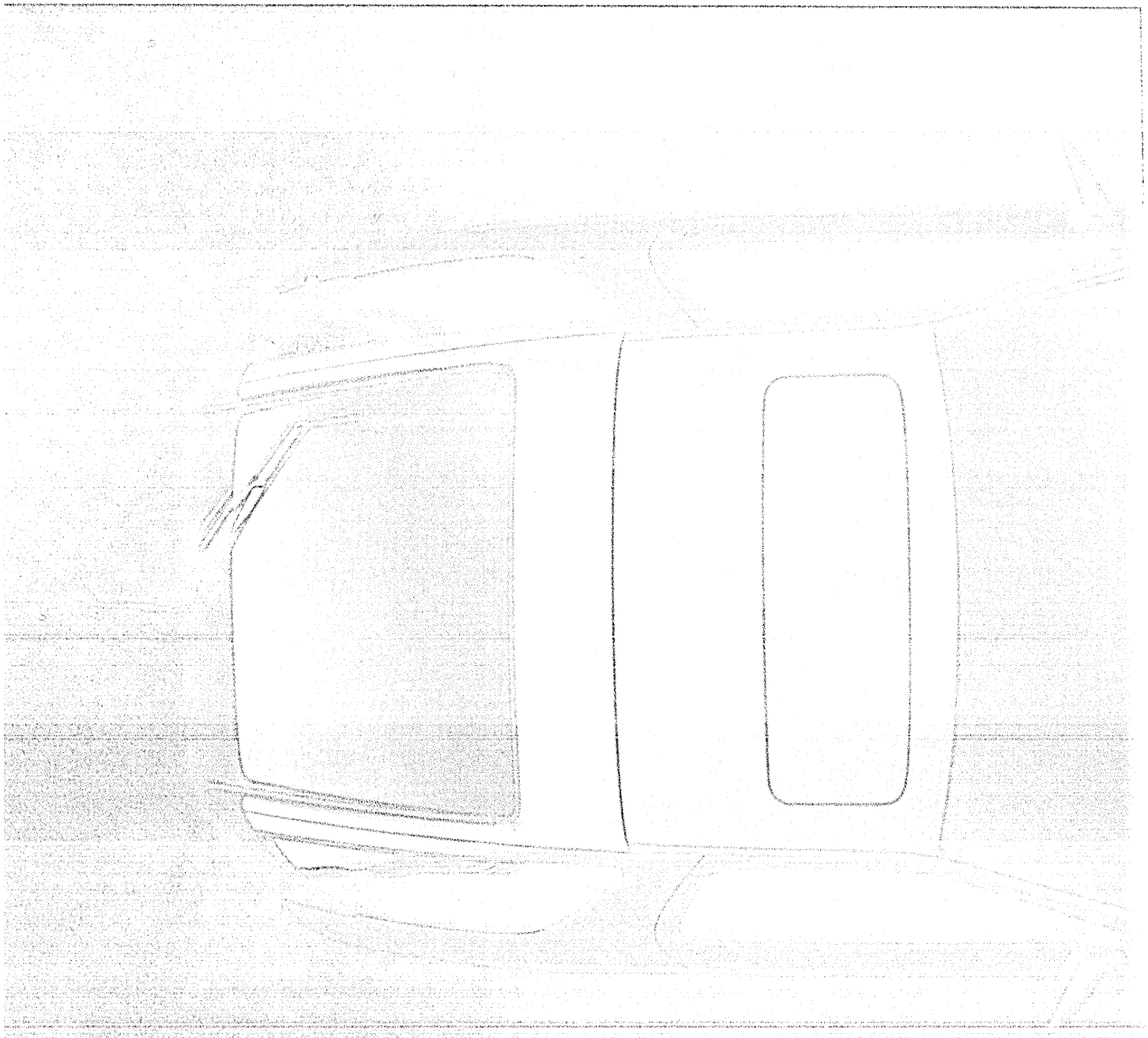

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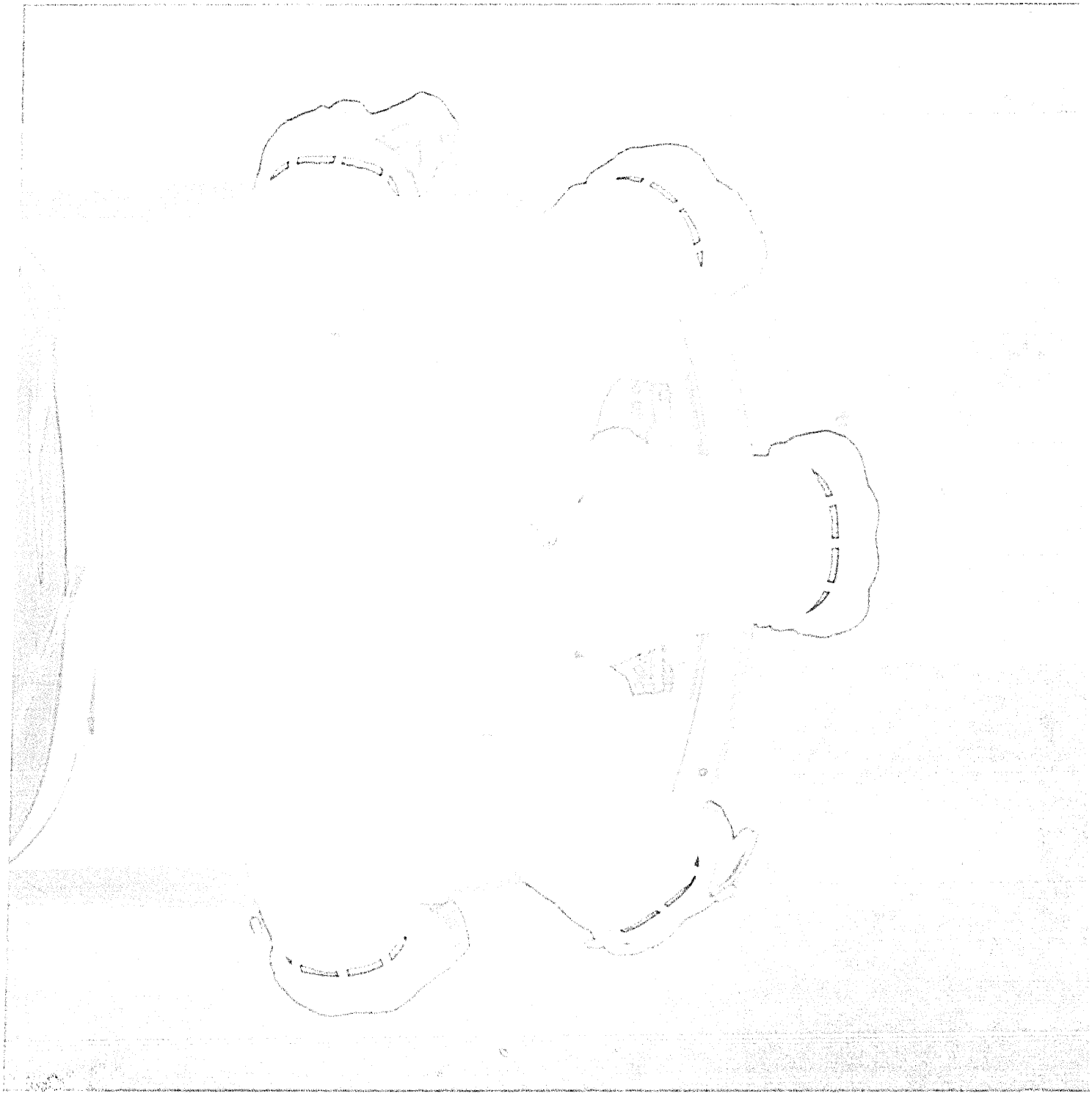

An initial period of timesharing, then a transition to in-house processing is the safest route to follow.

into an organization's internal decision support structure. Moreover, they are limited in the range of ways they can easily generate reports using the command syntaxes available. And they usually do not have standalone databases that would greatly enhance their usefulness.

DECISION SUPPORT CHOICES

By now it is obvious that there is a host of attractive alternatives to supply top management with one or more of the broad range of capabilities generally known as "decision support." For instance, the financial planner who needs to look at a limited amount of financial data for a specific purpose can acquire a line-item modeling language. Similarly, the business planner who wants access to historical information to help analyze current trends can use a variety of database management languages. And the corporate economist has a range of preprogrammed statistical modeling packages to choose from.

But for an integrated set of solutions to all those problems—so planners and managers can access the same large corporate database, perform analyses, generate reports and graphics, and create and manipulate models and projections that look to the future—top management often discovers it needs a comprehensive, integrated DSS.

A number of companies are approaching this concept from several directions, most often by purchasing individual applications and building the interfaces themselves. However, because these interfaces are usually created by the dp department, they are difficult for nontechnical executives to use. And because there is little if any relation between the various vendors' packages, when the vendors announce new enhancements they require further extensive modifications or entirely new interfaces.

With its Information Center concept, IBM is among those moving toward an integrated DSS. But the Information Center is essentially a group of discrete mainframe software packages tied together with an array of interfaces that the user must master before he can take advantage of the full power of the combined system. It is not as elegant or user friendly a solution as many would like.

A key to integrated decision support is the creation of a software environment that, while taking advantage of the full power of the minicomputer or mainframe storing the corporate database, also simplifies the process of accessing data and running a wide variety of analysis and modeling programs. Users working with a common language in a unified software environment not only work with individual applications more productively, but also use other applications more often because they are easier to learn.

Essential to this process is establishment of a common and familiar terminology across all applications. Learning in such an environment is easy and natural.

Even more important is the logical organization of data in easy-to-define data structures that are familiar to managers. For example, if it makes sense to organize information by account, month, and department instead of by product, week, region, and delivery mode, the software should readily support these data structures. This is where many of the row/column financial modeling languages break down, because they force the user into artificial structures to manage data.

Finally, to be cost effective, an integrated DSS should support a wide range and large number of users. An effective database management capability will support users from many sectors of the organization, allowing single copies of information to be used by a wide range of functional groups. This sharing of the same data not only increases the cost effectiveness of the system as a whole, but also increases productivity by reducing the number of time-consuming conflicts due to different managers basing projections and analyses on different data.

Only a few vendors (Boeing Computer Services and IDC, for example) supply this complete, integrated capability with unified DSS software environments. These all represent large initial investments that, even though they offer a fast payback, highlight the need for care and planning not only in vendor selection, but in implementation and ongoing support of the system.

COSTS OF INVESTING IN DSS

The implementation of a DSS requires a sizable investment in hardware, software, and people. For example, the cost of a comprehensive, integrated Express DSS from Management Decision Systems, Inc., starts at $75,000 for a system with applications ranging from production of management graphics to sophisticated modeling and forecasting.

Startup activities include needs assessment and extensive planning prior to installation. The vendor should offer consulting services to help with these activities and should remain actively involved with the system well past the startup phase, as an in-house support group is created.

The issue of support, both from the vendor and in-house sources, is critical. The most important party in the support process is top management. Even if the initial request for DSS capabilities came from the executive suite, there is a need for ongoing education and consultation to ensure a strong commitment from top management. Decision support systems dramatically change the way people work, and changes of this magnitude do not happen unless top management is firmly behind the change. Without management's commitment to DSS, it will never be implemented, much less utilized.

The key to obtaining support is a complete understanding of management's needs, in-depth knowledge of the information flow in the corporate structure, a good feel for how top executives think, and finally the active involvement and education of management in the use and development of the system. If appropriate DSS software is selected, if a methodological approach to the implementation developed and a plan for an internal support organization developed, and if the appropriate hardware environment is planned, senior management can be shown the real, demonstrable value in having a DSS in the organization from a cost, productivity, and information management standpoint.

With the backing of top management, it is then possible to start working intensively with prospective users of the DSS. Users should be deeply involved in the development of the system because, with the development of DSS software over the past 10 years, it has become possible for the least computer-literate user to grasp the design and implementation issues.

Moreover, the flexibility of DSS software eliminates the need for strict adherence to classical development strategies that were designed to address the limitations of lower-level programming languages such as FORTRAN and COBOL. The key to success in implementing DSS systems is a well-developed database. If the analysis, definition, design, and implementation of the database component of the DSS have been carefully developed, the other capabilities of the DSS will be easily defined, designed, and implemented. This allows for a less detailed development strategy, meaning the project can move forward at a much faster rate.

It is important to work closely with top management and other users prior to installation to discern what information is utilized in the decision-making process, to decide what critical data should be included in the system's database, and to determine how the data files should be structured. This requires a detailed definition of the source systems, the necessary links between the source systems and the DSS, the basic manipulations of the data, and what the output will look like.

Next, a more detailed design of the system should be written to address each of the various capabilities of the DSS. Because DSS products are composed of various building blocks, allowing for a modular design starting with basic functions, an evolutionary design and implementation process is possible. That, in turn, allows for a dynamic system to meet future needs.

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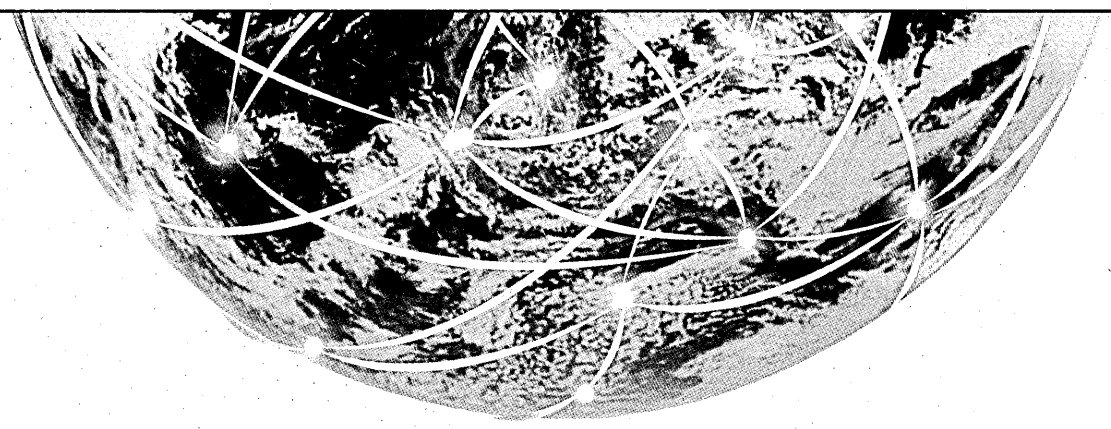

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A DSS ideally is a comprehensive computer software system encompassing everything a manager needs.

SYSTEM STARTING POINTS

There are two alternative starting points in implementing the decision support system itself. One is to deliver a basic DSS to as wide a user group as possible. The other is a more evolutionary method, starting with a single application and gradually enlarging the system with other functions.

In the first instance, the DSS's ready capability to define and capture historical data goes a long way toward meeting basic reporting, analysis, and modeling needs for a wide user base. The chief benefit of starting with these basic capabilities is that a usable system can often be delivered in as little as three to six weeks, and even in the most complex situations in less than six months. This reduces the risk of implementing a DSS, as usable results can be delivered quickly and at low cost, meeting a broad segment of the user community's needs in a very timely manner. But the numbers of people who have to be trained and the amount of technical support needed are substantial.

In the evolutionary method of implementation, a specific application area is targeted and addressed via the DSS software and the vendor's consultants. This approach generally results in a high-value solution for a specific user organization. After the successful implementation of that capability, additional areas can be addressed and over time an integrated DSS developed. Because it is targeted at a more specific audience, this approach requires less comprehensive support and training. It can be every bit as successful as the other, although care should be taken in the design to ensure easy integration of future capabilities.

An initial period of timesharing on the vendor's machines followed by a transition to in-house processing is generally the safest route to follow in getting started. During the timesharing phase the appropriate hardware environment can be determined, the software can be more carefully evaluated to ensure it is capable of meeting the defined needs, the internal support group can be organized and trained, and the exact specifications of the in-house system can be determined. As hardware prices plummet and software products multiply, some organizations are choosing to bypass this crucial phase—only to wish at a later date they had been more careful.

The in-house transition should occur if the internal support organization becomes self-sufficient, if the project can be easily cost-justified, if management is sensitive about having proprietary information on the vendor's machine, and if more internal control is needed on the evolution and use of the DSS in the organization. A strong consulting capability on the part of the DSS vendor is critical both in implementation and transition to in-house.

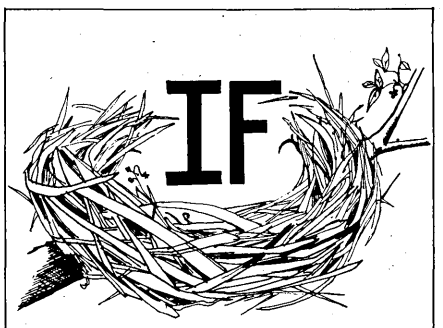
The final element of this implementation process is an ongoing series of audits that address several issues. First, is the system actually performing what was intended when it was implemented? Is it useful? What should be added? This assurance increases the organization's confidence in the widespread application of DSS.

Second, a review of the overall system design should be performed periodically to determine if resources are being used as efficiently as possible and to ensure that all possible user-friendly characteristics are in place. Finally, the future evolution of the system should be redefined regularly to guarantee that future development addresses real needs.

All these steps taken together will go a long way toward implementing a successful corporate-wide DSS. An effective, management-oriented database management system, superior modeling and forecasting capabilities, comprehensive statistical analysis, and a range of output and report-generation options will satisfy management's request for decision support.

But above all, it's important to remember that the glue holding the integrated DSS together is made up of two elements. First, the implementers in dp must understand management's true needs and have insiders' knowledge of how the corporate organization really works. Second, executives from the top down must be committed to making the investment in money, manpower, and time spent learning to take advantage of a system capable of revolutionizing the ways they work and think. ✲

Richard M. Denise, managing consultant with Management Decision Systems Inc., Waltham, Mass., has designed and implemented large-scale decision support systems for some of the world's biggest companies. He has extensive experience working with both top management and data processing executives.



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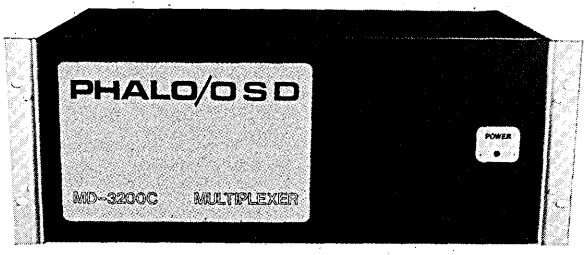

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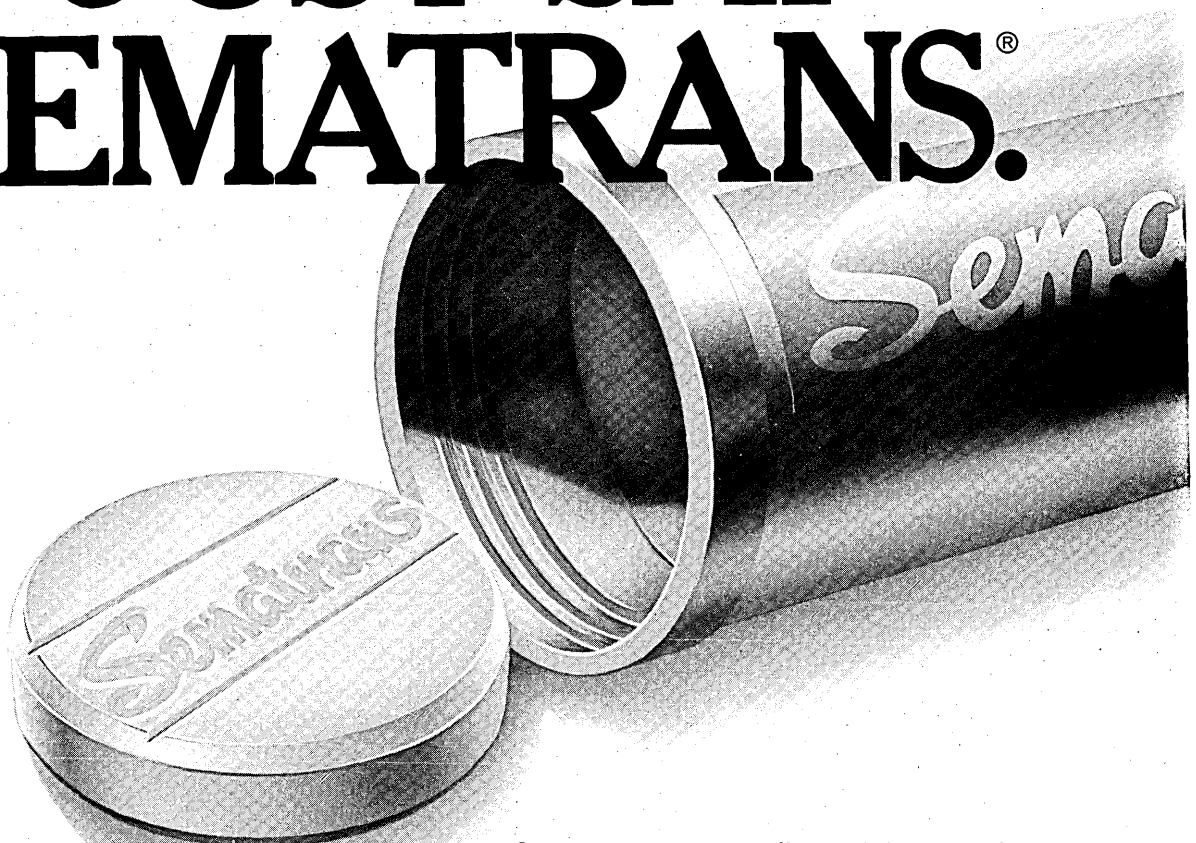

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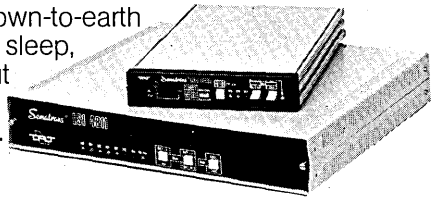

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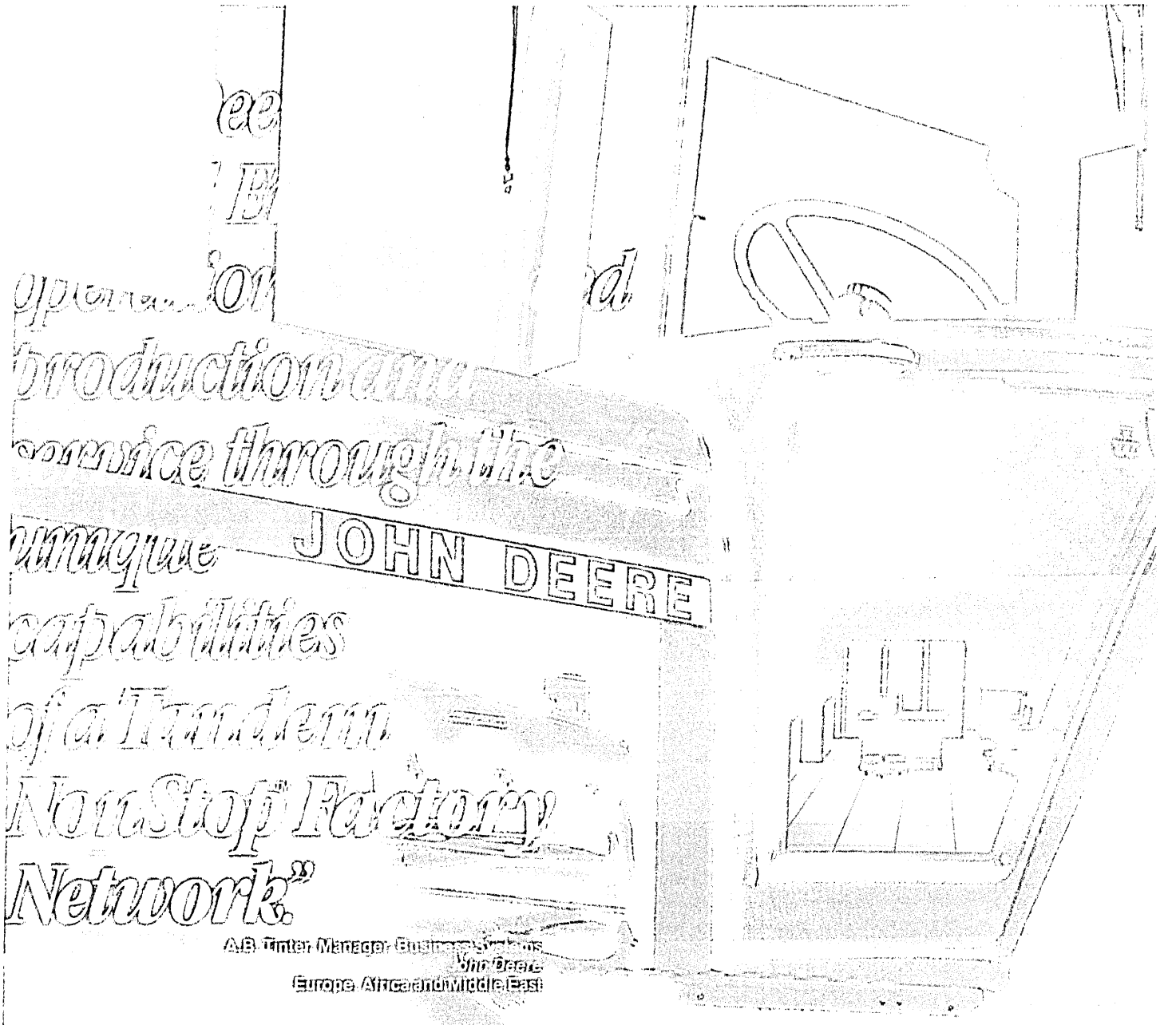

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Consolidated Rail Corp. laced together a variety of products to create a huge—and hugely successful—marketing support system.

DECISION SUPPORT AT CONRAIL

by Thomas B. Hoover

It seems all too rare in data processing to be asked, "What additional hardware and software do you need to accomplish this new project?"

But that is precisely the question Conrail management put to its dp department nearly three years ago as Congress was preparing to reform the regulatory structure of the railroad industry through the Staggers Rail Act of 1980. Conrail had supported that process as critical to its becoming a viable enterprise and returning to the private sector.*

Management was keenly aware that accurate, easily accessible information would be crucial to making the right marketing decisions in this new competitive environment. To prepare for that environment, Conrail acquired computer hardware and software for a marketing-decision support system that would help place the company in the forefront of the changes in the transportation marketplace. This article presents a technical profile of a successful approach to supporting ad hoc information requests against huge volumes of data.

Marketing analysts typically make a hypothesis about a market opportunity—for example, the effect of a particular pricing strategy on the company's intermodal, or "piggyback," business—and then measure its potential effect by using historical data on profitability and volume of business. The hypothesis is usually modified and remeasured several times until the opportunity is maximized. In order to quickly capture new opportunities afforded by deregulation, Conrail's marketing analysts were looking for a quantum reduction in the typical turnaround time for historical data extractions. They had shown that their increased productivity would be worth the additional computer resources required.

*Consolidated Rail Corp. (Conrail) was created by Congress as a for-profit corporation to organize and revitalize most of the railroad freight service of six bankrupt railroads in the northeastern United States. It began operations April 1, 1976.

The environmental factors to be dealt with in data management for the marketing groups were as follows:

- one year of detailed historical revenue data contained 4 million to 5 million records
- each record contained 100 fields of data
- more than 30 fields were commonly used for selection criteria
- approximately 10 concurrent ad hoc users of these data would be expected during normal business hours
- resulting selection volumes (hits) would not be known in advance of queries.

The primary data manipulation features requested were as follows:

- user-defined computations
- automatic data reduction (sorting and summarizing)
- data combinations from multiple sources
- full range of data presentation formats (tabular matrix, graph, labeled statement, etc.)
- data exchange interfaces to other analytical software tools
- ease of use by personnel without dp expertise.

In short, the marketing department was asking for an interactive, efficient, user-friendly, large-scale decision support system that was compatible with existing software.

Our first reaction was extreme skepticism. We did not believe such a decision support system was possible with current technology. Our counter proposals utilizing traditional dp solutions, however, were not appealing to users.

After finding the desired functions scattered among the many fine software packages on the market, marketing and systems personnel decided to try interfacing several software products. In one instance, two competitive vendors were told of our intention to buy both their products and requested to work together on an interface. From our point of view, their respective strengths complemented each other very well. (Fig. 1 shows the network of software ultimately laced together at Conrail's interactive com-

PHOTOGRAPH BY M. FUNK/THE IMAGE BANK

puting facility.)

Where available, standard interfaces between products were purchased from the software vendors. Additional interfaces were developed at Conrail using simplistic techniques such as TSO CLISTs, standard external CALLs, and shared sequential files. These interfaces enabled the users to move data from one environment to another for reasons of preference or functional requirements. No attempt was made to promote the use of one software product over another. Resource abuses were controlled by installing an accounting system that terminates computer accounts that have exceeded their authorized budget.

The approach taken to structuring a huge database for ad hoc queries by users is of particular interest. Our product search narrowed the field of possibilities to an inverted list database manager (ADABAS) and an interactive nonprocedural language (RAMIS II) marketed by different vendors. Although an interface between the products existed, neither vendor was quick to endorse what we had in mind for the two of them together.

Between December 1980 and April 1981, the marketing and systems departments built a prototype decision support system with these products. It featured optional prompting menus, utilities, help screens, and interfaces to other products. In May 1981 the new hardware ordered for deregulation studies arrived and a full, 5 million record database was loaded. Typical response times were 10 seconds for extracting 1,000 records.

On the business side, Conrail was able to take many marketing initiatives based on information derived from this facility. The bottom line of this high risk venture was that a $4 million computer resource expansion yielded many times that amount in benefits in just a few months.

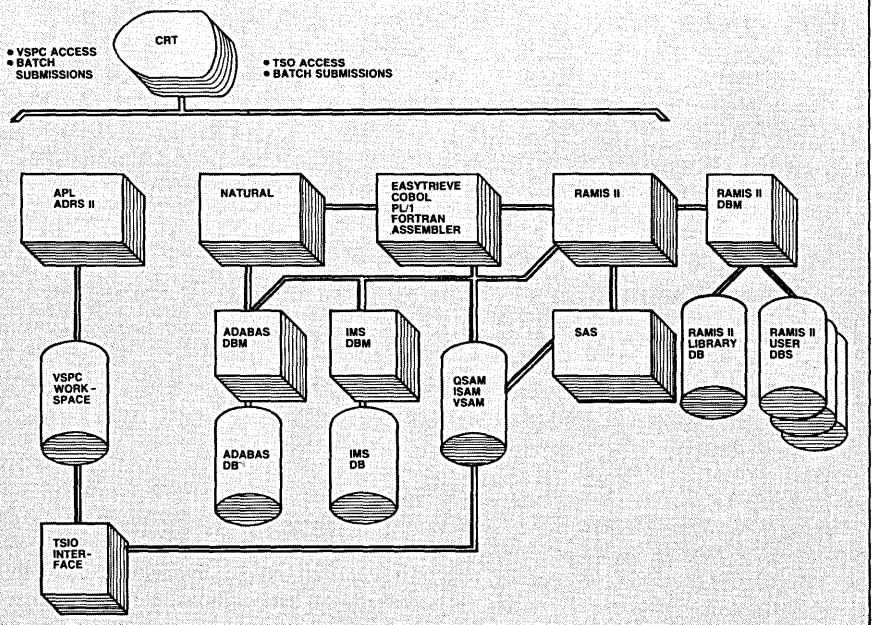
SOLVING DATABASE PROBLEMS

Of course, any project of this size is bound to stumble; we ran into problems after just a few months, but managed to solve each one as it arose. When we started to develop production systems in the same database used for ad hoc queries, response began to slow. With full implementation of several production systems, response became intolerable. The huge ad hoc files could not cohabitate with production files and maintain expected service levels. They were split into two databases and response times returned to normal.

Another problem stemmed from the fact that some users would unknowingly make interactive ad hoc requests that would select and process millions of records, causing a terminal to be tied up for hours and slowing down everyone else. This was reme-

FIG. 1

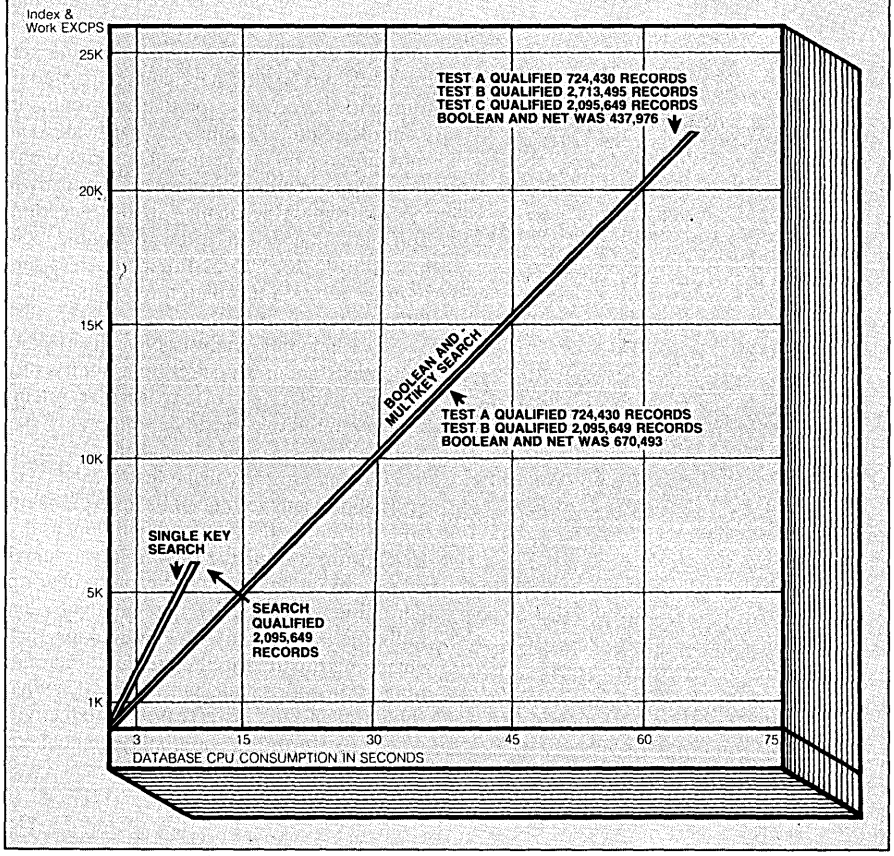
CONRAIL'S INTERACTIVE COMPUTING SOFTWARE



NOTE: ADDITIONAL SOFTWARE PRODUCTS USED IN PRODUCTION ONLY ARE NOT SHOWN

FIG. 2

RELATIONSHIP BETWEEN I/Os AND CPU CONSUMPTION FOR KEY SEARCHES



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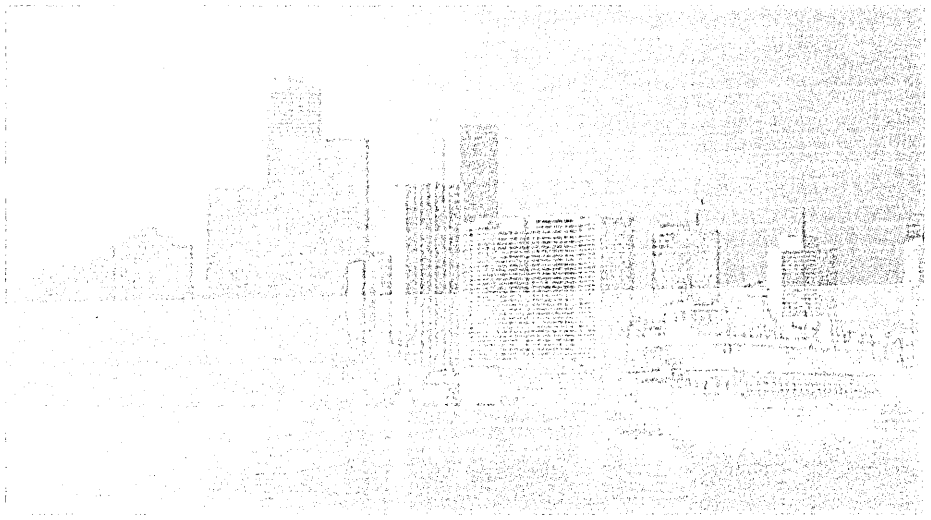
USENIX Summer Conference, July 12-15, 1983, Toronto, Canada



The USENIX Summer Conference of the USENIX Association and Software Tools Users Group will be held in Toronto, Canada July 12-15, 1983 at the Harbour Castle Hilton. This announcement provides information about the dates of events, as well as who to contact for further information. A pre-registration packet will be mailed on request in [illegible] and hotel registration forms.

USENIX Technical Sessions—July 13-15, 1983
Basic topics include UNIX programming tools, networks, graphics, applications, languages, hardware, word processing, etc.
Invited speakers and panel discussions will round out the program.

Software Tools Users Group Meeting—July 12, 1983
This meeting topics will include enhancements, standardization and consolidation of all the various implementations into a compatible system.

UNIX Tutorials—July 12, 1983
More specific information on Tutorials is included in the pre-registration packet. Past subjects have included introduction to UNIX text processing and documentation and basics of writing UNIX Device Drivers and 4.2 BSD.

Vendor Exhibits—July 12-14, 1983
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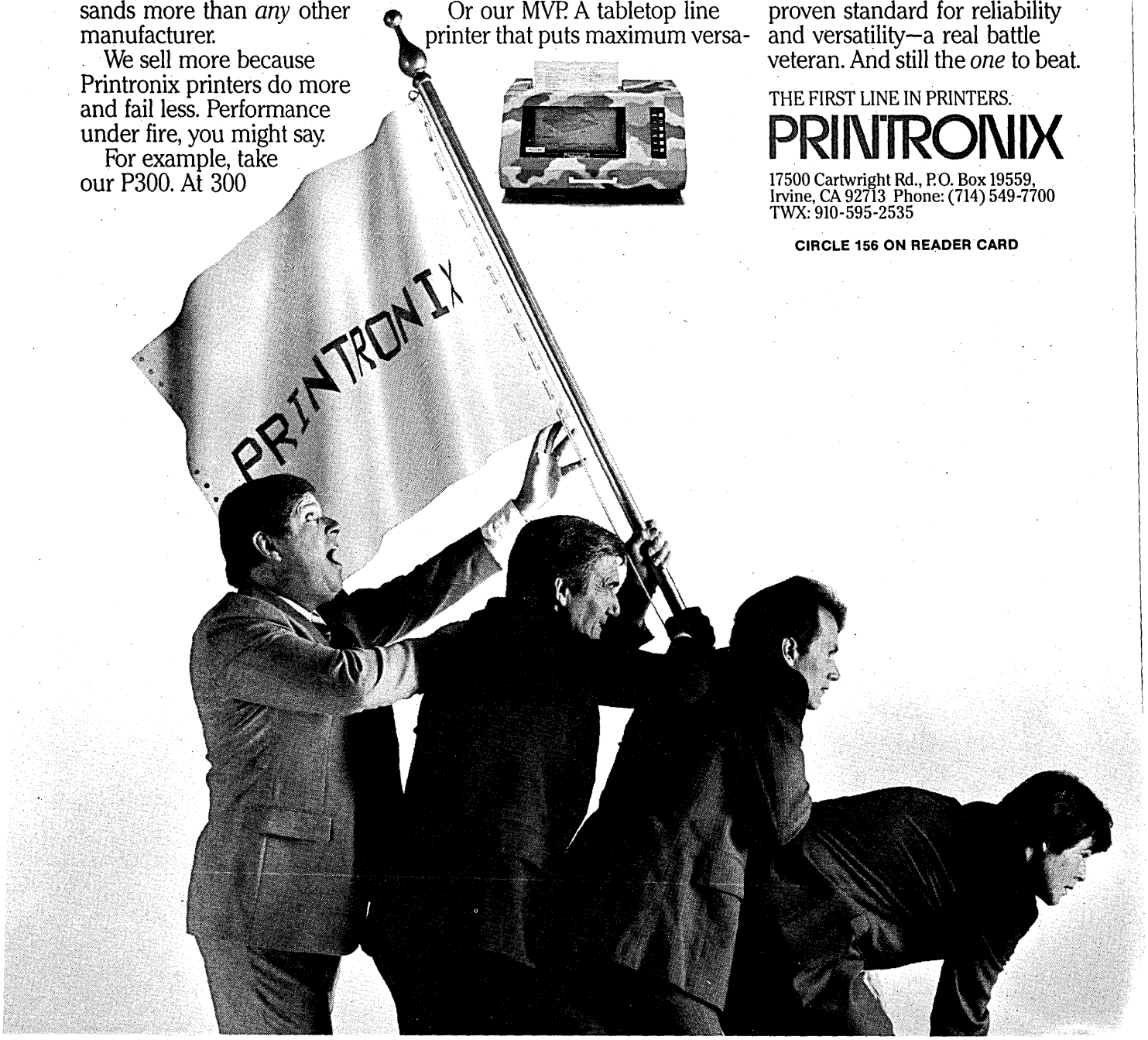

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Economical because the 32K text editor reduces time-sharing costs by allowing you to prepare your data, make revisions and create your format off-line to reduce computer time and communication charges by as much as 70%. And at the same time edit out costly mistakes.

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With 150 cps, a simple to use color coded, annotated keyboard which allows format programming, easy to read digital LED display that gives you printer parameters, print position, self-test diagnostic readouts and error messages all in plain English...the compact, lightweight GE 2120 teleprinter delivers the flexible, reliable performance you need at a price you can afford.

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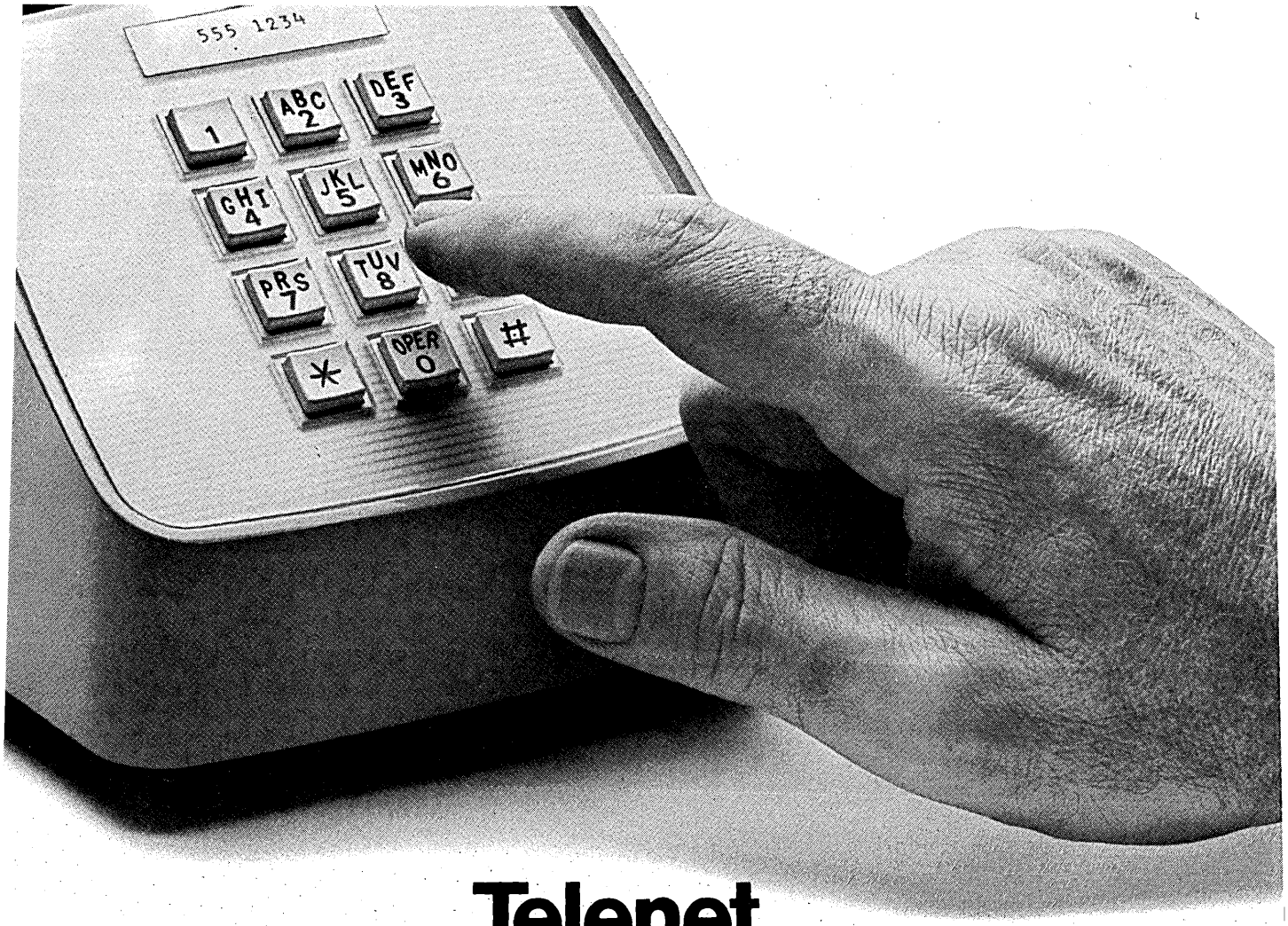

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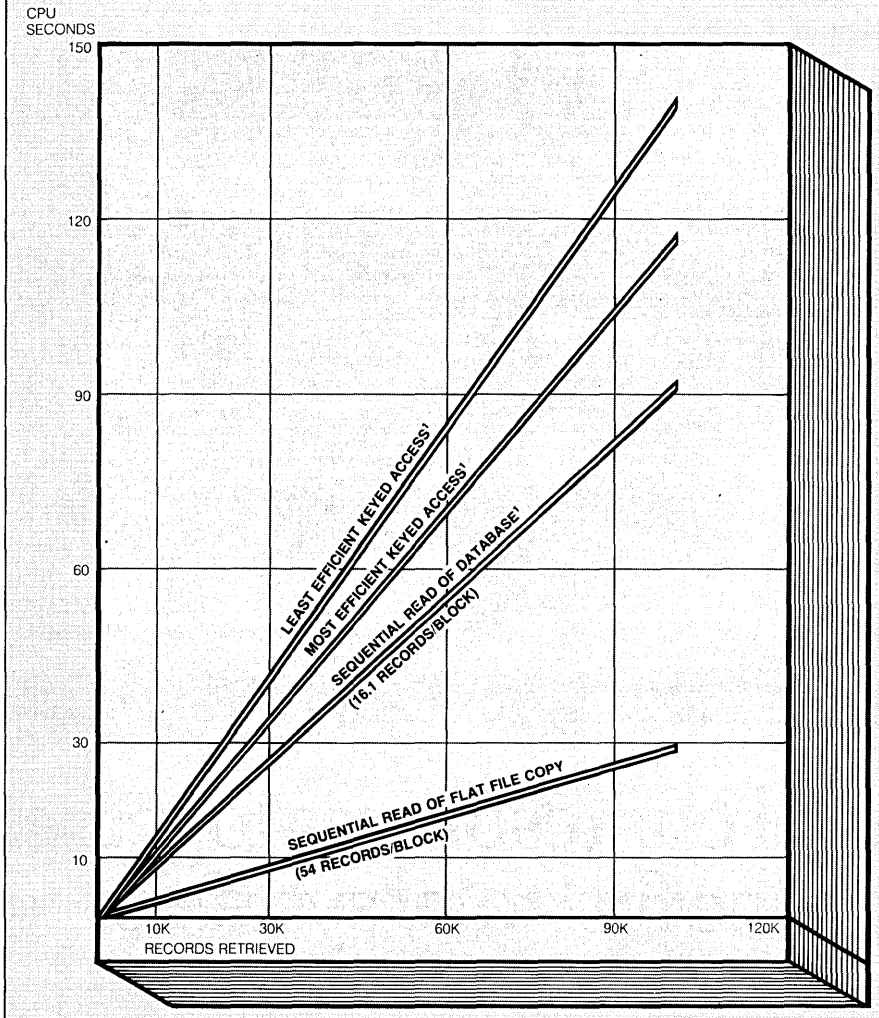
FIG. 3

CPU CONSUMPTION BY TYPE OF DATA ACCESS



[1] Includes cpu time for database region and extraction program region

died when the software vendor modified the selection process to pause after processing the index and inform the user how many records will be retrieved if he continues. A sampling scheme was developed to service users requiring global analysis.

Data are an issue for debate among the many users. According to some, the data are too old; others say that data are incomplete, or not keyed right, or complain that data differ in quality from some other source. Regular reviews by a committee of users is needed to guide the content of the database. Users become dependent on the database and require it to be up perpetually. Negotiating a long down (24 hours) for loading a big database is difficult—it means working weekends.

The remaining problems fall in the broad category of training and information dissemination about environmental changes. These situations are frequent in a heavily used system and require a dedicated staff that can address them as they occur.

In tuning any database for performance, you want to minimize I/Os and head movements. A static read-only database used for ad hoc queries is the easiest type to tune. The data should be sorted into the same order in which they will be retrieved. This produces better efficiency and minimizes I/Os. In the case of a multikeyed file, this sorting becomes impossible because the file is accessed in different sequences. We have, however, achieved a similar result by "cluster" sorting. This is generally accomplished by sorting first on the most "nonunique" keys, followed by the most "unique" keys. The idea is to put records with the greatest similarity next to each other. Then for a given access key, the physical blocks may be scattered but clusters of desired records will probably be in each block. This is not a perfect rule, though, and must be modified as experience dictates.

Head movement is affected by data organization, file placement, and contention between tasks. Unsorted data potentially cause a head movement or seek for each logical record retrieved. Files used in conjunction with each other should reside on different devices if possible—you don't want to get in your own way. Contention between unrelated tasks on the same device is harder to diagnose. If separating the files on different devices is not feasible, we place the most active files adjacent to one another. Concurrent users of the same files will always generate contention, increasing the importance of minimizing I/Os.

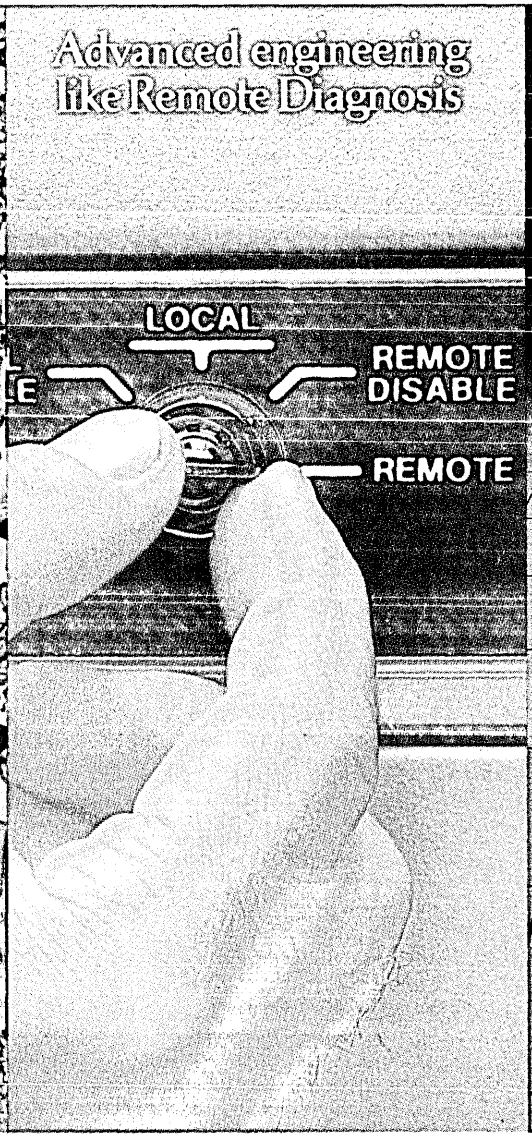
Sample timings of various components of database activity are presented in Fig. 4. The ad hoc database in its most recent form contains 10 static read-only files totaling 7 million records. The file used for resource consumption measurements was the largest of these and contained 3,605,428 records of 320 characters each. There were an average of 16.1 data records per block, each containing 92 fields of data. The file was keyed on 33 fields. Index and work files reside on 3350 disks and data files reside on 3380 disks. The cpu times cited are that of an IBM 3033U mainframe and where applicable refer to the sum of the database region and the extraction program region.

Graphical presentations of various types of resource consumption are shown in Figs. 2 and 3. A few significant deductions can be made:

- Each activity type displays a linear relationship between volume and cpu consumption. (There are aberrations to the linear models at the low end, but they cannot be detected on the scale shown.)
- Cpu efficiency is directly related to buffer efficiency, showing yet another benefit of "cluster" storing.
- The approximate break-even point for reading the database versus reading an entire sequential file copy is a 20% selection.

DECISION SUPPORT SYSTEMS

The factors that most constrain this decision support system are cpu demand growth and training requirements. Successes will increase demand for new uses of the cpu. When it becomes impossible to maintain a constant interactive service level, another large cpu becomes justifiable. Training is required for users of any computer language, no matter how simple the syntax.



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The bottom line is this. The COMPAQ Computer is the first uncompromising portable computer. It delivers all the advantages of portability without trading off any computing power capability.

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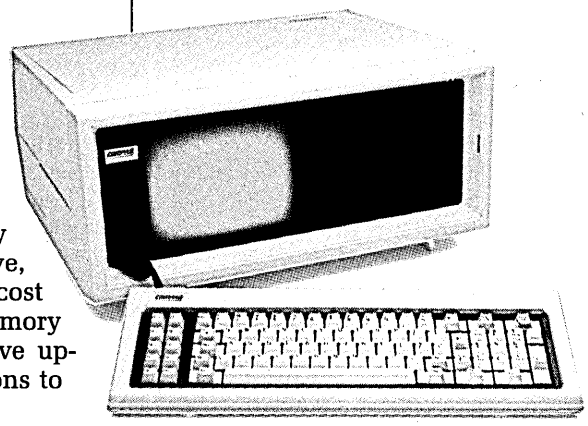

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FIG. 4

TYPICAL RESOURCE CONSUMPTIONS

ACTIVITY	RESULT	DATA EXCPS	INDEX & WORK EXCPS	CPU TIME	TSO ELAPSED TIME
Sequential pass of flat file copy	3,605,428 records read (54 records/ block)	66,776	—	17 Min 26 Sec	1 Hr 22 Min[1]
Local file into database	3,605,428 records loaded 33 fields indexed	—	—	6 Hr 27 Min	24 Hr 17 Min[1]
Single key search of database	47,510 records qualified (data not retrieved)	—	150	.21 Sec	5 Sec
Boolean 2 key search of database	Test A qualified 47,510 records Test B qualified 121,097 records Boolean AND net was 17,857	—	636	1.66 Sec	14 Sec
Boolean 4 key search of database	Test A qualified 47,510 records Test B qualified 54,374 records Test C qualified 45,037 records Test D qualified 102,097 records Boolean AND net was 0	—	744	1.92 Sec	16 Sec
Retrieve data from database sequentially	50,000 records read (16.1 records/block)	3,098	—	46.64 Sec[2]	118 Sec
Retrieve data on most efficient key	47,480 records qualified and read	2,957	793	55.05 Sec[2]	137 Sec
Retrieve data on least efficient key	101,773 records qualified and read	15,145	5482	142.24 Sec[2]	698 Sec

[1] Batch elapsed time
[2] Includes cpu time for both database and extraction program

The solutions to these inhibiting factors can be seen in the products now arriving on the market. These products, however, have not yet matured or been fully integrated with existing products.

Personal computers are of course getting cheaper and more powerful and will exchange data with host computers. As the software supporting this relationship matures, the respective functions will merge and appear as one facility to the user. There will then be inexpensive subsecond response time for analysis work and accessibility to great reservoirs of shared data on host systems.

Artificial intelligence is now manifesting itself in syntactical decoding of English language questions. The decoded specifications are then matched with data definition directories to generate queries against databases. Processing efficiencies and directory maintenance are the weak links today. When these problems are solved, however, imagine what this technology will be like when interfaced with voice recognition and voice synthesizers. *

Thomas B. Hoover graduated from Drexel University in Philadelphia with BS degrees in business administration and commerce and engineering sciences. He holds CDP and CISA certifications. Currently, he is a data administrator at Conrail's Philadelphia headquarters, where he has also worked in industrial engineering and edp auditing.

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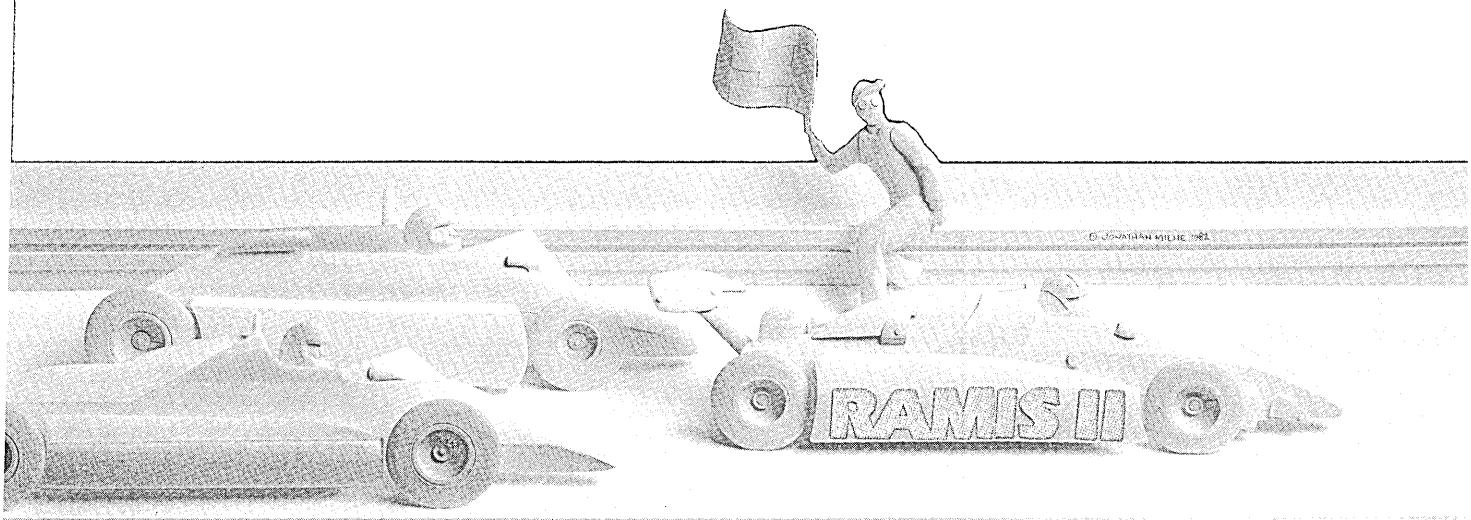

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SCREEN OUT

"IMF lets us solve them s

Keith Stone, Data Base Manager and Wally Morgan, Data Base Specialist—

"With Boole & Babbage's IMS MANAGEMENT FACILITIES (IMF),™ we can concentrate on solving problems quickly, instead of guessing where they might be. When you're responsible for providing IMS service to 600 terminal users, like we are, that's really important."

```
BOOLE & BABBAGE                                        IMF/WORKLOAD ANALYZER 1.0
DTRAC SERVICE  DISPLAY WORKLOAD TRACE          DATE  83/04/01     TIME  07:41:30

Trancode: DB91T01  Ltrm:MASTER   Node:G99992C  Class:  1  Arrive-07:28:53.3
  Start-07:28:53.3  Stop-07:28:55.5  Elapsed-  1.7 sec  Response Time-  1.7sec
  DC Calls:1,105 DB Calls:     0 #I/O:   0  Appl CPU  345 msec IMS CPU  226 msec
-------------------------------------------------------------------------------
Trancode: DB91T01  Ltrm:MASTER   Node:G99992C  Class:  1  Arrive-07:29:31.1
  Start-07:29:31.1  Stop-07:29:35.5  Elapsed-  4.0 sec  Response Time-  4.0sec
  DC Calls:1,190 DB Calls:     0 #I/O:   0  Appl CPU  294 msec IMS CPU1,943 msec
-------------------------------------------------------------------------------
Trancode: EDWX050  Ltrm:A03581AR Node:A03581AR Class:  3  Arrive-07:30:36.6
  Start-07:30:37.7  Stop-07:30:43.3  Elapsed-  6.5 sec  Response Time-  6.8sec
  DC Calls:     2 DB Calls:     9 #I/O:   3  Appl CPU    6 msec IMS CPU  392 msec
-------------------------------------------------------------------------------
Trancode: PACPG00  Ltrm:G11017U  Node:G11017U  Class:  7  Arrive-07:30:49.9
  Start-07:30:49.9  Stop-07:40:55.9  Elapsed-606.0 sec  Response Time-606.0sec
  DC Calls:     4 DB Calls:     8 #I/O: 14k  Appl CPU   18 msec IMS CPU9,876 msec
-------------------------------------------------------------------------------
------------------- TOTAL OF ALL TRACES -------------------------------------
Trancode: ALL     #Trans:     4 AVG DC CALLS:575.2 AVG DB CALLS:  4.2
  AVG APPL CPU  166 msec  AVG IMS CPU:3,109 msec AVG # I/O: 3k
  AVG I/O TIME  0.1sec    AVG E/T TIME 154.5sec  AVG RESP TIME: 154.6sec
```

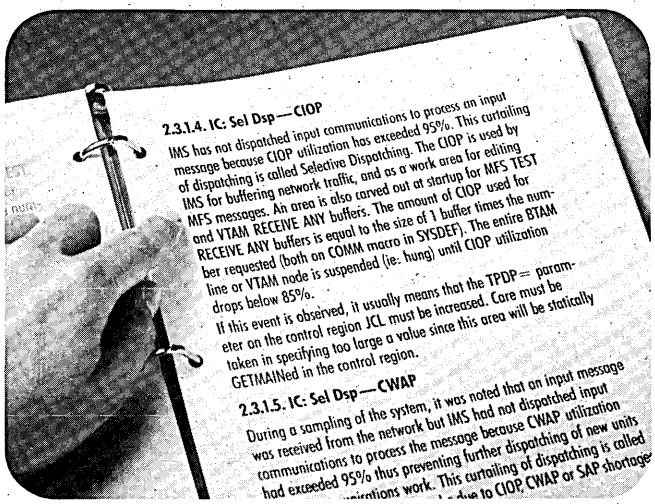
"About a month ago, we had a transaction which appeared to go into a loop and then abend. IMF/TRANSACTION TRACE showed only 8 data base calls, but one resulted in over 14,000 data base I/O's. We spotted this without inducing the overhead of DC MONITOR."

```
BOOLE & BABBAGE                                        IMF/WORKLOAD ANALYZER 1.0
WWAIT SERVICE                  WORKLOAD WAIT

TRAN FLOW COMPONENT          --- CURRENT PERIOD ---        ------ HISTORY -------
                             %  0.....25.....50     %  0.....1.....2
INPUT COMMUNICATIONS        .58|                   1.62|----------)
  Sel Dsp - CIOP          (.58)|                  (1.62)|----------)
INPUT QUEUE                39.34|----------)       1.23|----------)
  All MPR's Busy         (38.45)|----------)      (.86)|--------).
  MPP GU                   (.89)|                 (.37)|---).
SCHEDULING                  .68|                    .60|-----)
  FETCH I/O Active         (.68)|                  (.60)|-----)
APPLICATION PROGRAM         1.77|)                 1.94|----------)
  DL/I-CTL Using CPU       (0.02)|                 (.08)|).
  IRLM ENQ Wait            (1.75)|)               (1.86)|----------).
SYNC POINT                  4.26|=)                 .86|--------).
  LTWA Wait                (4.26)|=)              (.86)|--------).
OUTPUT QUEUE                1.17|                   .20|-)
  Node Busy                (1.16)|                 (.20)|-)
OUTPUT COMMUNICATIONS       2.36|)                 1.52|----------)
  MFSP Pool Space          (2.35)|)               (1.52)|----------)

RESPONSE TIME (SEC)        50.19|   79 SAMPLES     7.97|  1,039 SAMPLES
# OF TRANSACTIONS            67|   0 MIN/39 SEC     856|  8 MIN/39 SEC
```

"Before I had the IMF/WORKLOAD WAIT, I needed a trained person who knew how work flowed through IMS. But IMF shortens a long learning path—it makes our junior staff productive a lot sooner. As the technical manager, it even added to my own understanding of IMS by showing how work flows through the system."



2.3.1.4. IC: Sel Dsp—CIOP

IMS has not dispatched input communications to process an input message because CIOP utilization has exceeded 95%. This curtailing of dispatching is called Selective Dispatching. The CIOP is used by IMS for buffering network traffic, and as a work area for editing MFS messages. An area is also carved out at startup for MFS TEST and VTAM RECEIVE ANY buffers. The amount of CIOP used for RECEIVE ANY buffers is equal to the size of 1 buffer times the number requested (both on COMM macro in SYSDEF). The entire BTAM line or VTAM node is suspended (ie: hung) until CIOP utilization drops below 85%.

If this event is observed, it usually means that the TPDP= parameter on the control region JCL must be increased. Care must be taken in specifying too large a value since this area will be statically GETMAINed in the control region.

2.3.1.5. IC: Sel Dsp—CWAP

During a sampling of the system, it was noted that an input message was received from the network but IMS had not dispatched input communications to process the message because CWAP utilization had exceeded 95% thus preventing further dispatching of new units ...due to CIOP, CWAP or SAP shortage ...rections work. This curtailing of dispatching is called

"If WORKLOAD WAIT says that transactions are waiting in Input Communications because of selective dispatching due to a CIOP shortage, you can go to the IMF documentation to find what that means and what needs to be changed."

"IMF has made an incredible difference for us. Like day and night. It's an integrated approach—that's the beauty of it. It's got everything we need and it all works together: the complete realtime tool, historical data, and cost accounting. With IMF, we can manage our system's performance a lot more easily and effectively. We're elated with the IMF architecture."

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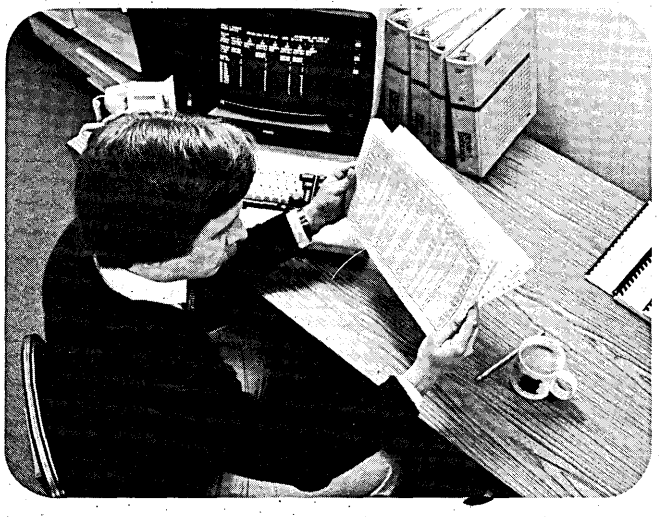
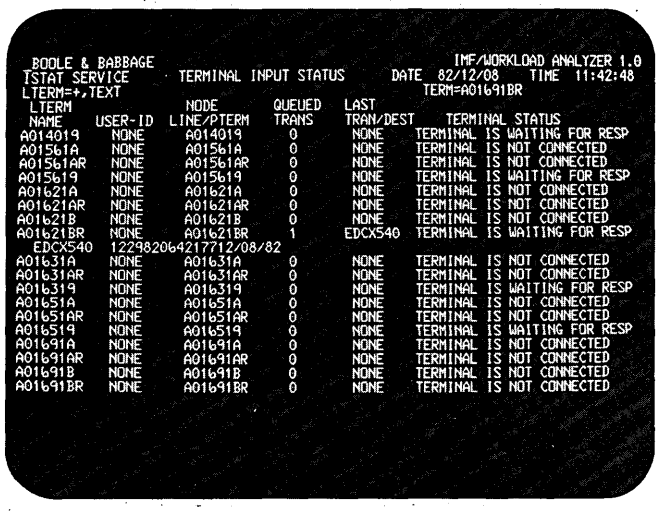
IMS PROBLEMS.

uickly, our users never see them."

responsible for IMS data base/data communications service at a Southern U.S. data center



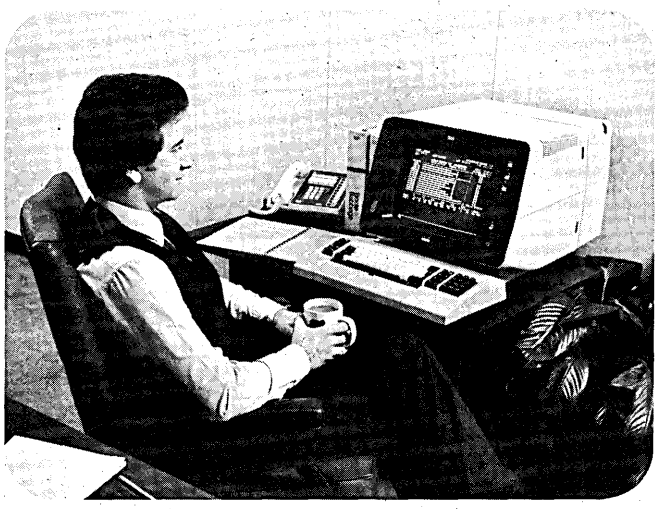
"With IMF I get off-line reports that correlate exactly to what I see in realtime. These were next to impossible to correlate before. We now have consistency and very readable reports—the data, formatting, and terminology are all the same!"



```
 BOOLE & BABBAGE                                          IMF/WORKLOAD ANALYZER 1.0
ISTAT SERVICE      TERMINAL INPUT STATUS      DATE  82/12/08    TIME  11:42:48
LTERM=+,TEXT                                          TERM=A01691BR
 LTERM                NODE        QUEUED   LAST
 NAME     USER-ID  LINE/PTERM    TRANS    TRAN/DEST    TERMINAL STATUS
A014019    NONE     A014019       0        NONE     TERMINAL IS WAITING FOR RESP
A01561A    NONE     A01561A       0        NONE     TERMINAL IS NOT CONNECTED
A01561AR   NONE     A01561AR      0        NONE     TERMINAL IS NOT CONNECTED
A015619    NONE     A015619       0        NONE     TERMINAL IS WAITING FOR RESP
A01621A    NONE     A01621A       0        NONE     TERMINAL IS NOT CONNECTED
A01621AR   NONE     A01621AR      0        NONE     TERMINAL IS NOT CONNECTED
A01621B    NONE     A01621B       0        NONE     TERMINAL IS NOT CONNECTED
A01621BR   NONE     A01621BR      1       EDCX540   TERMINAL IS WAITING FOR RESP
  EDCX540  122982064217712/08/82
A01631A    NONE     A01631A       0        NONE     TERMINAL IS NOT CONNECTED
A01631AR   NONE     A01631AR      0        NONE     TERMINAL IS NOT CONNECTED
A016319    NONE     A016319       0        NONE     TERMINAL IS WAITING FOR RESP
A01651A    NONE     A01651A       0        NONE     TERMINAL IS NOT CONNECTED
A01651AR   NONE     A01651AR      0        NONE     TERMINAL IS NOT CONNECTED
A016519    NONE     A016519       0        NONE     TERMINAL IS WAITING FOR RESP
A01691A    NONE     A01691A       0        NONE     TERMINAL IS NOT CONNECTED
A01691AR   NONE     A01691AR      0        NONE     TERMINAL IS NOT CONNECTED
A01691B    NONE     A01691B       0        NONE     TERMINAL IS NOT CONNECTED
A01691BR   NONE     A01691BR      0        NONE     TERMINAL IS NOT CONNECTED
```

"Because we use MFS, when a user calls with a hung terminal after entering a service order, he doesn't know the transaction code. Using the IMF/ISTAT SERVICE we can see the input message, the transaction code, and the LTERM that submitted it."

"Sometimes we like to print out an IMF screen image so we can show management the effect of a change. It gives you a really good feeling to get some positive feedback from what you've done."



"Having IMF monitor transaction queue time, elapsed time, and response time is absolutely essential. We set up 5 resource and 7 workload displays to be constantly refreshed every 5 seconds. Every minute this gives us a complete picture of how IMS is doing. It tells me at a glance that everything is okay."

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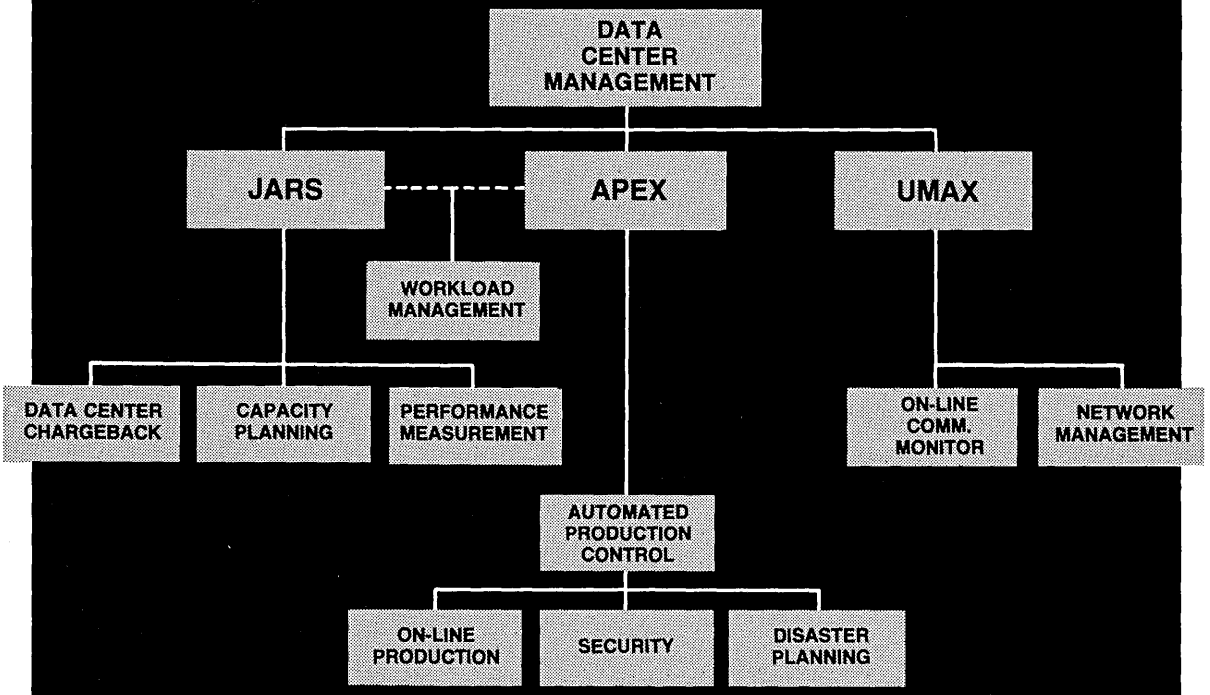

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CIRCLE 172 ON READER CARD

An ergonomic work place isn't something you achieve by means of a list.

THE ERGONOMIC ART

by Richard P. Koffler

As personal computers, word processors, and other forms of office automation have spread, a latent problem has surfaced: how can the equipment—and the office itself—best be adapted to the people who have to work with it?

Ergonomics, also known as human factors engineering, is the discipline that is used to solve this problem. Contrary to popular belief within the computer industry, ergonomics is not new. It was informally born around the time when cavemen designed tools to fit their hands. As an independent and formal discipline it was developed by the military during World War II because weapons systems such as tanks and airplanes had to be designed to be used by a wide range of people with different bodies and minds. Military planners realized they could no longer depend on finding people with specific physical and psychological attributes. The same realization is happening today within the computer business as more people work with computers, sometimes for eight or more hours per day.

The objective of ergonomics is simply to raise the level of efficiency of any system by ensuring that the human element is not its weakest link. Ergonomists are concerned with comfort, fatigue, safety, understanding, ease of use, and any other issue that affects welfare, satisfaction, and performance of people working with man-made systems and equipment. In the case of computers, ergonomics does not simply mean compliance with German standards. Nor is it limited to hardware, as many people currently believe; it includes software and every other related issue, such as training and documentation.

Research has shown that the improper use and application of computer equipment causes temporary ailments such as muscle and joint fatigue and pain, visual discomfort and fatigue, and psychological problems such as boredom, confusion, and frustration. These complaints, which sometimes affect up to 90% of the office workers at a given site, are key contributors to worker dissatis-

ILLUSTRATION BY ANDREA BARUFFI

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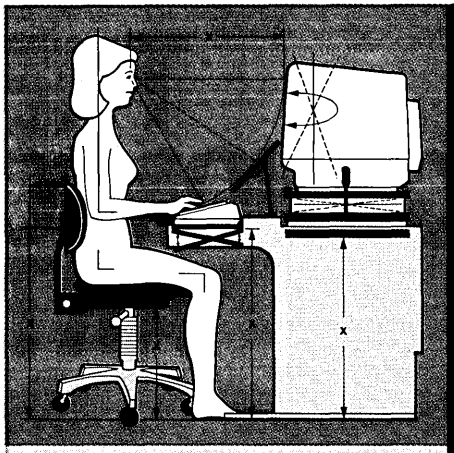
addresses the human variable...



BIOTEC ergonomically designed VDT furniture allows universal adjustment for correct operator posture and comfort thereby reducing fatigue.

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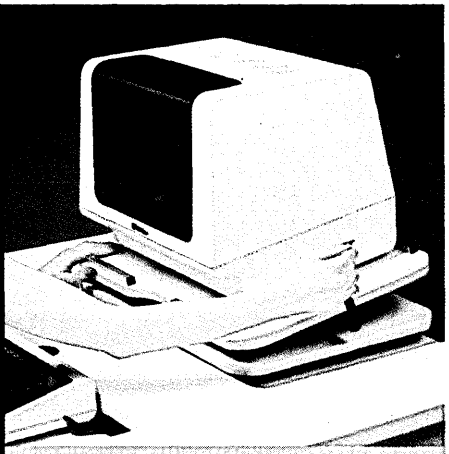
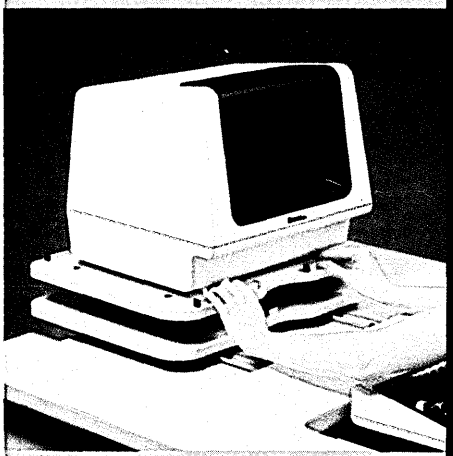
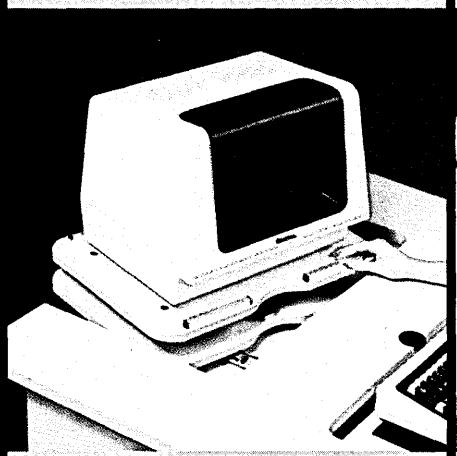


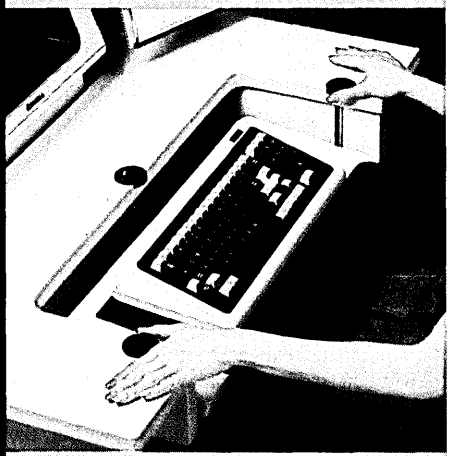
Glare and reflection are eliminated by tilting the VDT. Variances in viewing angle are also accommodated.



Tired or strained eyes from continual screen viewing are relieved by adjusting the VDT for optimum focal distance.



Eye strain and errors from character distortion are reduced by rotating the VDT to an appropriate position relative to the operator's various work areas.



Muscle strain in the arms, wrists and hands is minimized by varying keyboard height, keyboard inclination and palm rest position.

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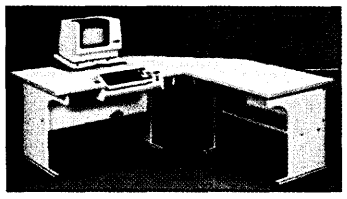

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CIRCLE 173 ON READER CARD

Researchers hardly have time to investigate a given technology before it becomes obsolete.

faction. They are known to cause high absenteeism and turnover, low productivity, and can help motivate unionization, which occurred in many factories during the first half of this century. Although the complaints cannot be attributed entirely to the use of computers, they are aggravated when a mismatch exists between the equipment, the environment, and the users. The good news is that despite some reports that have appeared, no research has yet linked computer equipment to permanent health disorders like birth defects, eye cataracts, or miscarriages.

It is not easy to determine the most suitable way to solve a given set of concerns because, in general, no ready-made answers and formulas currently exist. After many years of work, researchers have found few general solutions for most of the recognized problems associated with offices and the use of computers. This is partly because of the intrinsic difficulty in identifying and analyzing the problems, and partly because of the relative youth of the concern for computer ergonomics.

NO RULES SATISFY ALL USERS

Researchers clearly indicate that it is impossible to find design rules to satisfy all users under all applications. This is especially true with software, where problems are much harder to identify and analyze than with hardware. This does not mean that there are no solutions available, but simply that these are not general in nature and must only be applied when the research and specific circumstances that support them are properly understood. In other words, ergonomic solutions must be specifically designed for the requirements of users and their applications.

Part of the reason for this shortage of answers is the conflict that exists between ergonomists and computer experts. Computer experts, motivated by the same criteria that applied years ago when processing power cost much more, seek to maximize the efficiency of the machines. Ergonomists, by contrast, seek to maximize the comfort (and hence efficiency) of the humans who use those machines. Ergonomic studies are also hampered by technology itself, which continues to move so fast that researchers hardly have a chance to investigate its human ramifications before it becomes obsolete.

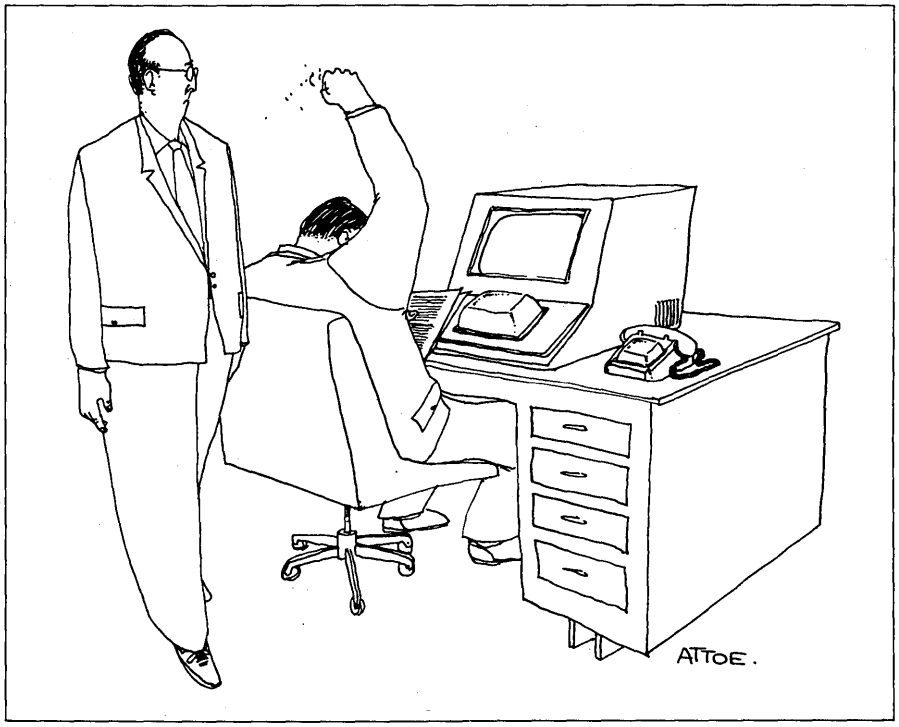
The list of factors that affect the ergonomics of offices and computer systems is quite long. Environmental issues include lighting, noise, layouts, temperature, and humidity. The hardware issues center on furniture and video display terminals (VDTs). The user-system interface (USI) includes software, training, and documentation. The design of ergonomic offices and computer systems cannot be achieved by solving a restricted set of problems within any one of these areas. All of the factors interact heavily with each other: to neglect any of them can negate the potential benefits of taking care of the others.

Thus, ergonomics requires an approach similar to that used in systems analysis, where trained individuals systematically build solutions based on their observations, experience, and on specific issues and constraints such as budgets and schedules. Task analyses of this nature are as much art as they are science, and must be supported by a proper understanding of the problems and the available solutions uncovered by researchers. Ideas must be prototyped and tested before final commitments are made for a given ergonomic solution. For example, there is no such thing as the "best" ergonomic furniture. Depending on the specific needs of an organization, what is good for one group of people will not necessarily be good for another. Likewise for lighting, where the specific task, whether paper- or VDT-intensive, determines the optimum level of illumination. In extreme cases, solving the lighting problem for a given environment while leaving furniture unattended may decrease productivity due to unanticipated side-effects and interactions among the equipment, the environment, and people.

Recommendations for user-system interfaces often take the form of high-level design principles. These principles are not meant to indicate the best way to design software for a given set of users but are to be used as a quality benchmark for any USI. Examples are "be consistent," "use familiar terms," and "omit needless concepts." There is no consensus among experts on the correct set of these principles, and hardly a day goes by without somebody publishing another list.

The important thing is not to have the perfect list, but for software design and development teams to build their own set of principles and apply them to the USI of every program they develop. Comparing software against a given set of high-level principles will immediately improve the relative quality of the USI.

There are also specific design guidelines, detailed "cookbooks" of suggestions to be applied to various aspects of USIs. For example, one guideline is, "When codes are assigned special meaning in a display, a definition should be provided at the bottom of the display." To date, one of the only continuing efforts to maintain a list of these guidelines is taking place at The Mitre Corp. on behalf of the U.S. Air Force. These guidelines provide an excellent source of ideas for developing ergonomic USIs. They should not be applied indiscriminately to all applications and sets of users, however, because they are not meant to answer all questions a designer might have about USIs, and they do not indicate how to make certain design decisions. For instance, they do not say when to use menus as opposed to mnemonic commands, or which is the correct way to implement help features for proficient and inexperienced users.



CARTOON BY STEVE ATTOE

Ergonomic furniture that is good for one group of people is not necessarily good for another.

There's a great deal of interest within the industry in assessing the true value of applying ergonomic design principles to offices and equipment. Some countries, such as West Germany, have gone so far as to issue standards and safety regulations that spell out how certain aspects of VDTs and office environments should be designed and configured. Similar efforts within the United States have failed because legislators have felt that these problems are better resolved by market forces.

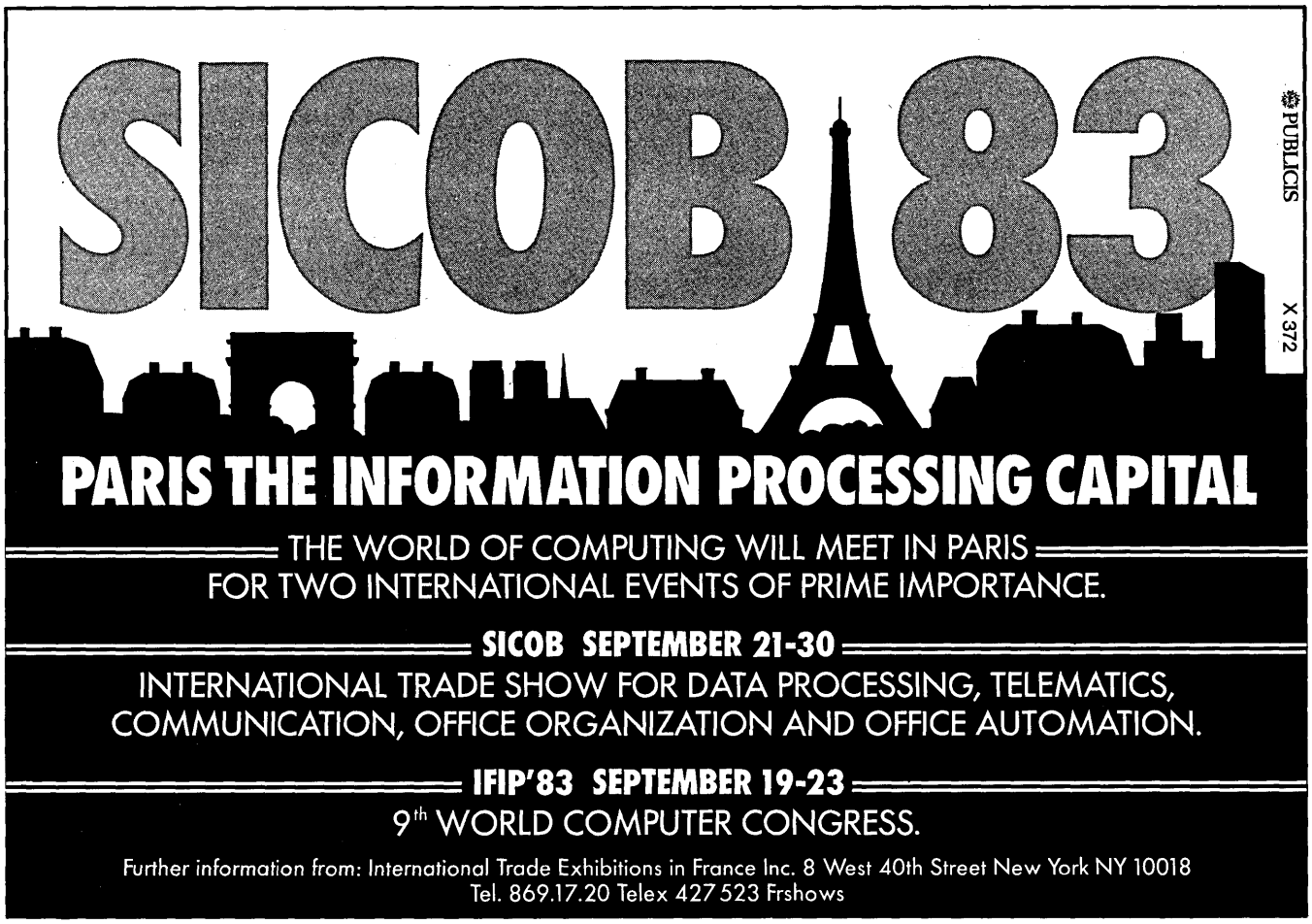
IBM has long maintained this position, motivated among other things by its desire to avoid standards that may retard technological progress, especially in areas such as ergonomics where the vast majority of questions remain unanswered. People who want standards-setting legislation for office equipment sometimes seem to believe there are formulas that can answer all ergonomic questions. But no such rules exist; the search for legislative solutions to human factors problems is a bit like asking the lawmakers to pass laws mandating certain kinds of systems analysis.

A comparison of products designed in the United States with units coming from Europe indicates that market forces can indeed generate ergonomic designs. An informal survey performed by the *Ergonomics Newsletter* during the summer of 1982 showed many U.S.-designed products (terminals and furniture) to be even more ergonomically acceptable than their European competitors. Furthermore, the number of vendors that unjustifiably call their products ergonomic is rapidly diminishing as the industry learns the real meaning of the word and pays attention to the available information regarding ergonomic designs. The area of greatest confusion today is probably software, where the qualities "user friendly" and "easy to use" are attributed to nearly every product regardless of the USI's suitability for the target user group.

In general, the benefits that attention to ergonomics can bring are not readily quantifiable, partly because nobody yet knows how to measure productivity, and partly because too many factors affect the performance and satisfaction of an individual. Some of these factors are far from being understood by scientists. But studies performed in Europe and the U.S. (at State Farm Insurance Co., for example) have shown that taking care of just a few problems present in most offices can immediately raise workers' level of satisfaction and performance.

Those who attempt to manage office automation and computer technology without dedicating proper attention to ergonomics run the risk of negating the potential benefits that technology offers by making the human element the weakest link within the total system. Demand for systems with ergonomic designs is growing, forcing designers and developers to be more aware of human factors. To achieve this goal they must acquire new skills. Some of these are to learn how to recognize deficient environments, equipment, and USIs, and to prototype and test ideas that are not readily answered by research or somebody's "expert" opinion. ❋

Richard P. Koffler is the president of The Koffler Group, an office automation and human factors consulting firm based in Santa Monica, Calif. He is also the publisher and editor in chief of the *Ergonomics Newsletter*. He has MS and BS degrees in computer science from the University of California, Berkeley, and the Massachusetts Institute of Technology, respectively.



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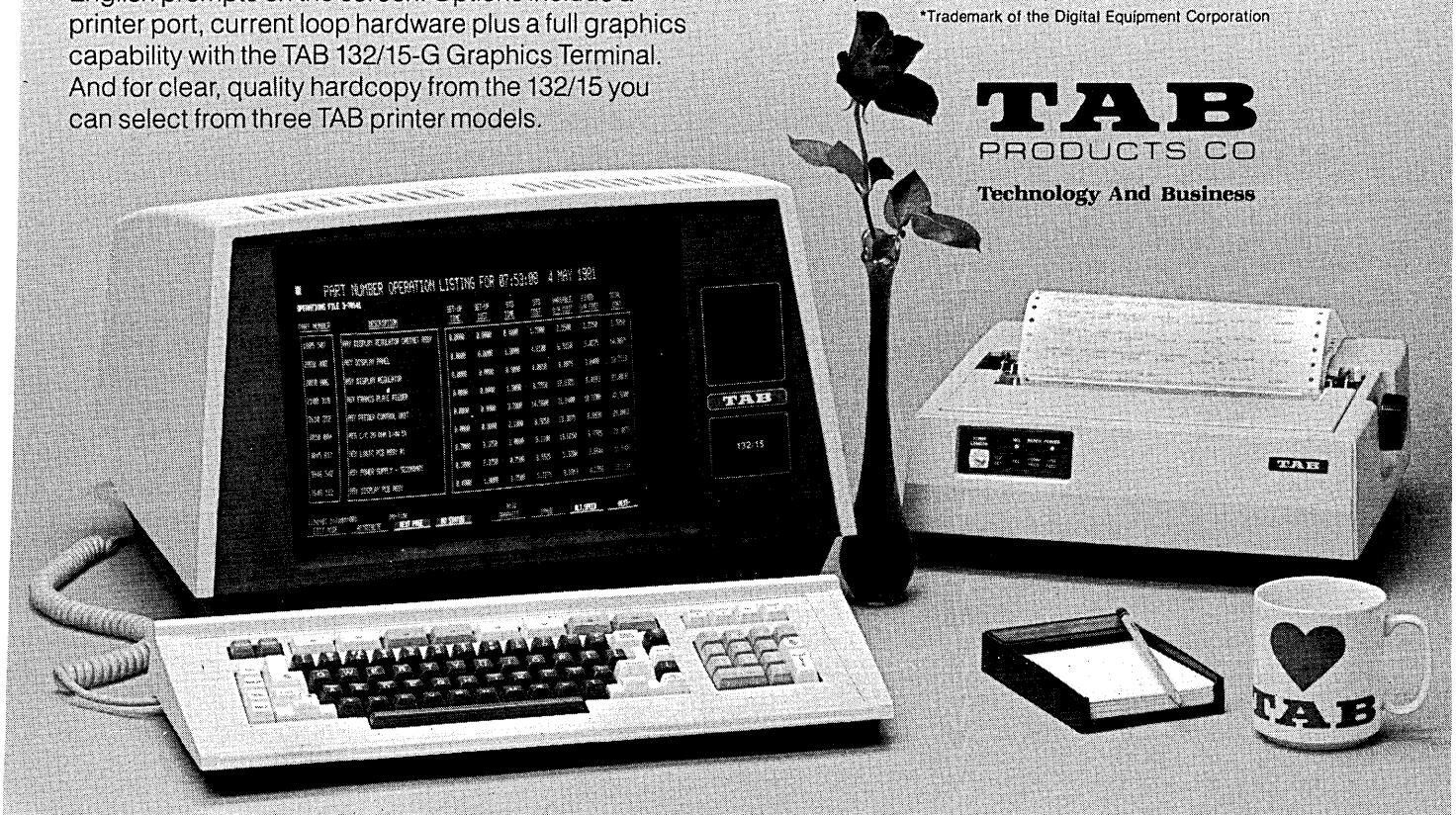

CIRCLE 175 ON READER CARD

SCIENCE/SCOPE

The new Landsat 4 spacecraft measures surface temperatures with an emitted thermal energy band not available on previous Earth resources satellites. The band, part of an experimental instrument called a thematic mapper, adds another fundamental dimension of data to that already present in bands that measure reflected sunlight. The new band can identify and map surface composition for geological studies and for mineral and petroleum exploration. It also can identify vegetation types and monitor their health. Hughes Aircraft Company and its Santa Barbara Research Center subsidiary built the thematic mapper for NASA.

Confusing enemy weapons so they plunge harmlessly into the ocean is the job of an electronic warfare system now being installed on U.S. Navy aircraft carriers. The SLQ-17A shipset can fool an enemy missile's guidance system by transmitting a ghost image of a Navy carrier. The hostile weapon locks onto this false image and veers away from the real ship. Hughes delivered its fourth SLQ-17A ahead of schedule for installation aboard the USS Carl Vinson.

Five new IMPATT diodes, with the highest power outputs at their respective frequencies offered to date, have been added to the Hughes line of solid-state millimeter-wave transmitter products. Included among the devices are Ka-band and Q-band units with output power of 500 milliwatts and a V-band CW device of 400 milliwatts. In addition, 140 GHz IMPATTs, with 20 milliwatts output in the CW version and 1 watt in the pulsed version, have been added.

Hughes spends about $8 million a year in support of colleges and universities, including help to alleviate the shortage of engineering faculty and modern laboratory equipment. For example, Hughes hires faculty consultants part-time during the school year and full-time in the summer. The program establishes a continuous technical interaction and supplements the pay of faculty members. Also, Hughes donates textbooks, software packages, and a wide variety of used equipment -- including electronic instrumentation and components.

Scientists from many disciplines are turning to thermography, the technique of producing pictures from heat, for help in their research. One system that displays scenes in up to 16 different colors is the Hughes Probeye® thermal video system, an adaptation of a hand-held viewer. It can be used in analyzing the growth of crystals, in studying volcanoes and mineral veins, and in monitoring the growth of bacterial cultures. It also can record the transfer of heat in hardware and help evaluate the structural integrity of complex forms.

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PEOPLE

GROWING PANES OUT WEST

"But do you do windows?"

Ask any other high-tech company president that question and he might never talk to you again. Ask Therese E. Myers and you'll be in for a sales pitch. She does windows for a living.

On personal computers, that is. Myers is president and cofounder of Quarterdeck Software, a Santa Monica, Calif., startup whose DesQ package runs several applications programs concurrently, providing each with its own "window" on the crt screen. The company unveiled its product to considerable acclaim at the recent Comdex show in Atlanta. Myers was there to share with her small staff the pleasures of finally showing off what had been under quiet development for many months.

"It's quite exciting, actually," she says, noting that the company had kept a tight lid on its efforts, despite the introduction by high-flying software supplier VisiCorp of a competitive product, VisiOn, last fall.

Both companies plan to begin shipment next fall of products that will bring to standard personal computers—IBM's P.C., primarily—the multiwindowing abilities of more sophisticated machines such as the Xerox Star and Apple Lisa workstations. Windows are rectangular areas on the screen that provide input and output facilities to different applications programs running at the same time. Using windows is said to provide substantial benefits in user interfacing and productivity, but it calls for a hefty investment in programming the required multitasking operating environment.

That environment is built into the hardware and microcode of such machines as Star and Lisa, but is absent from such machines as IBM's. Seeing a niche, Quarterdeck, VisiCorp, and a number of other companies are working hard to bring windowing packages to market. Their goal is a "seamless integration" of applications that would replace the current sequence of inserting, executing, and removing diskettes repeatedly as information is "messaged" in a spreadsheet, formatted in a word processor, and moved electronically by still another program.

THERESE E. MYERS: She's Quarterdeck captain, but she does windows for a living.

Quarterdeck's team of 10 has worked together for about 10 years, according to Myers, whose background is in finance and administration. The design of Desq was left primarily to teammate Gary W. Pope, executive vice president. Pope and Myers met at Transaction Technology Inc., a Citicorp subsidiary that handles the banking giant's electronics and systems development.

TTI, as the subsidiary is known, worked primarily in the area of consumer banking, designing automatic teller machines, credit authorization terminals, and other front office systems. Myers was assistant vice president at TTI from 1970 to 1974, when she and Pope left to join a newly spawned Citibank subsidiary, Lexar Corp.

Lexar, Myers remembers, was an ambitious effort by Citibank to develop office automation systems for its own officers as well as for sale to the rest of the world. Citibank's thinking at the time was that it would eventually be able to get out from under strict federal banking rules that prevented it and other banks from entering the data processing market.

Part of the bank's strategy was to set up Lexar as a separate subsidiary and eventually to spin out part of Lexar as its own company, Axxa Corp., in which Citibank would hold a minority interest. All that legal and financial maneuvering took so much time that when the Axxa office system was finally introduced it was far overpriced compared to other systems already on the market. Axxa found little success outside of Citibank itself, but Myers, Pope, and the others learned a great deal from the experience.

"We left Axxa in 1981 and decided we wanted to develop the same things we had learned there," recalls Myers, who had been Axxa vice president of product management, director, and principal. "The Axxa system was overpriced, but its functions were superbly integrated. We wanted to design an office system of similar capability but one that wouldn't be dependent on hardware."

Myers and company set out to build a system for professionals that would be easy for nontechnical people to use and would incorporate off-the-shelf applications programs. To do so meant a major software development effort to produce a system that could interface to unmodified standard programs, Myers explains.

Key to the Axxa system's success in its integration of functions was its use of macro commands. Pope took that idea one step further in the design of Desq through the use of a Lisp-like language he calls Sympl.

He describes the language as list-oriented and capable of treating code and data similarly. In that respect it is like Lisp, a language that has found a loyal following in artificial intelligence circles. Moreover,

the system can be "taught" how to perform routine tasks by stepping through them in the proper order. Thus, the system could learn to compare actual expenses with a planned budget in a series of steps requiring the calling up of a remote mainframe, entering the required data in an electronic spreadsheet package, and performing calculations before inserting the final comparisons into a word processing program's text.

Sympl is written in Pascal, according to Myers, who says the company has no intentions of releasing it to other users. The language is expected to find use in other Quarterdeck developments because of its adaptability, however. Moreover, it is claimed to be especially good for quick program development: the design of Desq was completed in November 1982 and the program was ready for public showing within "a few months," the executive says.

Quarterdeck was funded primarily by its founders until October 1982, when it managed to raise close to $1 million in venture capital from Montgomery Ventures, Genesis Capital, and North Star Ventures. More funding will probably be required to bring Desq to the mass market, says Myer, whose experience includes a stint with Arthur Young & Co. and training in accounting.

The company hopes its product will appeal to end users and hardware vendors alike in its ability to integrate various applications without modification. Vendors hoping to compete with Apple's much-heralded Lisa system are thought to be at a disadvantage unless they have some way of bringing together the many applications programs end users want to execute without having to switch diskettes, load and reload files, and transfer control of the machine from program to program.

"DesQ will enable users to use their favorite packages," Myers states.

Delivery of the package is slated for next fall with the retail price set at $395, she adds. VisiCorp had not yet specified a price for its VisiOn product but officials of that company were heard at the Quarterdeck Comdex booth to be impressed with the competing product.

One of DesQ's differences from VisiOn, says Myers, is its ability to use color. Each window on the display screen can be given a different color, which makes the screen image easy to read and highlights important information.

Control of DesQ can be handled through the keyboard or through that other computer device of growing popularity, the mouse. Desq also requires 256K bytes of main memory and, for speedy execution, a hard disk, notes Pope.

Industry observers suggest that when DesQ, VisiOn, and an expected competitive product from Microsoft are finally ready for delivery later this year, operating speed will be a determining factor in market success. While software-based windowing systems can never hope to compete in speed with a system like NBI's recently introduced IWS workstation, which incorporates a custom-designed 32-bit processor to "paint" windows on screens, they will have to perform fast enough to not get in the way of a user's applications. In other words, say industry observers, the multiwindow systems can't require too much overhead.

VisiOn, also designed to run on IBM's P.C., is expected to require modifications to applications programs but by the same token may run faster than DesQ, observers note.

How does it feel to be president of her own firm? Myers says it's exciting but there's no great sense of power. "We've all worked together since 1972. Each of us has specific duties and there's an element of expected trust among us."

Future plans? "The development language we've used lends itself to more and more customization. For instance, we could make a law DesQ or a medical DesQ."

Final question: whre did the name Quarterdeck come from? "It's the name of the street I live on," says Myers.

—John W. Verity

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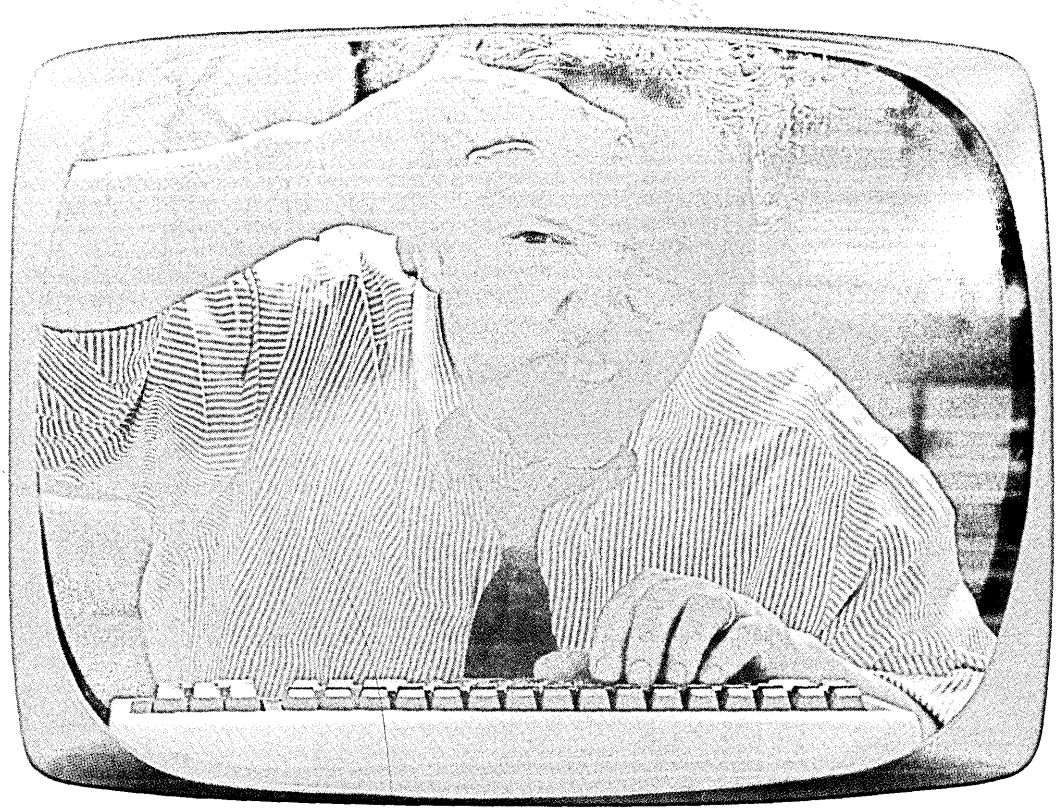

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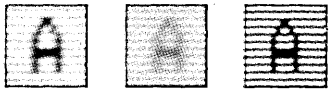
The fact is, CRT glare takes its toll. On your terminal users. And on department productivity.

But now there's a sensible solution.

Introducing Glare/Guard® anti-glare panels.

Glare/Guard instantly eliminates up to 94 percent of all CRT glare. Resolution is always sharp. And image brightness and clarity are dramatically enhanced—even under bright, fluorescent lighting.



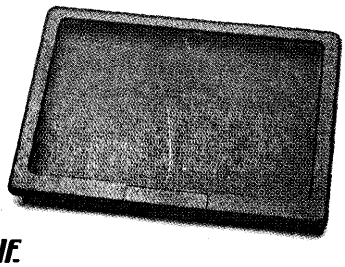
Without anti-glare panel | Etched panel | Glare/ Guard

The result? No screen washout.

Glare/Guard's secret is HEA®—a special High-Efficiency Antireflection coating we applied to the windows of NASA's Space Shuttle. And only Glare/Guard has it.

Glare/Guard's durable, laminated-glass design lasts indefinitely. It quickly retrofits to virtually every leading display terminal—no tools required. Its smooth surface is easily cleaned. And Glare/Guard sells for $99, regardless of display size.

Of course, there are less expensive anti-glare products available. But the nylon strands of mesh screens cause fuzzy images. While etched panels merely spread glare around and blur resolution.



Only Glare/Guard does exactly what an anti-glare panel is supposed to do. And that's getting your terminal user's attention out of the glare, and back onto the screen.

Try one. And see for yourself.

Place a trial order from your dealer and install Glare/Guard on your busiest terminals.

Then sit back and watch.

You'll see the difference. On the CRT screen. And in your terminal user's performance.

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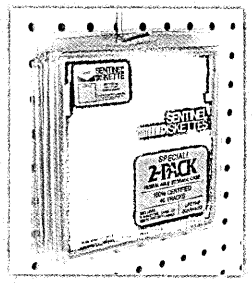
The expert technicians who produce and monitor the quality of our diskettes have developed new state-of-the-art technology using equipment we design and build ourselves, unlike any other diskette maker. That's why our burnishing method uses a unique, dedicated technique which provides an advanced degree of surface smoothness, the key to consistent high quality performance. In addition, a superior, high quality lubricant assuring extra long life and a quality control program which includes certifying every Sentinel Diskette are reasons we can offer you the industry's most exciting guarantee. For unsurpassed information security, choose Sentinel brand, and ask your dealer about the new 2-PACK in a resealable storage case.



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HARDWARE

OFF-LINE

Plexus, the supermicro maker whose name means "network" in Latin, has finally announced that its family of systems can indeed be networked together over an Ethernet-like network. The CSMA/CD technology was chosen because most traffic is expected to be short bursts resulting from users working at remote processors.

When NCR's Tower 1632 minicomputer was announced last fall, the emphasis was placed squarely on the oem marketplace, so much so that NCR created a division just to market it to oems. Now NCR has decided to sell the unit, with peripherals and software, to end users. Although it might seem that NCR was having trouble selling into the oem market, that is not the case; from the start, end-user availability was promised.

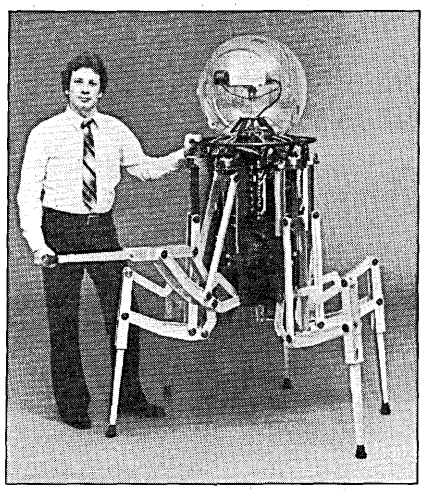
CompuPro's System 816 model 68K microcomputer may be the first away from the gate with the 68000 microprocessor and Digital Research's new CP/M-68K operating system. Applications written in C under Unix can be ported to the CP/M environment on the system.

American manufacturers are becoming more sensitive to the Japanese marketplace, at least insofar as the kanji character set is concerned. MDS Qantel recently became the latest vendor to offer the Japanese character set as an option on its business systems. Qantel hardware is distributed in Japan by C. Itoh Data Systems.

There's always a nay-sayer. While most pundits agree that IBM, Apple, and Tandy are likely to control the microcomputer market for a long time, Advanced Resources Development says that they will lose out to vendors with more standardized systems.

MOBILE ROBOT

Here's one of those products that appears to do everything except slice and dice celery. The Odex I multilegged walking machine— or functionoid— can traverse any



type of terrain, in any direction; it can climb up or down 30-inch steps; it can assume different profiles, from a tuck to a squat to a stretch to a normal five-foot height; it can support up to 1,800 pounds on its 370-pound frame; it can act as a stable platform; and it can move at different speeds.

The unit is composed of six articulators—legs that can function as arms as well—attached to a primary structure. The self-contained 360 watt/hour battery is located at the bottom of the primary structure, with the command/control center on top. Above that is the platform.

The movements of each leg are controlled by a proprietary computer within the leg; these are in turn controlled by a master computer in the unit's primary structure. A radio receiver is used to control the unit's master computer from a computer located at the user's desk; when the user moves a joystick, the local computer, master on-board computer, and articulator computers interpret that and move the articulators accordingly.

The unit is far from a production level, since sensors have not yet been added to the robot; without sensors or a vision system, travel over rough terrain is impossible. ODETICS, INC., Anaheim, Calif.

FOR DATA CIRCLE 302 ON READER CARD

IBM P.C. 68000/XENIX

The 68000 processor expansion offered by this vendor for the IBM Personal Comptuer (and the XT version) comes with 512KB of memory, expandable to 1.5MB. The processor expansion—which can run the Xenix, RM/COS, or UCSD p-System operating systems and several programming languages—is interned to give oems a tool for configuring P.C.s as engineering workstations or as multi-user systems.

In the enhanced configuration, the 8088 processor in the P.C. attends to all I/O processing chores, such as handling multiple terminals, disk I/O with disk track caching, local area networks (CSMA/CD), and other remote batch communication protocols (including 2780/3780). The 8MHz or 10MHz 68000 supports the operating system software and user applications. Exploiting the resulting concurrent processing between the 8088 and the 68000 significantly increases the overall system throughput, the vendor says.

A 68000 processor card with 512KB of memory and Xenix basic system software costs $2,500; substantial oem discounts are available. SRITEK, INC., Cleveland, Ohio.

FOR DATA CIRCLE 303 ON READER CARD

LISA'S ANCHOR

The Anchor Pad for Apple Computer's Lisa microcomputer is an addition to the vendor's line of desktop security devices. Other customized Anchor Pads are available for the IBM Personal Computer, the Apple II with two disk drives and monitor, and other microcomputers and related peripherals. The devices are intended to lock the hardware onto a desk without drilling any holes into the desk or the hardware (and thus invalidating the warranty).

The pad is attached to the desk with a powerful adhesive glue that can be removed with a certain heat process. Attached to the other side of this adhesive strip is a steel plate with two rows of loops. Four

steel bars jut through the adhesive to the tabletop to prevent anyone from slicing through the adhesive with a wire. Matching the rows of loops in the steel plate are rows of loops attached to rubber-coated steel feet that are glued to the computer (or disk drive, or any other desktop device) with the same adhesive. A two-stage key lock with left-handed threading releases a steel rod that goes through all the loops, locking the hardware to the desk. By opening the lock, the computer can be taken off the desk by any user authorized to have the key. The pads cost about $450. ANCHOR PAD INTERNATIONAL, Marina Del Rey, Calif.

FOR DATA CIRCLE 304 ON READER CARD

LASER PRINTER

The Holoscan 28 laser graphic printer is composed of the vendor's proprietary semiconductor laser, holographic scanner, and microprocessor-controlled print engine. Because holographic scanning technology is used, the complex optical alignment mechanisms and vibration mounting hardware found in conventional polygon laser scanners are eliminated, the vendor says.

The 28-pages-per-minute page printer, with video interface, resolution of 300 × 300 dots per inch, dual input paper cassettes, and plain paper with dry toner printing, costs, $12,000 in single units; for large oem quantities, about $6,000 each. Downloadable and programmed font cartridges allow the combining of character fonts on the same page, including digitized logos and signatures.

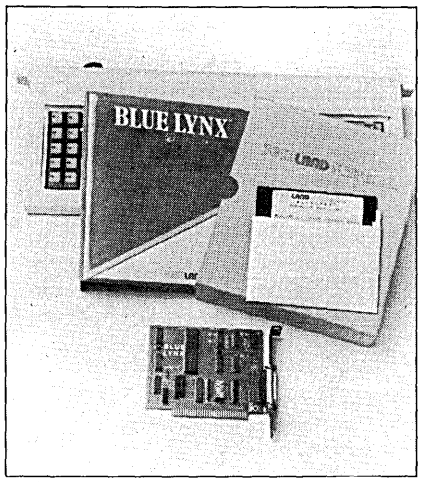
The printer can operate with most standard grades of bond, letterhead, and label stock, and transparencies. The optical bench containing the laser and holographic scanner requires no periodic maintenance; routine maintenance of the print engine is performed every 30,000 pages. GENERAL OPTRONICS CORP., Edison, N.J.

FOR DATA CIRCLE 305 ON READER CARD

5251 EMULATOR

The Blue Lynx 5251 Emulator allows the IBM Personal Computer to act as a 5251 terminal for System/34 and System/38 hosts. The hardware/software package is intended to extend the lifespans of 34s and 38s that are currently operating at close to capacity, by enabling users to download many functions to the P.C./terminal. With the Blue Lynx, the P.C. can process information off-line and then feed information back to the mainframe through telephone links.

The Blue Lynx hardware comes on a single plug-in card for the P.C. Software is



resident on a single 5¼-inch floppy disk. (Southwest Systems, Inc. developed the software and licensed it to this vendor.) The product can also emulate a 3270 terminal under the SNA/SDLC or BSC protocols. The complete product costs $700. TECHLAND SYSTEMS, INC., Mt. Vernon, N.Y.

FOR DATA CIRCLE 306 ON READER CARD

TERMINAL CONVERTER

This microprocessor-based system transforms IBM 3278, 3178, and compatible terminals into multifunction intelligent workstations with personal computing capabilities. the Avatar TC3278 universal terminal converter lets the terminal retain all of its normal functions and features for dedicated operations.

The TC3278 consists of a single board microprocessor with 64KB of RAM; three async ports for connection to non-IBM hosts, local printers, and modems; and two interfaces for the 3278 and 3274/6 cluster controller. The system includes dual 5¼-inch floppy diskette drives; a Winchester drive can replace a floppy drive. The floppy drives have an 800KB capacity, while the Winchester can hold 5MB, 10MB, or 20MB.

The product comes packaged with software including the CP/M operating system, the CalcStar spreadsheet, WordStar word processing packages, and the CBASIC software development system. Utilities for data transfer, file maintenance, and system configuration are also included in the 7¾ × 12¼ × 12¾-inch box. The unit connects between the terminal and the host's cluster controller; the user switches between on-line and local operations with a switch on the front panel. The unit costs $2,800. 3R COMPUTERS INC., Westboro, Mass.

FOR DATA CIRCLE 307 ON READER CARD

MOBILE MICRO

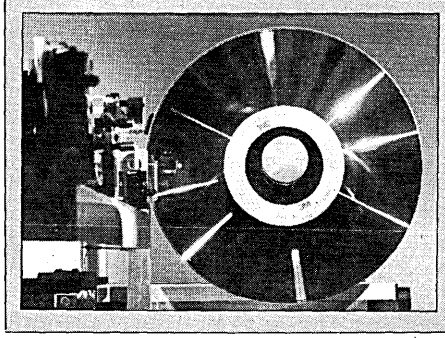
The Gavilan microcomputer manages to cram together an Intel 8088 microprocessor, 80KB RAM, a 3½-inch floppy diskette drive, a modem, batteries with recharger, full size QWERTY keyboard with numerical keypad, eight line by 66 character flat liq-

HARDWARE SPOTLIGHT

OPTICAL DISK

Optical disk drives are beginning to achieve some prominence as alternative methods for high-volume permanent document storage. Borrowing technologies such as electron beams, lasers, and optics, some optical disk drive systems allow users to store up to 6,000 pages on a single, $12, 12-inch optical disk.

One such disk is currently manufactured by 3M, and can hold 1.3 gigabytes on each side. The disk is formatted and grooved so that, in combination with laser diode-based optical drives, it offers the potential for a storage and retrieval system with far greater capacity than conventional micrographics techniques and with shorter access times. (Any individual sector of a disk can be accessed and retrieved in approximately 0.45 seconds; there are 40,000 grooves with 70 sectors on each side, and each sector contains four kilobits of information.



The disk is a "write once" optical disk based on "direct read after write" technology that assures error-free writing onto the disk. Access to the system is achieved by a combination of laser-based head technology and the grooved disk. Embossed in each of the disk's 40,000 grooves are multiple track and sector access codes. The medium is carried in a plastic insertion cartridge for protection and ease of handling. 3M, St. Paul, Minn.

FOR DATA CIRCLE 300 ON READER CARD

Working in conjunction with 3M, NEC has an N6329-21 optical disk drive on the market. The drive writes information by leaving a submicron permanent physical change on the media surface. It can store both image data (drawings, documents, logos, etc.) and digital data on the same disk.

The drive's front-loading and loading/unloading operations are designed to make this technology as easy to use as possible. Because of the construction process and the stable material used in the media, long archival life is expected; the materials are not sensitive to oxidation.

The disk drive features 810KBps data transfer rate and spins the disks at 900 rpm for less wear on the motor. The drive is priced at about $14,000. First customer shipments are scheduled for the fall, and about 5,000 drives are expected to be sold in the first three years. NEC INFORMATION SYSTEMS, Lexington, Mass.

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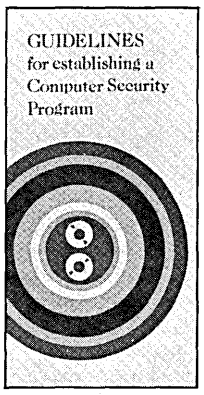

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uid crystal display, and what might best be called a "solid-state mouse"—all into a box weighing nine pounds and measuring 11½ × 11½ × 2¾ inches. Also included in the $4,000 box is the proprietary Gavilan operating system, human interface software akin to Lisa's filing system, "intelligent" on-line help, a portable secretary program, and word processing and spreadsheet applications programs. MS/DOS, M-BASIC, and PFS and Sorcim software are also included.

The computer is intended for professionals who use more than one desk as their "office," including people who work at home, at branch locations, in transit, or at client sites. The battery pack can last through eight hours of use, and the nonvolatile RAM—which can be expanded to 336KB through plug-in CMOS RAM cartridges—allows users to store programs and data in main memory not attached to the cpu.

The unit can be combined with an 11½ × 3½ × 2¾ printer that attaches to the back and provides 11 × 16 characters under its own battery power. GAVILAN COMPUTER CORP., Campbell, Calif.

FOR DATA CIRCLE 308 ON READER CARD

UNIBUS-VERSABUS LINK

The Uni/Vers link directly connects Unibus to Versabus architectures to give DEC system designers more flexibility in configuring systems, by taking advantage of the multiprocessing capabilities of the Versabus architecture. The product is a two-board set with two cable assemblies joining them. On the Unibus side, the cable assemblies connect to a circuit board that occupies one SPC slot of the Unibus in the backplane. On the Versabus side, the cable assemblies connect to a standard Versabus board occupying one slot of the Versabus backplane. Base address assignments and range boundaries are user defined by DIP switches on both boards.

Because the Versabus address space (16MB) is very large compared to the Unibus address space (256KB), the Unibus memory looks like part of the Versabus memory from the Versabus processor's perspective. Uni/Vers memory maps all 256KB locations to the Versabus. In a transparent mode DMA, there is no need for either system cpu to set up physical address pointers. Shipments are expected to begin in the third quarter. Each two-board set costs $5,000, with oem discounts. ASSOCIATED COMPUTER CONSULTANTS, Santa Barbara, Calif.

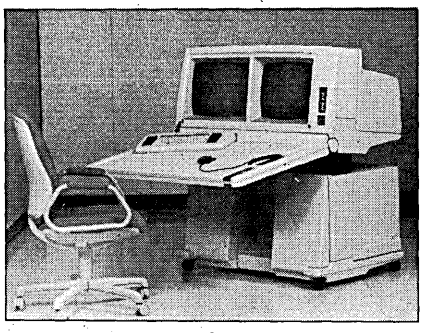
FOR DATA CIRCLE 309 ON READER CARD

ENGINEERING WORKSTATION

This engineering workstation consists of a pair of monochrome crts, a detached keyboard, 12-button mouse, and 22 × 34 inch digitizing surface. The workstation is based on three internal microprocessors—a 68000 and two proprietary chips—with 750KB RAM to support interactive applications and the 1,280 × 1,024 pixel resolution of each display.

The unit can perform locally display operations such as dynamic pan, continuous zoom, and real-time rotation of three-dimensional elements. Other functions that can be offloaded include grid generation, cursor tracking, menu command decoding, dynamic drag, and selective erase. Data files are maintained and updated by the host.

The digitizing work surface can be rotated from a flat position to a 35° angle, and the entire housing of screens and work surface can be pivoted 30 degrees and raised 12½ inches. Standard and user-defined menus can be installed directly on the work surface or on a Floating Menu, an



input tablet that can be placed anywhere on the digitizing surface.

Communications are provided to a host using SDLC and to other Intergraph systems using the Internet local area network. A color model is promised later this year. A single workstation costs $44,000. INTERGRAPH CORP., Huntsville, Ala.

FOR DATA CIRCLE 310 ON READER CARD

TAPE DRIVE

The 3430 magnetic tape subsystem offers about three and one half times the data rate and storage density of the current comparable model 3410, this vendor says, and is designed to offer high storage capacity and reliability to users of medium-size IBM computers. The 3420 can operate with the System/38 models 4, 5, and 7, as well as with System/370 models 135 through 168, and all 303X and 4300 series processors.

The data rate, storage, and reliability improvements come from Group Coded Recording, a method of magnetic tape recording used on high-performance models of the 3420 series. The 3430 can read and record data at 1,600 or 6,250 bytes per inch, and operates at instantaneous data rates of 80KBps or 312KBps.

A microdiagnostic package provides for error detection. The 3430 model A1, which consists of a tape control and one tape unit housed in a single compact enclosure, costs $33,400. The model B1, which consists of a single tape unit, costs $16,900. IBM CORP., Rye Brook, N.Y.

FOR DATA CIRCLE 311 ON READER CARD

CONTROLLER

The Multi-Path Controller is intended to eliminate the need to have more than one crt on a desk. The device allows a single tube—ASCII terminal, personal computer, or other workstation—to access two IBM and multiple minicomputer hosts or time-sharing devices. Virtually any such device can be attached to the desktop-sized controller. The controller allows either direct connect attachment (via RS232 cables) or dial-in connection (via async modems) of its devices. Up to eight integrated 212 modems are offered, and the controller's 23 modem ports are shared. Users can choose their access path from the keyboard. All async ports and logical unit addresses are individually passwork protected.

The controller can replace IBM 3274/3276 devices as input for a 3705 front-end processor. It costs $17,000. DATASTREAM COMMUNICATIONS, INC., Santa Clara, Calif.

FOR DATA CIRCLE 312 ON READER CARD

T-1 MUX

The T-Mux microprocessor-controlled multiplexor can combine 48 voice and data signals for transmission over a single T-1 1.544Mbps carrier facility. Such facilities include microwave, satellite, infrared, fiber optic, and other private carriers.

The T-Mux accommodates up to 24 data inputs, both synchronous and asynchronous, at speeds up to 448kbps. The product may be used in local point-to-point applications and in larger networks in combination with the vendor's 790 and 792 concentrators.

T-Mux is available with redundancy options for better system reliability. Downline loading and built-in diagnostics are also provided. Reconfiguration can be done centrally for both ends of the communications link, so that the far end may be unattended. The multiplexor starts at $4,800. INFOTRON SYSTEMS CORP., Cherry Hill, N.J.

FOR DATA CIRCLE 313 ON READER CARD

OCR SCANNER

The Series 500 optical character recognition system, based on LSI technology, comes with either a wand or slot reader for data entry. A string of up to 80 characters can be recognized in OCR-A, ORC-B, and E13B fonts. The Series 500 can be connected to most standard terminals that use dual port or standard parallel interfaces. An interface to the IBM P.C. is also available.

Users of the Series 500 can program their own data formats, specifying field lengths and character types to be accepted as valid. Data can be scanned at speeds varying from five to 20 inches per second. The scanner costs $1,300. CAERE CORP., Los Gatos, Calif.

FOR DATA CIRCLE 314 ON READER CARD

—Michael Tyler

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At Nixdorf, we go to great pains to eliminate the problems that can result from inflexible systems—problems like eye strain, neck strain, backaches and headaches.

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We also developed flicker-free numbers and letters, displayed in an optimum size, shape and color. And a movable, low-profile keyboard with rounded keys that help the human fingertip glide more quickly from A to Z, and provide reassuring feedback to the user.

All of which means a more comfortable, confident and productive relationship between people and systems.

For 31 years, Nixdorf has been providing solutions for the information processing needs of all kinds of businesses. And today, we're a successful international company with 16,000 people and over 110,000 computer systems installed around the world.

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300 Third Avenue, Waltham, MA 02154

NIXDORF
COMPUTER

CIRCLE 61 ON READER CARD

Users and DP form powerful team, thanks to INQUIRE

Anthony Gambatese
Vice President, Data Processing

Robert W. Amick
Vice President, Marketing

The day-to-day insurance business of $1 billion-a-year Blue Cross of Northeast Ohio (BCNO) has been automated for a long time. Enrollments are made quickly. Claims are paid promptly.

But competition for group insurance business had become strong in the eleven-county market surrounding Cleveland. Blue Cross marketing executives knew there was a considerable amount of information already on the computer which would help the company stimulate aggressive growth in its market. "The challenge," said Vice President of Marketing Bob Amick, "was how to turn existing customer information into meaningful marketing information."

Using INQUIRE, a small team of DP people were able to prototype each part of the required application as marketing people looked on. The final system met the users' objectives because they had been directly involved in its development. INQUIRE was used to retrieve ad hoc reports from diverse and widespread databases. INQUIRE made it possible to do user-specified multi-key searches for information. The INQUIRE User Language allowed DP people to develop complex systems for end-users to run themselves.

Said Vice President of Data Processing Anthony Gambatese, "The Marketing Information System has shown us what is possible for application development through INQUIRE. Now we're turning to INQUIRE for Executive Decision Support, budgeting, HMO utilization, and much more. We call INQUIRE our user-enabling tool."

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CIRCLE 185 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Phase One Systems, which sells the Oasis family of operating system software, has had its share of troubles meeting pre-announced schedules. Its 8-bit Pascal compiler, announced over a year ago, is still unavailable and probably will be for a while, since the company has shifted focus to the 16-bit world. But the Oasis-16 operating system was more than six months late when it was finally made available at Comdex in April. The system is initially available for the IBM P.C.

We all know you can't judge a book by its cover, and you certainly can't judge computer software by its cover -- with some companies, at least. So along comes Coopers & Lybrand, the respected accounting firm, offering to evaluate software written for personal computers, desktop micros, and other small business systems. That way, you know what you're getting before you lay down your money. Specifically, C&L will determine whether a package is well documented and enables accounting information to be prepared in accordance with generally accepted accounting principles.

Another entry in the altruism department comes from Silicon Valley Systems, which will be giving away $1 million of its word processing and educational software to the public schools. The software is available for the asking; schools should write to the Belmont, Calif., vendor for details.

Cromemco is eyeing the artificial intelligence market as a target for its line of 8-, 16-, and 32-bit computer systems. The vendor recently announced that the AI programming language LISP will run on the entire Cromemco line. The move is designed for natural language database applications and other "expert systems."

P.C. - S/34 CONNECTION

Baby/34 allows the IBM Personal Computer to run software written for the System/34 series of computers. The product creates a software environment for the P.C., allowing complete RPG II application systems and programs developed for the S/34 to be transported "as is" to the P.C. Performance will be degraded since the P.C.'s engine is not as powerful, however.

The Baby/34 package includes an IBM System/34 Operations Control Language processor; an S/34 compatible RPG II compiler; a Runtime Execution package; source entry utility; screen format generator; basic data exchange conversion; and a data file utility. The package is intended to extend the life of System/34s that are operating at near capacity by downloading some tasks and applications to the P.C.

The package is based on the technology incorporated in the vendor's RPG Package 34, which is installed in the U.S. and Europe on the Honeywell DPS 6 series of minis. Baby/34 runs under PC/DOS and requires a minimum of 128KB of RAM and a 5¼- or 8-inch diskette drive. The package will be available in July and cost $2,500. CALIFORNIA SOFTWARE PRODUCTS, INC., Santa Ana, Calif.

FOR DATA CIRCLE 326 ON READER CARD

FINANCE AND DISTRIBUTION

Following the lead of other independent systems software companies such as Cincom and Cullinet, this vendor enters the applications software market with these two Advanced Business Software series. Both series are planned to be integrated with the vendor's recently introduced CA-Universe relational database management system. When that integration is complete, the products will be transportable across the IBM and Data General hardware lines.

The Financial Management series encompasses products for general ledger, accounts payable, accounts receivable, budgeting, forecasting/modeling, customized financial reporting, asset management, human resources, and payroll administration. The Distribution Management series, designed to automate the warehouse and distribution industry, includes modules for receivables and payables, inventory control, purchasing, order processing, and sales analysis. All of the modules in each series are integrated and interactive, so that a user making an update in one module can immediately use that updated information in another module.

For IBM OS-based mainframes, the Distribution Management series costs $97,500 and the Financial Management series costs $109,500. For DOS systems, the Distribution Management series costs $89,500 and the Financial Management series costs $96,000. For Data General computers, the Distribution Management series costs $35,000 and the Financial Management series costs $30,000. COMPUTER ASSOCIATES, INC., Jericho, N.Y.

FOR DATA CIRCLE 327 ON READER CARD

PORTABLE COBOL

RM/COBOL, the popular implementation of the programming language, is available on IBM's S/370, 30XX, and 4300 series mainframes under VM/CMS. The compiler allows users to develop applications on mainframes that can be downloaded to micros. In such cases, the source code would remain on the mainframe, unavailable to the micro users.

RM/COBOL is available on a wide range of minicomputers and micros, and is identical in all installations for portability. The compiler allows for ANSI Level 2 sequential, relative, and indexed file access methods, including alternate keys with duplicates.

The product comes with an interactive COBOL debugger, which allows the programmer to inspect what is going on inside the computer while the program is being executed. The RM/COBOL can be leased on the IBM mainframes for $5,000 per year. RYAN-MCFARLAND CORP., Rolling Hills Estates, Calif.

FOR DATA CIRCLE 329 ON READER CARD

BURPLE

This hardware/software attachment adds Burroughs TD830/MT983 terminal and B 20 microcomputer emulation capabilities to

the Apple II Plus and Apple III microcomputers. The Burple, as it is called, provides integrated async, sync, direct connect, and daisychaining capabilities. Apple users can access a mainframe Burroughs database, process the data locally, and then upload the data back to the mainframe.

The modular software is composed of an emulation program that performs the terminal functions and three major communications routines written in 6502 assembler. These polling, receiving, and transmitting routines are callable using Apple BASIC, Pascal, and COBOL. Routines can be incorporated into user or vendor-written programs to make the Apple communicate with the Burroughs.

The software also includes a tutorial configuration program to aid in configuring the Burple hardware to the Burroughs physical environment. The hardware is a custom-designed communications board with three serial ports, for communications with the mainframe, for the printer, and for daisychaining of terminals. Burple costs $1,000, including a year warranty and a 30-day unconditional trial. MIDWEST DATA SOURCE, INC., Cincinnati, Ohio.

FOR DATA CIRCLE 328 ON READER CARD

GEOGRAPHY

Users of this vendor's Executive Presentation System for color business graphics can purchase computerized maps of the 48 contiguous states in a format compatible with the EPS/Map software package.

The package includes an outline of the U.S. with the states outlined and labeled separately or collectively. States can be colored individually or in groups. Also included are larger-format maps with coordinates for plotting locations of major cities. Users can tailor each map for specific needs or combine them with other EPS charts.

The maps can use eight colors, with seven type faces. Full zoom control, pan and rotate, and horizontal or vertical orientation are provided on the $500 product. Color construction of a chart can be done on the vendor's EPS terminal, with editing completed minutes before the nal visuals are produced. Complete or partial charts can be stored on diskettes for future use. Charts and maps can then be produced on transparencies, on print-quality hardcopy, or on slides. INTELLIGENT SYSTEMS CORP., Norcross, Ga.

FOR DATA CIRCLE 330 ON READER CARD

P.C. WORD PROCESSING

NBI Word Processing provides IBM and Compaq personal computer users with the same capabilities as this vendor's professional word processing workstations provide. Documents created on the IBM P.C. (or XT) or Compaq can be communicated to the vendor's OASys office automation systems.

The product includes an NBI coprocessor board, which inserts into the P.C., as well as the necessary software. Functions available include form letters, printing while editing, indent, word wraparound, outline formatting, disk password security, alphabetized directory, typewriter mode, block copy, move and delete, decimal tabs, display of page breaks, and document insertion. User help menus are provided with three levels of detail to aid newly trained operators in becoming productive and to refresh experienced operators without slowing them down.

A training guide, reference card, reference guide, and adhesive-backed keyboard layout are provided as part of the $700 price. NBI INC., Boulder, Colo.

FOR DATA CIRCLE 331 ON READER CARD

SPREADSHEET CREATORS

The Multi-Tool expert systems create finance and accounting worksheets for use with the vendor's Multiplan electronic spreadsheet package. The Multi-Tool Budget package is designed for budget planning and control, and the Multi-Tool Financial Statement package is designed for performing financial statement ratio analysis.

Each package consists of program disks that contain a demonstration to teach new users how to use the package; the programs that prompt the user for information for building the Multiplan worksheets; and example cases, which are interactive case studies that help the user understand how a mythical company would develop the worksheets. A user manual contains tutorial guidance for the subject area and the decision process; these tutorials are designed for users who are experienced professionals or who are learning finance and accounting.

The systems ask the user English questions to elicit the information needed to build a worksheet. Users select time periods, intervals, number of categories and subcategories to analyze, and assign names that are appropriate to the business environment. The software then creates the formulas and formats the worksheet. The budget package costs $150, while the finance package costs $100. MICROSOFT, Bellevue, Wash.

FOR DATA CIRCLE 332 ON READER CARD

ELECTRONIC MAIL

CT-Mail is an electronic mail system for this vendor's oem microcomputer-based workstations that processes messages locally at the workstation. The product is designed to provide an interface to the company's other office automation programs, such as business graphics and Multiplan.

The CT-Mail is based on the vendor's cluster architecture. Messages with up to eight attachments can be sent among the 16 workstations in a cluster, or from cluster to cluster through remote dialing lines. Because the package is not based on a central computer, the mail package would run even if a cpu went down.

CT-Mail is oem configurable so that oems can write their own modules and interface the electronic mail to their own products. The package costs $70,000 for a multi-user license, which gives oems the

SOFTWARE SPOTLIGHT

VOICE OPERATING SYSTEM

The Voice Operating System (VOS) is intended to speed and facilitate the use of voice technology products in computer systems by helping applications programmers design the voice input/output segment of their applications efficiently. The VOS consists of three segments: a conventional operating system such as PC/DOS or RMX-86; a command language for writing applications, called Dialog Builder; and a complete set of utilities capable of copying and renaming files, backing up floppy files, and accomplishing similar tasks.

The Dialog Builder works with PC/DOS or RMX-86 to provide the programs necessary to define a dialog, enter voice data, and generate and execute code for an application. The Vocabulary Builder aspect of the Dialog Builder is a screen-oriented procedure for defining and maintaining files that define a dialog and store voice data. The module enables programmers to evaluate and fine-tune vocabulary and recorded messages without affecting the overall application. The Vocabulary Builder also helps define the voice elements and provides a menu-directed method of establishing the content. Once a user establishes a library of content elements (such as prerecorded messages, recognition templates, etc.), methods are provided for copying, combining, or editing dialog elements.

The Interactive Development Language aspect of the Dialog Builder segment is an on-line voice application development and debugging language. It sequentially executes high-level commands entered to control the vendor's VX voice processing equipment. Commands are compiled and executed one by one as they are entered. The program gives immediate feedback regarding how the command works, any errors that exist, or how the voice I/O interfaces with the program.

The Dialog compiler translates the source code written in the command language and generates code readable by the VX hardware. The Dialog Executive, the final aspect of the Dialog Builder, interprets the code generated by the compiler and runs the voice application program using the voice data in the voice data files.

The VOS package is available for use with the vendor's single-user or multiple-user development systems. VOS costs $1,000. VOTAN, Fremont, Calif.

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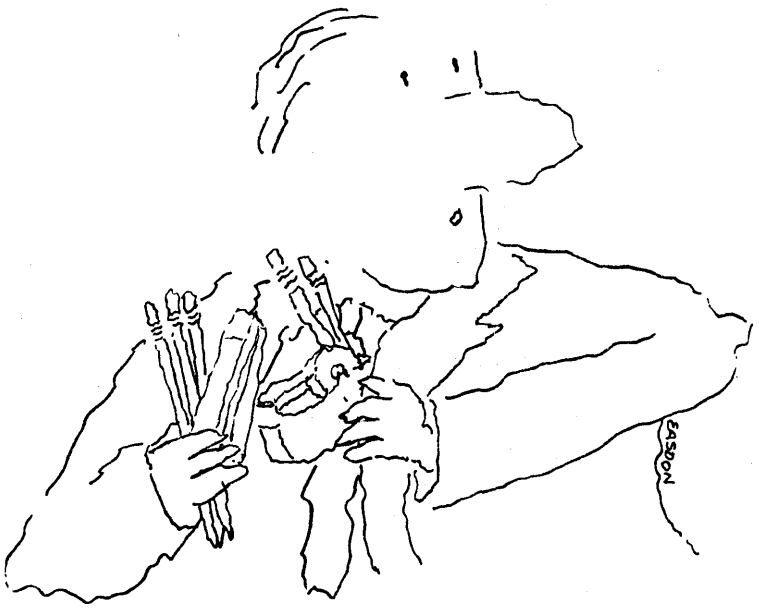

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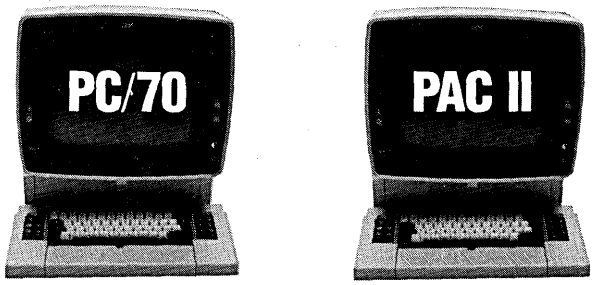

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right to copy the software and to distribute it for an unlimited number of copies. Single quantities cost $3,500. CONVERGENT TECHNOLOGIES, Santa Clara, Calif.

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P.C. DSS I

The IFPS/Personal distributed decision support system gives users of IBM P.C.s the same problem-solving and decision-making assistance as is provided by the mainframe-level IFPS software. The package allows P.C.s to access information stored in an Information Center and to incorporate that information into business models.

IFPS (Interactive Financial Planning System) offers P.C. users a nonprocedural modeling language that uses English-like commands. The IFPS/Personal modeling language, commands, and processes are the same as those used in the mainframe-level IFPS, so that models created with IFPS/Personal will run on the mainframe IFPS system. Thus, models can be built locally on the P.C. with information downloaded from the mainframe; models created by different managers can be combined by uploading back to the mainframe to create a comprehensive corporate-level report.

The six-part IFPS/Personal program includes: optional one day on-site training; advanced training for system coordinators; telephone assistance for system coordinators; user reference manual; reference card; and tutorial on model building and problem solving, available in print or on-line. The package is being sold initially only to current users of the mainframe IFPS. A minimum order of 10 copies costs $20,000. EXECUCOM SYSTEMS CORP., Austin, Texas.

FOR DATA CIRCLE 334 ON READER CARD

REPRINT DATABASE

The Sci-Mate Personal Data Manager is designed to manage scientists' and librarians' reprint collections by turning them into "mini databases." Users can enter bibliographic information about each paper, book, pamphlet, letter, lab note, or other items. They can then use Sci-Mate to search and identify items that match search items or phrases they select.

The system has a free-text searching capability that enables users to search all fields, rather than limiting the search to titles, authors, journals, or other fields. Users can label up to 20 different fields for each entry. These may include author, journal, article title, date, or other bibliographic information, as well as notes or comments. The product indexes all of the data.

The Sci-Mate package lets users employ Boolean logic to combine search terms and can truncate search terms so the user can retrieve variations on the term. Users can flag items in order to review the status of reprint or interlibrary loan requests or to review the status of research projects. The Sci-Mate Personal Data Manager costs $540 and operates on the IBM P.C. under CP/M-86 or on any CP/M-80 system with an 8-inch floppy disk drive. INSTITUTE FOR SCIENTIFIC INFORMATION, Philadelphia, Pa.

FOR DATA CIRCLE 337 ON READER CARD

PC MARKET SERVICE

The Personal Computers in Key Accounts (PIKA) service identifies large volume users of microcomputers in key accounts. PIKA provides installed user data and highlights 1983 buying intentions. The program concentrates on companies with up to 2,000 computers installed and more planned for 1983.

The service is designed for manufacturers and distributors who market directly to Fortune 1,000 companies. The accounts listed are qualified sales leads for key account marketing professionals with computers, peripherals, software, communications, and expansion boards to sell.

The information service highlights volume buying plans, micros currently installed, groups or individuals responsible for acquisition, applications areas planned, current micro buying standards, and personal computers networked or communicating. Other data collected include sales revenue, number of employees, mainframes at the site, communication manager, parent company, and location where buying decisions are made.

Information comes directly from 1,500 customer telephone surveys conducted monthly. Services can be tailored to meet individual companies' needs. The subscription varies from $500 to $1,200 per month. COMPUTER INTELLIGENCE CORP., La Jolla, Calif.

FOR DATA CIRCLE 338 ON READER CARD

GREATEST HITS

The Executive Package is a collection of over 50 BASIC and VisiCalc programs and tables for the IBM Personal Computer, based on the book *Executive Computing* by John Nevison. The Executive Package contains two disks, one with 41 BASIC programs and the other with 17 VisiCalc tables.

The VisiCalc disk is compatible with VisiCalc, Lotus 1-2-3, and Multiplan. The two disks come with 400 pages of documentation written as case studies. This documentation is intended to show the user how to approach problems and attain solutions using either popular software.

All of the VisiCalc tables are included as BASIC programs. Some of these are Inflate, which projects profit margin in products with inflationary costs; X-Ray, which allocates fixed costs among products and computes each product's contribution to profits; Timely, which estimates how long projects composed of several small jobs will take; Depa, Depb, and Depc, which calculate different rates of depreciation; Amort, which prints a loan amortization schedule; and Cashplan, which projects income statements and cash flow and reconciles debt with available cash. The entire package costs $145, which includes the diskettes, an audio cassette tape with verbal instruction, and an interactive demonstration. ALPHA SOFTWARE CORP., Burlington, Mass.

FOR DATA CIRCLE 340 ON READER CARD

ECONOMIC ANALYSIS

Ashton-Tate's microcomputer financial modeling and spreadsheet program, the Financial Planner, can be integrated into this vendor's Delta-DSS economic analysis package. Delta-DSS utilizes historical, regional, and forecast data supplied by the vendor to produce comprehensive economic and financial analysis for end users. The addition of the Financial Planner allows the vendor to build industry-specific models as well as incorporate industry-standard factors within the Delta-DSS, without making the result too cumbersome for end users.

The ability to use the Financial Planner—instead of using manual computation, timesharing services, or in-house mainframes—in the preparation of financial data and forecasts is intended to bolster the accuracy and efficiency of the monthly (or quarterly) data and forecast updates to the Delta-DSS system.

The enhanced Delta-DSS software includes six integrated functions: economic database manager; statistical analysis and time-series forecasting; color graphics with light pen support; word processing; an economic newsletter prepared by the vendor's economics staff; and the spreadsheet program. EVANS ECONOMICS, INC., Washington, D.C.

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DATA INSURANCE

The ACU All Risk Small Computer Policy is an insurance policy designed for small computer users. It covers accidental erasure or loss of data, reimbursing the cost of reconstruction of data and programs up to a limit of $25,000. The policy covers five risks: direct physical loss or damage to the computer, media, programs, data, and documentation or source materials; accidental erasure or loss of data; dishonest acts, fraud, or misuse of the computer by employees or outside parties; extraordinary damage to equipment caused by external electrical problems, such as spikes, brownouts, or power surges (often excluded from maintenance contracts); and extra expenses incurred in continuing the business as a result of the covered loss.

The policy costs $175 per year for protection up to $25,000, with a $250 deductible. It is being offered in conjunction with the St. Paul Fire and Marine Insurance Companies. ASSOCIATION OF COMPUTER USERS, Boulder, Colo.

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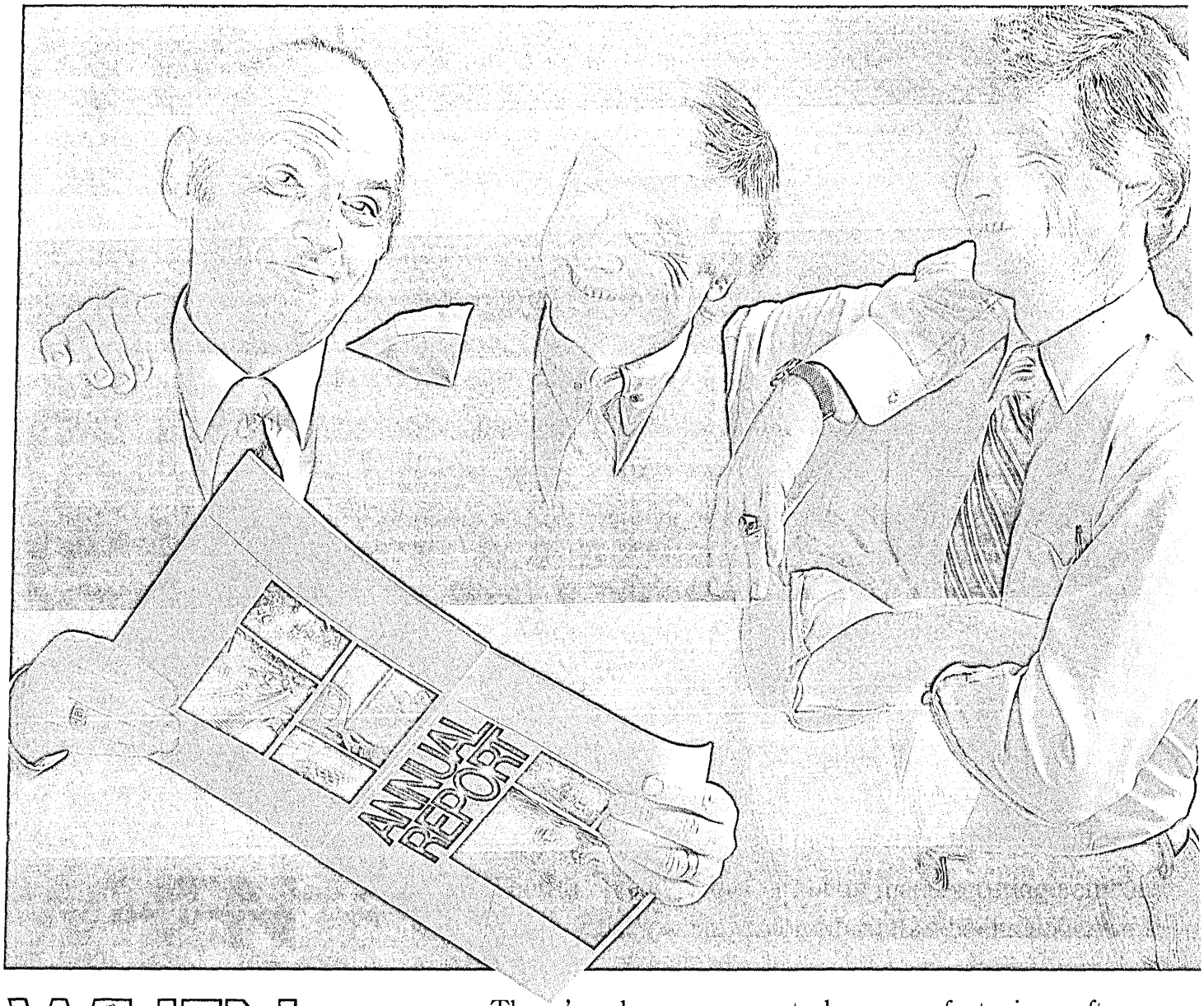
—Michael Tyler



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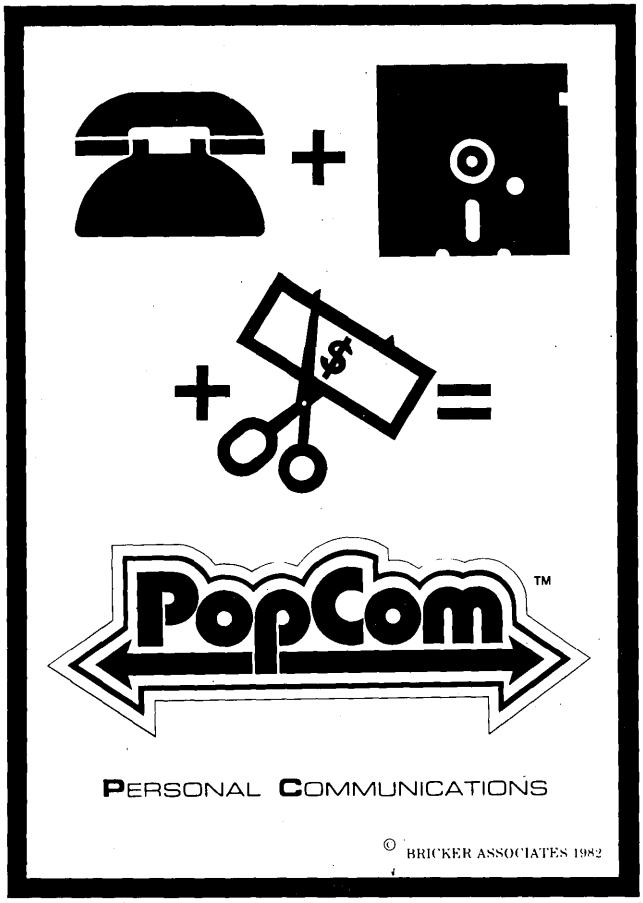

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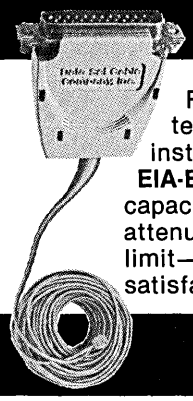

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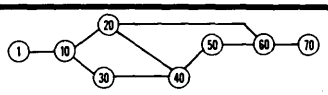

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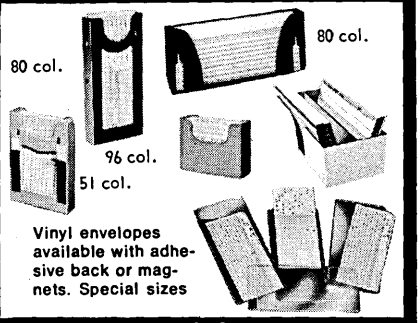

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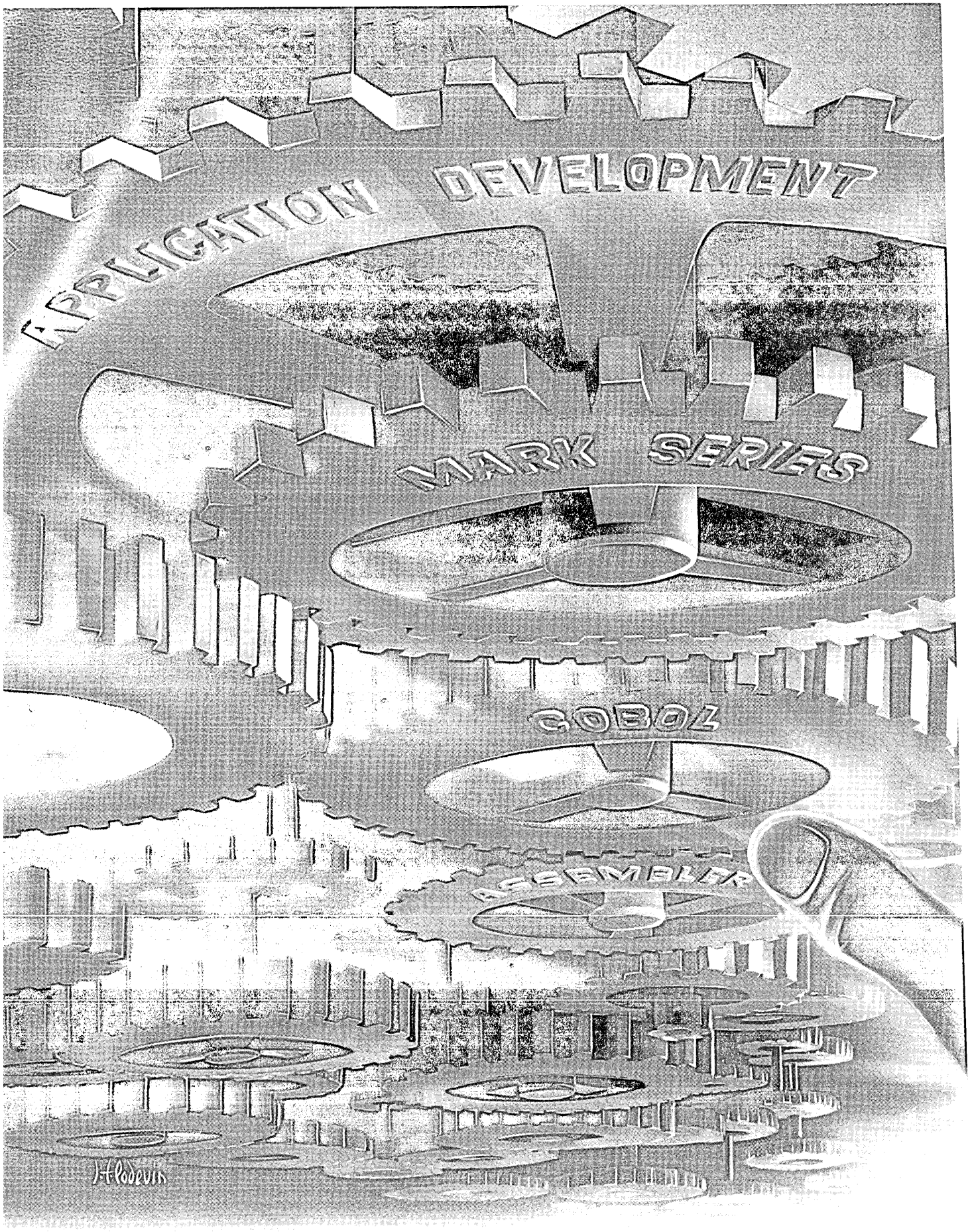
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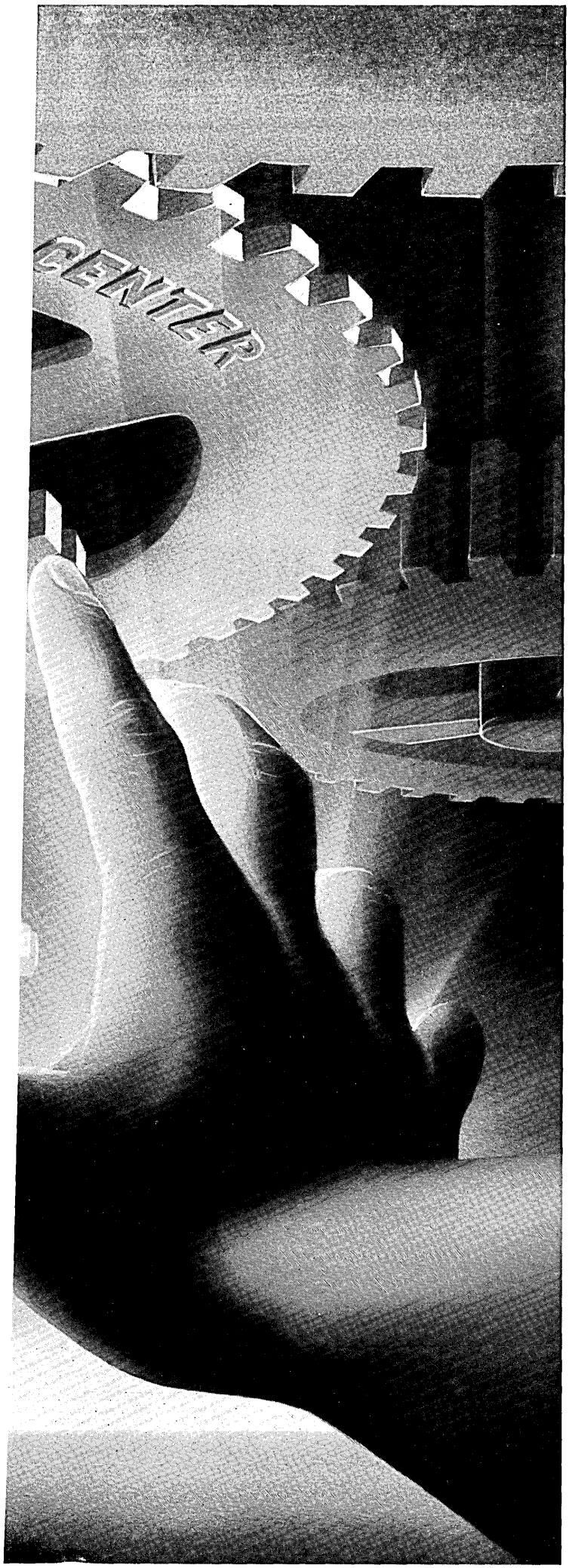

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BOOKS

AUTOMATING APARTHEID: U.S. Computer Exports to South Africa and the Arms Embargo by American Friends Service Committee

The spectacle of the computer, a machine that unlike any before it seems to do so much for so little, continues to dazzle the industrial mind as it has for 40 years. We may take for granted the computer's pervasiveness in business, but now, more frequently and with greater fervor than ever, we hear speculation that man himself is on the verge of a radical transformation through computing, that some Third Wave is about to wash us into the postindustrial grace of an information age. The world's most pressing problems, we are told, can be reduced to mere matters of data that are scientifically collected and processed for the good of mankind. Lately, even, the home computer promises each of us our share of the great banquet of mass production.

There is a hollow ring to such proclamations of the computer as an agent of liberation. We tend to overlook the fact that one of the biggest, if not the biggest, application for computers is that of management, not calculation in the strictest sense. The computer lends itself to putting power over the many in the hands of a few.

Nowhere is this more brutally evident than in South Africa, where computers are helping 4.5 million besieged whites rule over 25 million nonwhites. The computer has become a key tool in the enforcement of apartheid, the racist policy by which the whites ensure themselves of a regulated supply of cheap labor that has virtually no political power of its own.

Automating Apartheid is the product of several years' research into South Africa's use of foreign technology. Conducted by an independent Quaker organization, the research sheds new light on the often willing complicity of U.S. corporations that sell the South African regime computers, communications gear, and other electronics for use in suppressing opposition. Scouring South African libraries, delving into U.S. government files, and questioning those corporations willing to talk, the authors present an unprecedented documentation of how the integrated circuit supports a segregated society.

The sale of computers to South Africa has long been an issue raised, for instance, at IBM shareholder meetings. Church groups frequently propose that the computer maker leave South Africa until that country dismantles its apartheid system. The church groups are listened to politely for the most part, but their proposals are always rejected overwhelmingly. Foreign policy is for the government to worry about, management's line goes. Moreover, local subsidiaries treat blacks fairly and thereby contribute to peaceful change in South Africa.

In any event, it makes good business sense. For all their self-reliance in building jet planes, making oil from coal, and feeding themselves, South African whites are almost totally dependent on foreign suppliers for the computers that make their economy work. And, more importantly, the minute-by-minute, body-by-body management of the black, colored, and Asian work force is now performed on such a large scale that only computers can handle the task with the speed and accuracy apartheid requires.

This dependence on foreign computers has drawn into the South African market several dozen computer manufacturers, each seeking a piece of what is estimated to be a $500 million market. Not too surprisingly, the majority of these firms, and the majority of all computers installed in South Africa, are of United States origin. Their names are familiar—IBM, Sperry Corp., NCR, Burroughs, Digital Equipment, and Control Data, to name a few—as are the products they sell.

What some of those computers are used for isn't so familiar, however. How many of us, for instance, know what it is like to be fingerprinted at age 16 because the law says we must be? That is exactly what happens to each and every black child in South Africa, whether he has committed a crime or not. It is part of his formal induction into apartheid, for from that moment on he must always carry a passbook, the "Book of Life," which for the purposes of the government is his or her only proof of identity. Of course the passbook system has been computerized as part of the government's "influx control" program and, according to the authors of *Automating Apartheid*, serious proposals have been made recently to extend compulsory fingerprinting to whites as well as blacks.

At the time of this book's writing, the major suppliers of equipment for the passbook systems were IBM and International Computers Ltd. of Britain. Their equipment was installed long before a 1978 arms embargo was instituted by the Carter Administration as a means of putting pressure on the South African regime. The U.S. Commerce Department banned the export of all U.S.-origin products destined for South African police or military agencies. This included the computers, both "commercial" and military, that are of strategic importance to Pretoria in its fight for survival.

U.S. corporations, according to the book, were displeased at the embargo from the beginning and through various channels began voicing their protest. They also reportedly sought to evade the embargo's spirit if not the letter of its law. In a cable obtained by the authors, the U.S. embassy in Pretoria described to Washington the impact of international sanctions, the role of multinationals operating in South Africa, and the fact that the country had set up an "economic warfare commission." In that cable, according to the authors, appears this passage: "Multinationals, including U.S. subsidiaries, are determined to undercut any sanctions and have already made plans to camouflage their operation through subterfuges arranged with affiliates in other countries."

In other words, computer systems not actually manufactured in the U.S. would be shipped to South Africa by U.S.-based companies. And it appears that this is happening. Several U.S multinationals, in-

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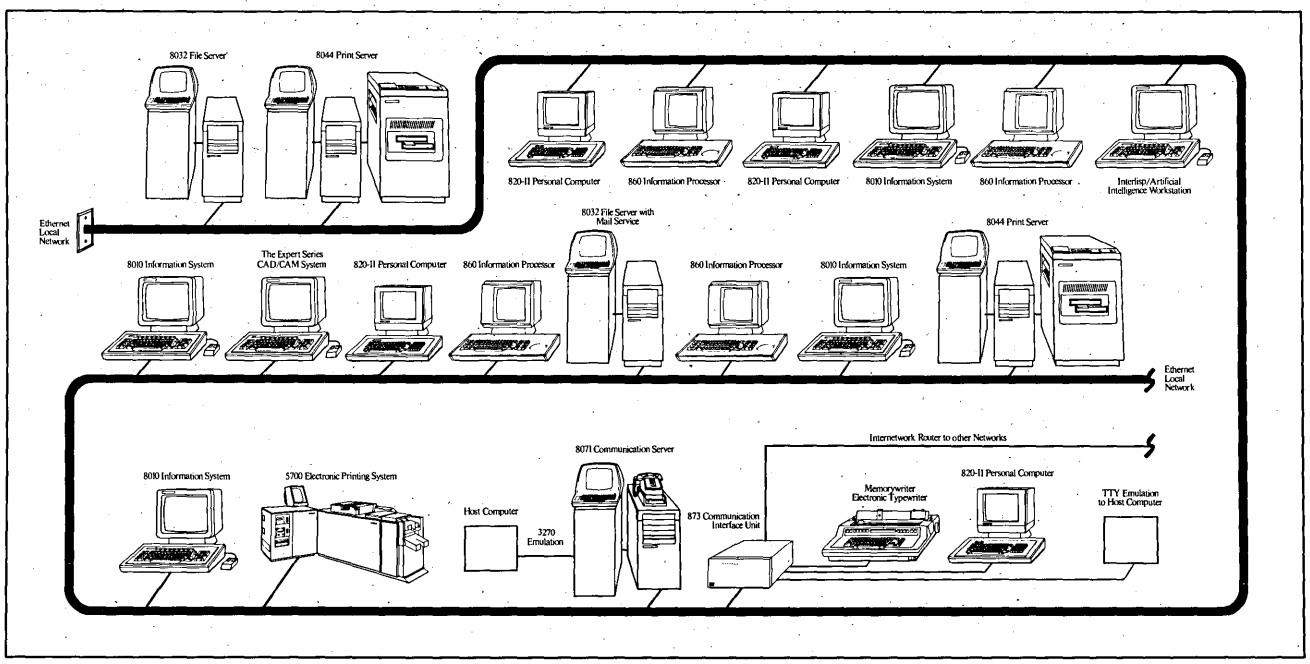

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And that, after all, is the value of teamwork.

CIRCLE 45 ON READER CARD

cluding IBM, Control Data, and Motorola, protested to the Commerce Department and asked for a lifting of the ban. To some degree, they got their way. In the spring of 1981, the Reagan Administration substantially modified the embargo to permit many types of computers into South Africa.

As far as it goes, this book accomplishes its mission, but little of it is surprising. It thoroughly and fairly details the repressive use of U.S.-supplied technology and shows that the arms embargo has not been entirely successful. The multinationals are portrayed as largely unconcerned with how their goods and services are ultimately used. But so what? Haven't we been witness to that kind of unconcern for years? Can we blame corporations for seeking business where business is to be had? After all, it may not matter who supplies computers or guns for apartheid; the market for those goods is global enough to undermine any but the most rigorous embargo.

While it may not surprise us, *Automating Apartheid* does present a disquieting picture of the extremes to which computer technology can be taken. What is perhaps most disturbing is that in the cruel mirror of that racist country we see reflected an abstract image of our own galloping computerization.

In South Africa stratification takes its simplest form: white or nonwhite. In our consumer society, we've achieved multilevel classifications. Beginning with graded compulsory education, we soon learn that there is always another classification or level or grade that we must strive for. The computer's power, of course, helps define ever-finer distinctions between individuals, but it also makes possible large-scale surveillance of a population's activities. Witness the nationwide electronic funds transfer systems being proposed that, as their terminals appear at every point of contact between citizen and the market economy, would be ready to keep track of daily activity. Is there much difference between a Bantu mine worker's passbook and our credit card? Each of us is warned daily not to leave home without it.

Are the computer networks rising to power in the U.S. today laying the foundations for a "multiple apartheid," a system under which people's access to many sectors of society would be dictated by their classification within various machines? The South African automation of its apartheid says to us that we cannot ignore such a possibility, for already a simple version of our nightmare exists.

As shown by this book, automated apartheid is no science fiction. It is real and deserves scrutiny by all who are concerned with the social impact of computers. American Friends Service Committee, Philadelphia (1982, 107 pp., $3.50 to individuals, $10 to corporations).

—John W. Verity

BOOKS

THE DATA PROCESSING MANAGER'S SURVIVAL MANUAL
by Larry M. Singer

"Moving data processing management out of the Dark Ages will be a continuous battle. With the right attitude and determination, it could even be fun." This is Larry M. Singer's advice to readers on a methodology for getting their dp shops in step with the 1980s. His is one of the best books I've seen in a long time that addresses the trials and tribulations of today's dp manager.

If you are looking for a book that "tells it like it is," this one's for you. Regardless of whether you are a project manager or the vice president of information, you can learn—and identify—with the author's examples. Singer exposes the skeletons that we dpers have been hiding in our closets and insists that we face the reality of such things as user involvement and personal computers. He even suggests such blasphemous acts as transferring program support to users (heaven forbid!).

All too many books published today either take a pablum approach to dp management, or they go to the opposite extreme and try to give us an MBA thesis solution. In either case, the results are unusable. Singer gives a good cookbook approach to solving many, if not most, of the problems that confront our modern-day dp manager.

The egoless management philosophy is the main thesis advocated in the manual. The theory is that if we, as dp managers, would work with our subordinates, peers, and users instead of trying to compete with them, we would all get along much better. Singer takes the theory one step further: if we don't become more cooperative and open-minded to the realities of computing in the 1980s, he writes, we may well lose the whole proverbial ball game.

I enjoy books that contain checklists and sets of rules to follow; I guess they make life easier. Otherwise, I have to read the book or article, extract the information, and create my own lists. Let's face it, we all live on lists or sets of rules. Singer's manual presents many of these guidelines in an easy to understand manner. Any dp manager can use at least one of these lists to help make his life easier and his department more responsive to user needs.

Singer starts the book with a chapter addressing the dp environment as it is in the early 1980s. He doesn't pull any punches, so if you think everything is A-OK in your shop, be prepared to defend yourself.

After deflating our egos, the book shows us how we can rebuild our positions with positive recommendations to get us back into the users' good graces (which we lost about 10 years ago, whether we admit it or not). After reading most of these suggestions, you'll say, "that's obvious." But it sometimes takes an observer like Singer to spell out simple things for us.

After soothing our chapter one wounds with chapter two recommendations, he proceeds to go into more detail about what we must do to revive our creditability and get back into the driver's seat. Chapters three through eight address personnel management, training, recruiting, project management, quality control, and maintenance.

In chapter 10 the concept of an internal auditing staff is introduced. From my experience, this is a new concept. The requirements for staffing the auditing group and setting its goals are well defined. We need this type of policing and should be mature enough to accept the recommendations it could propose.

The final two chapters address trends and hardware. Both of these areas are growing in importance as the rate of new hardware introductions increases. Again, Singer takes very practical approaches to the problems and suggests easily implemented solutions.

This book should be read by every manager who has any dp responsiblity. If you are striving to do a better job in this rapidly changing industry, there are many good ideas for you. If you are from the old school that believes all these newfangled ideas are just passing fads, then make sure your superiors don't read Singer's book—or your days may be numbered! John Wiley & Sons, Inc., New York (1982, 240 pp., $24.95).

—Larry D. Woods

SEMINARS

STORAGE SECRETS

DataStorage '83 is billed as "an international forum on critical industry issues and areas of change in data storage equipment and applications." The conference is sponsored by Disk/Trend Inc., Mountain View, Calif., and Freeman Associates, Santa Barbara, Calif. It will take place Sept. 20-21 at the Santa Clara Marriott Hotel. The fee is $850. For further information contact Cartlidge & Assoc. Inc., 4030 Moorpark Ave., Suite 205, San Jose, CA 95117, (408) 554-6644.

TRIPLE PLAY

Keston Associates is offering three separate workshops: "How to Develop an Effective Long-Range Data Processing Plan," "How to Increase the Productivity of Computer People," and "How to Establish a Successful Edp-User Coordination Function." These workshops are running through December in several U.S. cities. Each five-day program is priced at $995 per person. Contact Keston Associates, 11317 Old Club Rd., Rockville, MD 20852, (301) 881-7666.

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ON THE JOB

PLAY MAKES JACK A BETTER MANAGER

Bored with traditional seminars that promise to sharpen your managerial skills? Perhaps you'll be interested in a different approach. The International Management Game (IMG) was developed by Sony, Japan, in 1976 for use in its employee training programs. Since then, the IMG has become part of the in-house training programs of more than 2,300 Japanese firms, and over 140,000 employees have played it.

The game of "business in a simulated real world" uses a device resembling a roulette wheel. Each participant (as many as 42 players, six per table) is armed with a calculator, worksheets, colored chips representing workers, products, raw materials, machines, R&D, insurance, etc., and "risk" and "decision" cards.

Players are appointed presidents of their own fictitious companies and given $30,000 in startup money. Each table is a separate economic world, and the players are shifted from table to table to learn to compete in different worlds. The company presidents are responsible for planning, investment, hiring (this is a Japanese game, so layoffs aren't allowed), manufacturing, R&D, advertising, and selling. There are forms for tracking cash flow, closing accounts, and strategic planning.

Between rounds, the presidents plan their future actions and calculate financial ratios using Sony's strategic accounting or STRAC system. By the end of the three-day seminar, each participant will have moved at an "accelerated pace through the equivalent of five years of senior management experience," says Sony.

The IMG is also available in the U.S. The first stateside seminar took place in Boston, Mass., in December 1982. Attendees were charged $850 per person by Sony Management Systems Co., a New York division of Sony Corporation of America. To date, over 75 American companies have sent their employees to the game, and Sony has reduced the price to $500 per person ($550 for the moderate frills-attached version), or $350 to $500 when the seminar is at the attendees' company facilities.

The John Fluke Manufacturing Co. Inc., Everett, Wash., began using the Sony seminar by sending employees out to attend it. Now, the training is offered in-house, and approximately 70 top- to middle-level managers have taken it. Barbara Otonicar, Fluke's management development coordinator, considers this program a very good general introduction to business. It affords "a hands-on chance to see how a business works. Attendees learn the different effects that R&D, sales, promotion, and other areas have on a company. All finances are done manually, including record entries." Otonicar added that her company was considering using Sony's STRAC internally since it allows better "understanding between business and financial people."

According to Sony, the IMG is intended for middle- to upper-level managers. There are no prerequisites necessary to take the seminar, and some of the "Japanese ways" have been adapted for the American players. There are, of course, plenty of other methods for training managers, such as computer simulation. But, a Sony spokesperson told DATAMATION, with simulation "people tend to compete with the program instead of learning business skills."

Otonicar says Fluke's employees have been mostly enthusiastic about the IMG—about 95% of the attendees said it was a worthwhile program. Reactions ranged from "it's the greatest thing since hot dogs" to "so what, I knew that." The latter comment came from the highly trained MBA types. To the possibility of buying the IMG outright from Sony, Otonicar said, "We'd run everybody through it if we could buy the rights to it." Cost was the limiting factor.

—Deborah Sojka

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CIRCLE 199 ON READER CARD

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

SYSTEM DEVELOPMENT MYTHOLOGY

Over the last 10 years considerable effort has been expended to convert the process of system development from an art into a science through the application of formal development methodologies. This attempted conversion is what I call system development mythology. The only laws that govern the system development process are those of human nature and there is no less exact science than trying to predict the vagaries of human behavior. The conversion to a science cannot be made. System development is an art and, as far as I can tell, will stay that way.

This article attempts to provide a historical background to the evolution of system development methodologies and why, in most cases, they have not solved the problems they were intended to solve. I will also describe some fairly recent development tools and techniques that show great promise in solving these traditional development problems.

Ten years ago, the system development process was very informal. The following points indicate a few of the typical conditions that existed:

There were very few standards concerning the approach to system development. This deficiency applied to all aspects of the development process (i.e., analysis/feasibility, design, programming, and implementation). Management was, therefore, at the mercy of the ability and integrity of their technical staff. It should be noted that the informal approach to system development did produce some excellent results in extremely short time frames. In all too many cases, however, the end result was a badly designed and programmed system that required a tremendous maintenance effort to retain any meaningful functionality. Even today, many of these systems are still in production; it is simply too costly to scrap them and start again.

Project control was haphazard at best. Systems were usually implemented late. And it is impossible to comment on budget overruns as there was rarely any allocation of budgeted amounts for individual system developments.

An audit and control "mentality" regarding the development of computer systems was lacking. The audit community had not yet developed an appreciation of the effect of computer systems on internal control.

Ultimately, these conditions led to increasing corporate dissatisfaction with the apparent low rate of return on investment produced by the systems development function. The picture was bleak:

- Systems were developed that did not meet users' needs.
- Systems were not flexible enough to meet the business needs for which they were designed.
- If there was a budget, the system overran it.
- The system overran its development schedule.
- Systems were developed without proper management approval.
- Systems were developed that were difficult and costly to maintain.
- Systems were developed that did not fit in with the company's long-term business, financial, and computerization plans.

Against this background considerable effort was expended to develop a standard approach to system development. Individual companies and software vendors were the driving forces behind the start of system development methodologies.

In addition, the audit community was pushing for something tangible to audit against when reviewing individual system development. Formal, documented methodologies provided the necessary guidelines. The influence of the audit community is significant because management was beginning to appreciate the implications of computer systems on their organizations.

Although these methodologies differ at the detail level, they are consistent in attempting to break down the system development life cycle into manageable phases and constituent tasks. They also allow project control and management review functions to ensure that development is still on track before proceeding to the next phases.

Methodologies have helped developers to focus on the main issues and have contributed to improved project control in terms of time and money management, although even in these areas there's still room for improvement. Systems are still developed that do not meet the users' needs. Users complain that the edp department did not provide what was requested and, conversely, the edp department claims that the users didn't know what they wanted. It would take the wisdom of a Solomon to decide where the truth lies. It is a fact that system development methodologies have failed the user and in several ways they have compounded the problem.

For example, various documents are produced during the phases of development as charted by the methodology. The methodology will indicate the content framework for each document. The result of trying to standardize these documents is that they become voluminous, regardless of the size and complexity of the system being designed. Although users are asked to review these documents for completeness and accuracy, there is too much narrative, system-oriented information to sift through for them to comment with any degree of certainty. In addition, the unrealistic assumption is made that the users' requirements are stationary between the analysis phase and implementation. Changes to the documents produced via the methodology (and signed off by the user) are viewed with suspicion by the edp department and taken as a sign that the user once again does not know what he wants.

The methodology review process is usually a time of contention between user and the edp department, with issues being raised that require further work from the edp department. Unfortunately, the department is typically geared, from a resources standpoint, to move immediately to the next phase of development. One of two things tends to happen: either the development is delayed an inordinate amount of time while the outstanding issues are resolved, or the edp department carries on with development as if

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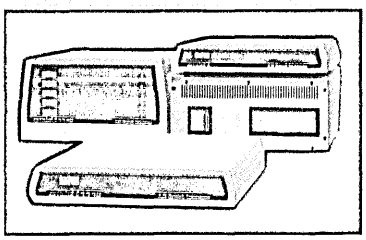

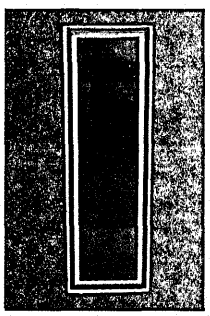

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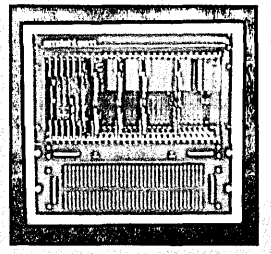

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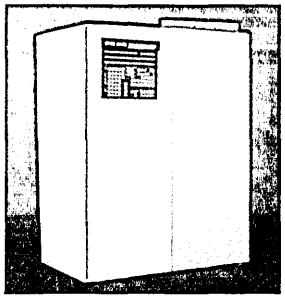

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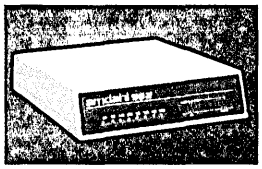

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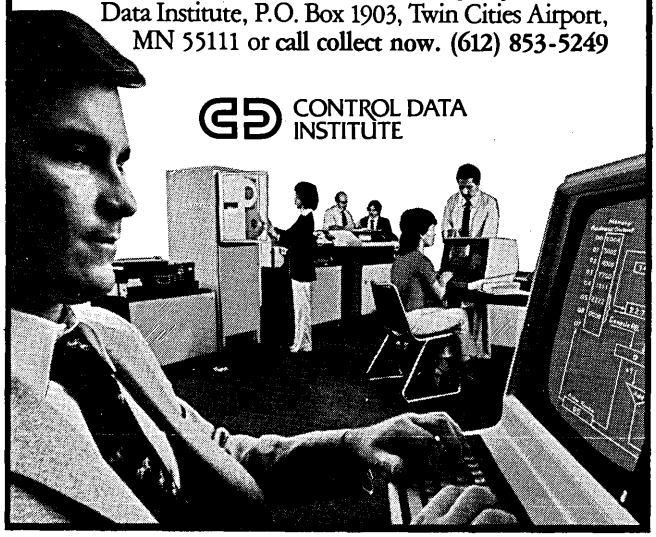

CIRCLE 202 ON READER CARD

READERS' FORUM

these issues did not exist and assumes that when they are resolved, the solutions will be incorporated "on the fly."

In many installations, adherence to the development methodology becomes more important than the development itself. Understanding the methodology becomes as important as knowing the business needs to be satisfied or the technical skills necessary to develop the system. Taken to its conclusion, failure to develop the system according to user requirements, on time and within budget, becomes the fault of the methodology and not of the people on the development team.

The development methodologies do not address the problems of maintaining existing systems. This is still very much a matter of negotiation between the user and the edp department.

My point is that adherence to a development methodology is not a panacea for the problems associated with system development. More advanced methods of system development are required to ensure that user needs are being met while the edp department improves its productivity and its efforts to develop and maintain computer systems.

This description is not a blind attack on system development methodologies. They did improve budgetary control from both money and time standpoints. They also brought a degree of standardization to the development function, a standardization that helped minimize management's exposure to their technical staff. Now it's time to focus upon the deficiencies of the methodology approach and to apply recent technological innovations to eradicate these shortcomings.

Systems have progressed from batch processing to real-time on-line processing. A batch mentality, however, still applies to the developing methods: system requirements are captured at a particular time and processed under set conditions. Secondly, inquiry and updating of stated requirements can only be made at predetermined times according to rigid rules.

Prototyping is a method whereby the systems or business analyst from the development team, in conjunction with the user, puts together a model of the proposed system. Although the prototype will not contain all possible logic conditions, it will show all the system's functional elements. In many ways prototyping allows a return to the informal approach to system development, while still retaining management control. Prototyping has always been an option for system developers. The technological tools were simply not available to allow prototypes to be developed within a short time frame and reasonable budget, or to be other than a throwaway commodity. In addition, if a prototype were developed, the coding structure would not be flexible enough to permit the changes that are often necessary to arrive at an acceptable model.

This situation has recently changed dramatically. There are now interactive development tools that allow on-line prototype design. These development tools are generally based upon fourth generation programming languages integrated with a relational database and data dictionary. The 4 GLs are, by definition, capable of providing productivity in excess of 10 times that of languages like COBOL and PL/1. A relational database combined with a data dictionary provides a highly flexible and controlled method of viewing and accessing data. The system developer will sit down at a terminal with a user and design the screens of information that are meaningful and functional to the user. It is irrelevant that the final disposition of this information may be on paper in the production system.

The purpose of the exercise is to get the exact information you need from the user. This is achieved by allowing the user to view the information in a real context. Designing these screens is an interactive process supported by a screen handler, which is an integral part of the programming language. The programming languages being discussed are generally interpretive, which means that the coding associated with the prototype may easily be retained and used as the foundation for the production system. The production system will differ from the prototype only in detailed logic; the functionality will remain as demonstrated through the prototype.

"Hyatt was a pioneer of local area networks. When Datapoint introduced the first one, we ordered."

—Bob Regan
V.P. Management Information Systems
Hyatt Hotels Corporation

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When Datapoint introduced the first local area network, the ARC® system, in 1977, Hyatt was among the first to install it. Today there are approximately 5,000 ARC local area networks in use, far more than any competing system.

"One reason the ARC network has been so effective for Hyatt is because it's easy to expand," says Regan. "Hyatt has had phenomenal growth, and the ARC has kept up. When more people needed the system to do more work, we simply added to the network."

The ARC local area network can be expanded virtually without limit by simply plugging in additional Datapoint processors, printers, storage disks, and terminals. Each new processor adds power to the network so new users get the same fast response the original users were getting. Companies can closely match the power of an ARC system to their needs, expanding in small, inexpensive increments instead of buying "more computer than they need" in order to have room for growth.

What's more, Datapoint systems can be expanded or upgraded without replacing software. "We run some programs on ARC networks that were originally written for our first Datapoint computer more than ten years ago," says Regan. "That means we didn't lose any of the money we invested in programming and training. And it made the growth steps easy on our people. The changeover to the ARC network was accomplished in only two days."

No matter how far an ARC system is expanded, all the users can have access to all the data except where security precautions are installed. So even though more and more people are using more and more computers, there's never a need to duplicate files.

"At present, Hyatt operates forty-five ARC systems," Regan says. "Others are in the planning stages right now. On the operations side we use them for accounting, reservations, and group sales. At Corporate we use them for accounting and for systems development. Obviously, we depend on them heavily. They're like the meters where we check our own financial performance. They simply have to work. And they do.

"Hyatt has stayed with the ARC system because it's been cost-effective. That's the bottom line. I can recommend a certain system to a hotel, but in the end, the system has to sell itself. And keep selling itself after it's installed. Our Datapoint ARC systems have done that."

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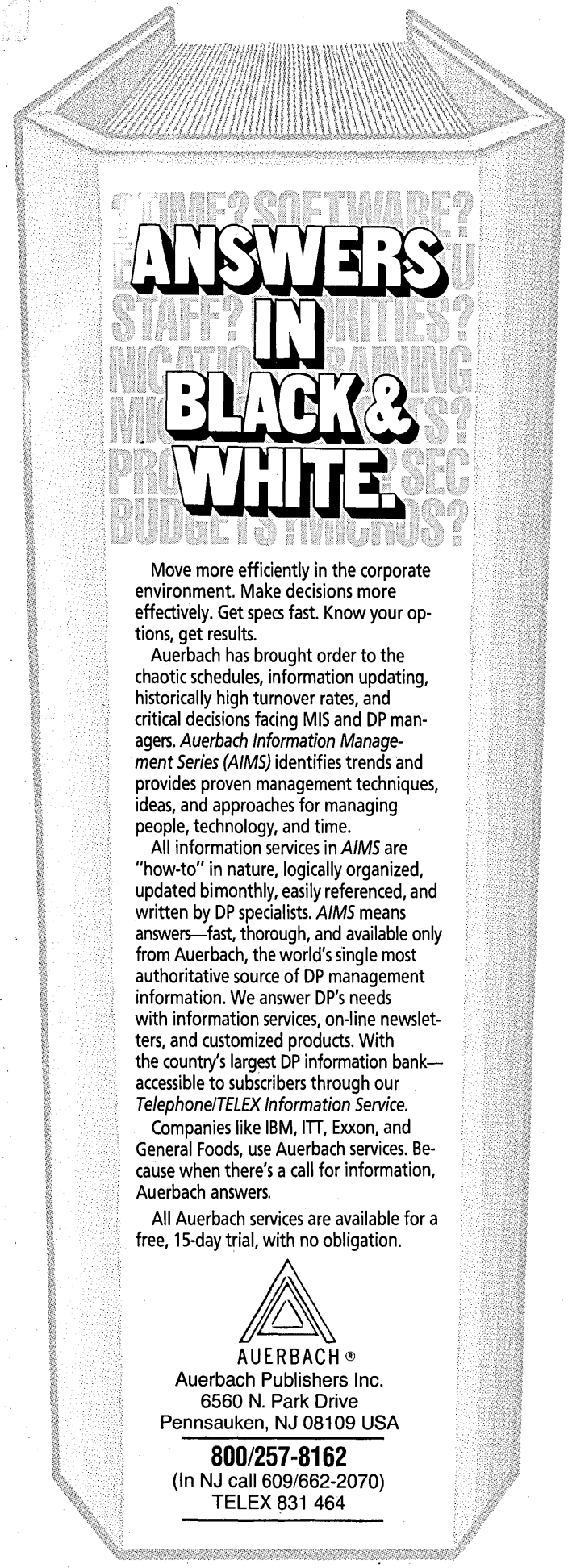

CIRCLE 204 ON READER CARD

READERS' FORUM

Prototyping, therefore, removes the problems associated with user acceptance of a system under development by allowing them hands-on experience as the system is being developed. The use of an on-line HELP command for each function performed by the system also facilitates user acceptance.

In addition, the development tools associated with prototyping are intended to improve development productivity. Typically, the programming languages require very few statements to perform multiple selection, manipulation, and presentation of data. Combined with an integral relational database and data dictionary, maintenance of systems written in these programming languages is substantially simplified.

There are a number of prototyping facilities currently available. The following list is not nearly exhaustive, but each product comes highly recommended and is capable of producing the benefits of prototyping as described previously: the entire development environment as supported by Tandem Computers, model 204 from Computer Corporation of America, Mantis from Cincom Inc., and Powerhouse from Quasar Systems Ltd.

Organizationally, the information center forms part of the edp department. Functionally, the information center is a technical support group to the user community with a mandate to allow individual users to access their own data in a friendly environment. Therefore, the information center is responsible for establishing this environment, selecting whatever software tools are appropriate, ensuring that the proper data are accessible, and acting as consultants to the user community on an as-required basis.

The friendly environment usually consists of an interactive development tool (such as CMS), coupled with a generic report generator (GIS, Easytrieve), and various business-related software packages (for example, general ledger, financial planning, and modeling). The development tools described under the section on prototyping would be extremely effective as part of the information center environment.

The information center concept is designed to allow users rapid and flexible access to their data without having to go through the regular channels. It is apparent that an edp department cannot service the entire user community in a timely fashion. This results in a system development backlog and user dissatisfaction.

The information center lets the user develop and run small, tailor-made systems. This leaves the edp department to concentrate on the larger, global systems that, in turn, may feed data to the end user for manipulation through the information center.

An additional advantage of the information center is that all users adopt a consistent approach to the access and manipulation of their data rather than each user selecting whatever means are at his disposal, such as the purchase of incompatible minicomputers or contracting with outside service bureaus.

The concept espoused by system development methodologies of breaking down the system development life cycle into the phases of analysis/feasibility, design, programming, and implementation is sound. Instead of the mass production of paper that currently emanates from each phase, the prototyping methodology should be applied from the very first phase of analysis/feasibility through to implementation. New interactive development tools allow the prototype to be expanded at the detail level through each phase of development to the point where the prototype can be implemented as a production system. Additionally, by passing the data produced by the development system back to the user via the information center, the user can access and manipulate the data to meet whatever needs may occur from time to time. This should substantially reduce the maintenance requests that would previously have been passed to the edp department.

In terms of productivity, both the development tools that make prototyping viable and the information center should allow the edp department to concentrate on developing systems that are crucial to key corporate goals in an accurate and timely fashion.

—Ian Gilhooley
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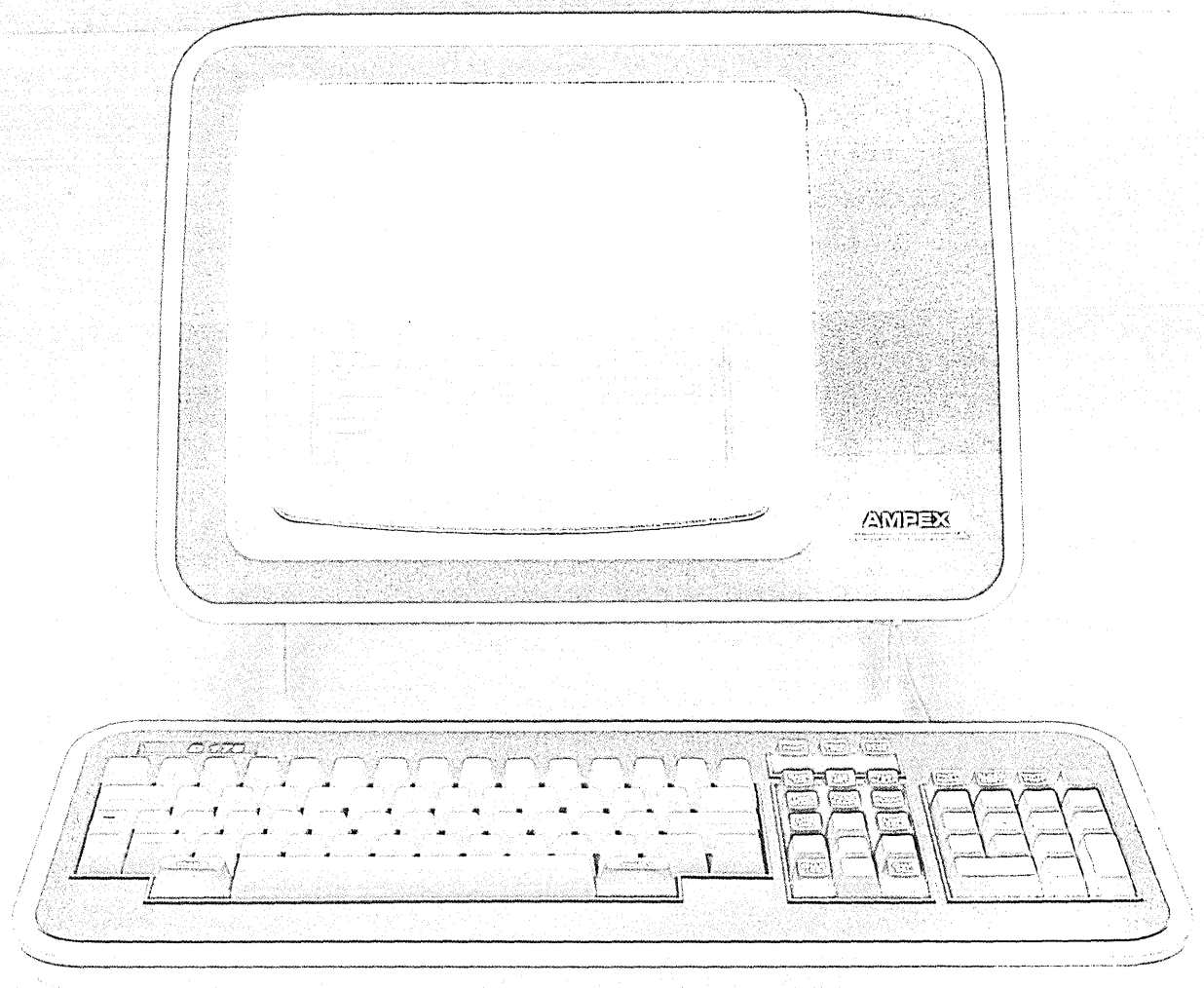

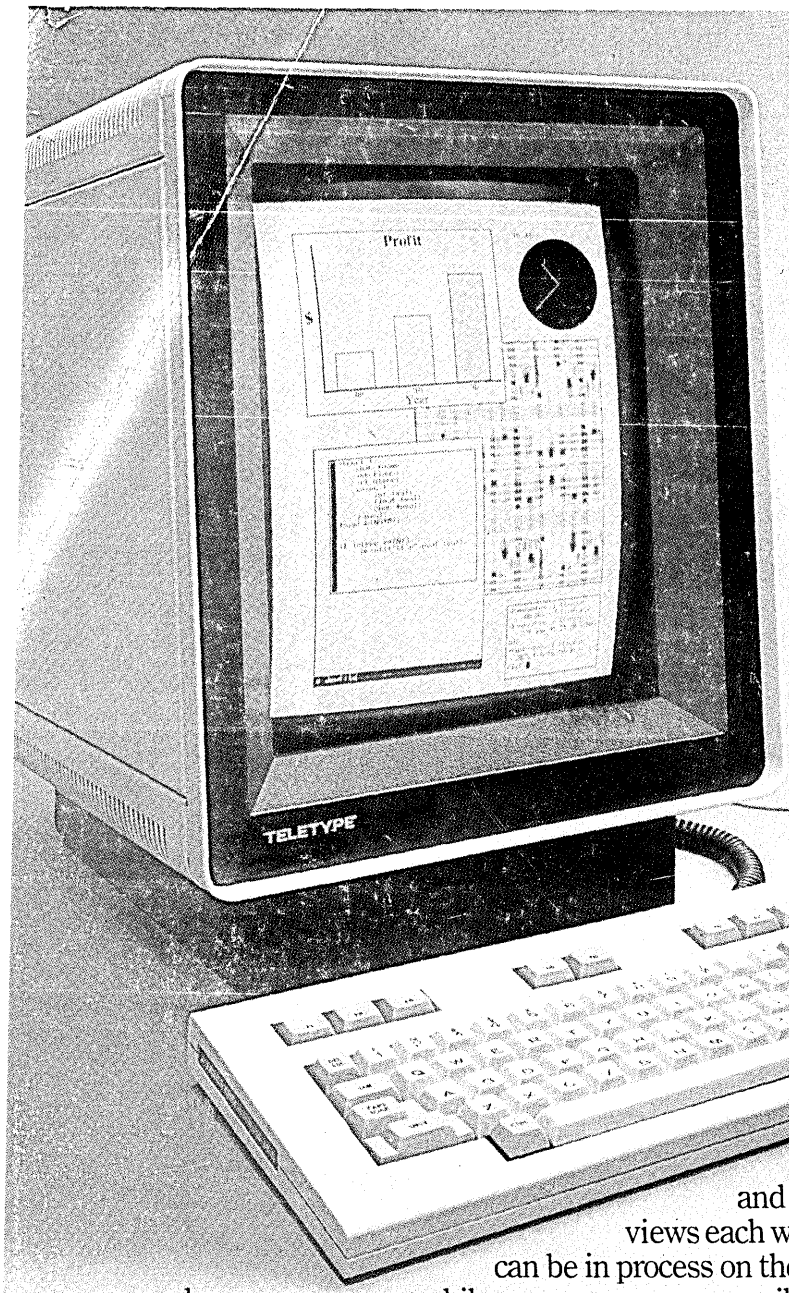

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