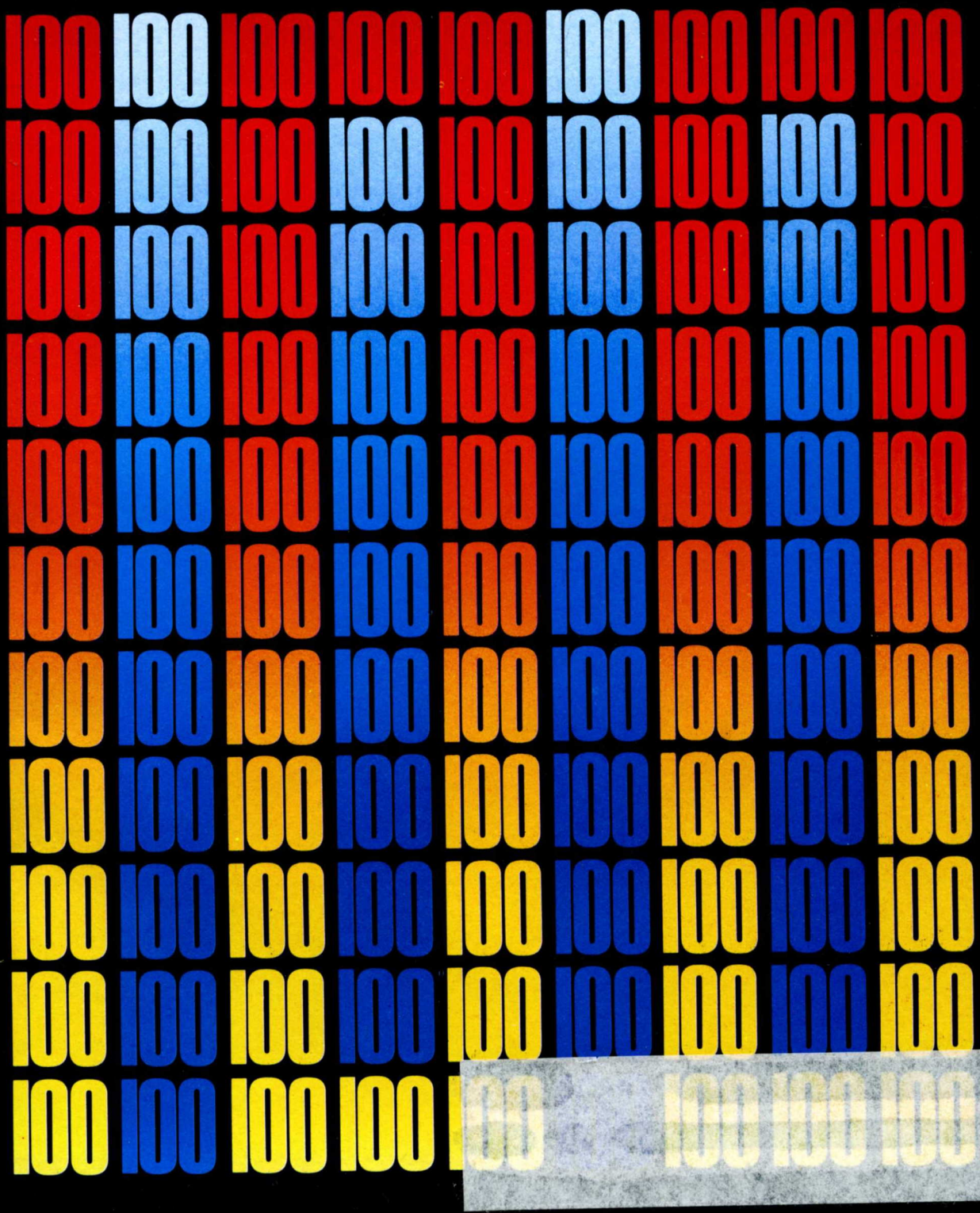
DATAMATION 80®
JULY/4.00 U.S.A.

THE DATAMATION 100



New from Kennedy

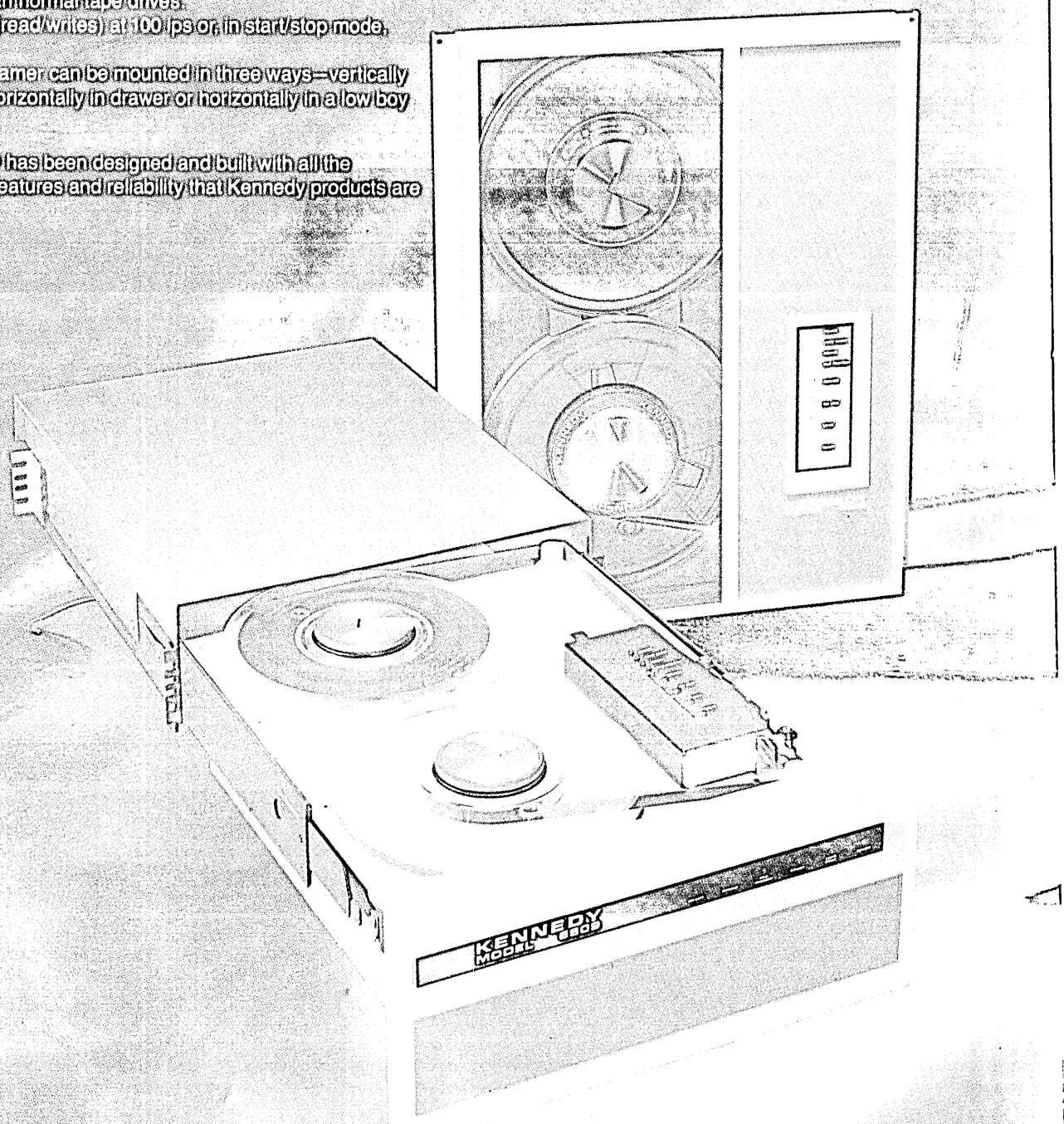
Model 6809 Data Streamer™

Kennedy does it again. Data Streamer is ideal for Winchester disk drive backup where fast starting and stopping is not required. Designed to emulate the performance of the IBM 8809, Data Streamer has a wide range of features:

- Tape drive includes built-in industry standard formatter—it's a compact package.
- Contains only four moving parts—hence a much higher MTBF than normal tape drives.
- Streams (read/writes) at 100 ips or, in start/stop mode, 12.5 ips.
- Data Streamer can be mounted in three ways—vertically in rack, horizontally in drawer or horizontally in a low boy console.

Model 6809 has been designed and built with all the innovative features and reliability that Kennedy products are known for. Additionally, Model 6809 is much less expensive than traditional tape transport/formatter combinations. It's the ideal answer for large capacity disk drive backup.

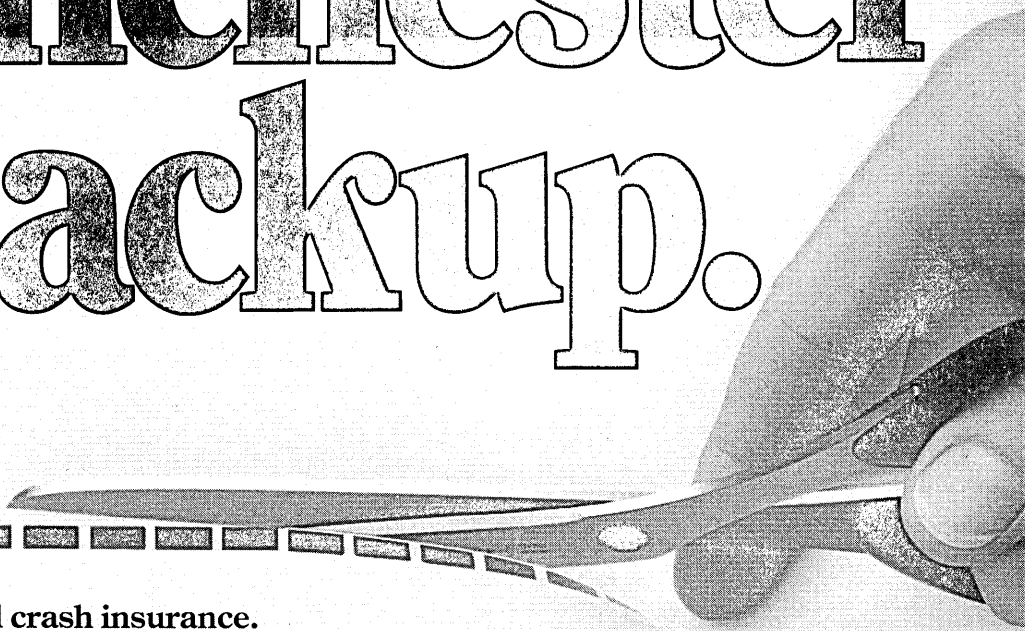
KENNEDY
Subsidiary, Magnetics & Electronics Inc.
1600 Shamrock Ave., Monrovia, CA 91016
(213) 357-8831 TWX 910-585-3249



KENNEDY ... NT ON IT

CIRCLE 1 ON READER CARD

How to cut the cost of Winchester backup.



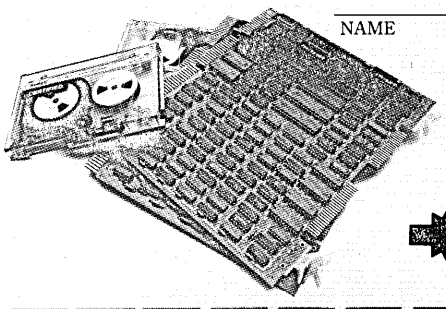
Low cost head crash insurance.
Save up to 50% by using a data cartridge system.
With a transparent controller by Western Peripherals.

The controller makes the CPU think it's working with a half-inch tape drive.

Piggyback as many as eight ¼-inch, 3-M type cartridge drives – and dump nearly 140MB of data.

For low cost archival storage, backup storage or economical head crash insurance, count on data cartridge systems – with controllers from Western Peripherals.

☐ Yes! Please send complete information about low cost mass storage.



NAME _____ TITLE _____

COMPANY _____ ADDRESS _____

CITY _____ STATE _____ ZIP _____ ( ) TELEPHONE _____

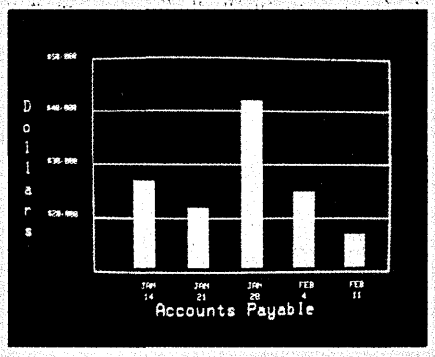
CPU Type: ☐ DEC LSI-11* ☐ PDP-11* ☐ Data General NOVA/Eclipse**

western peripherals

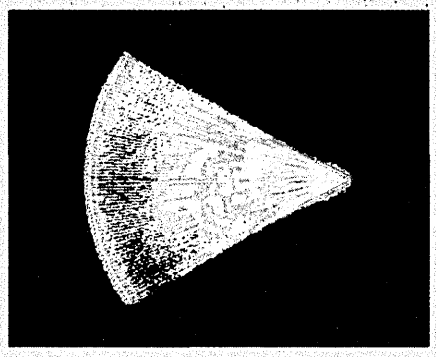
Division of Wespercorp
14321 Myford Road
Tustin, CA 92680 (714) 730-6250

*Trade name of Digital Equipment Corporation.** Trade name of Data General Corporation.

CIRCLE 4 ON READER CARD



Management Information Display



Ultrasonic heart sector scan

High-resolution display with alphanumerics

Get the professional color display that has BASIC/FORTRAN simplicity

LOW-PRICED, TOO

Here's a color display that has everything: professional-level resolution, enormous color range, easy software, NTSC conformance, and low price.

Basically, this new Cromemco Model SDI* is a two-board interface that plugs into any Cromemco computer.

The SDI then maps computer display memory content onto a convenient color monitor to give high-quality, high-resolution displays (756 H x 482 V pixels).

When we say the SDI results in a high-quality professional display, we mean **you can't get higher resolution than this system offers in an** NTSC-conforming display.

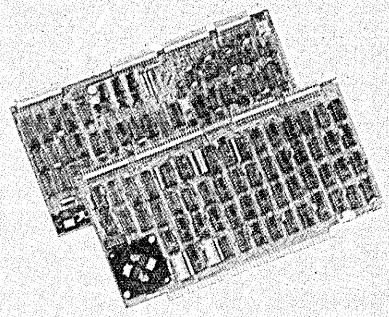
The resolution surpasses that of a color TV picture.

BASIC/FORTRAN programming

Besides its high resolution and low price, the new SDI lets you control with optional Cromemco software packages that use simple BASIC- and FORTRAN-like commands.

Pick any of 16 colors (from a 4096-color palette) with instructions like DEFCLR (c, R, G, B). Or obtain a circle of specified size, location, and color with XCIRC (x, y, r, c).

*U.S. Pat. No. 4121283

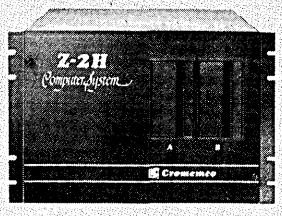


Model SDI High-Resolution Color Graphics Interface

HIGH RESOLUTION

The SDI's high resolution gives a professional-quality display that strictly meets NTSC requirements. You get 756 pixels on every visible line of the NTSC standard display of 482 image lines. Vertical line spacing is 1 pixel.

To achieve the high-quality display, a separate output signal is produced for each of the three component colors (red, green, blue). This yields a sharper image than is possible using an NTSC-composite video signal and color TV set. Full image quality is readily realized with our high-quality RGB Monitor or any conventional red/green/blue monitor common in TV work.



Model SDI plugs into Z-2H 11-megabyte hard disk computer or any Cromemco computer

DISPLAY MEMORY

Along with the SDI we also offer an optional fast and novel **two-port** memory that gives independent high-speed access to the computer memory. The two-port memory stores one full display, permitting fast computer operation even during display.

CONTACT YOUR REP NOW

The Model SDI has been used in scientific work, engineering, business, TV, color graphics, and other areas. It's a good example of how Cromemco keeps computers in the field up to date, since it turns any Cromemco computer into an up-to-date color display computer.

The SDI has still more features that you should be informed about. So contact your Cromemco representative now and see all that the SDI will do for you.

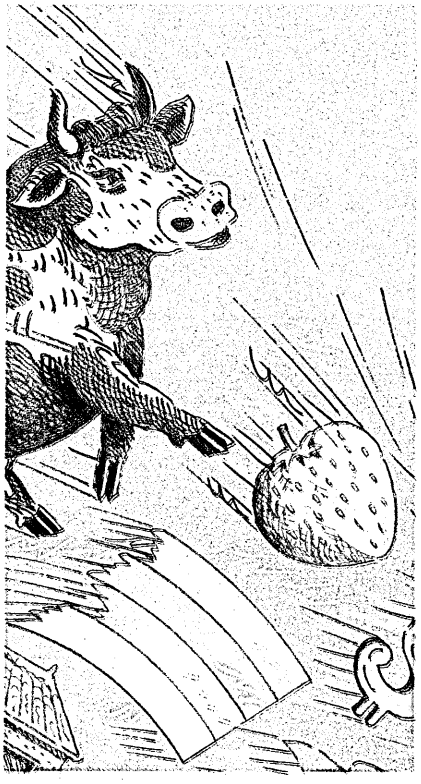
Cromemco
incorporated
280 BERNARDO AVE., MOUNTAIN VIEW, CA 94040 • (415) 964-7400
Tomorrow's computers today

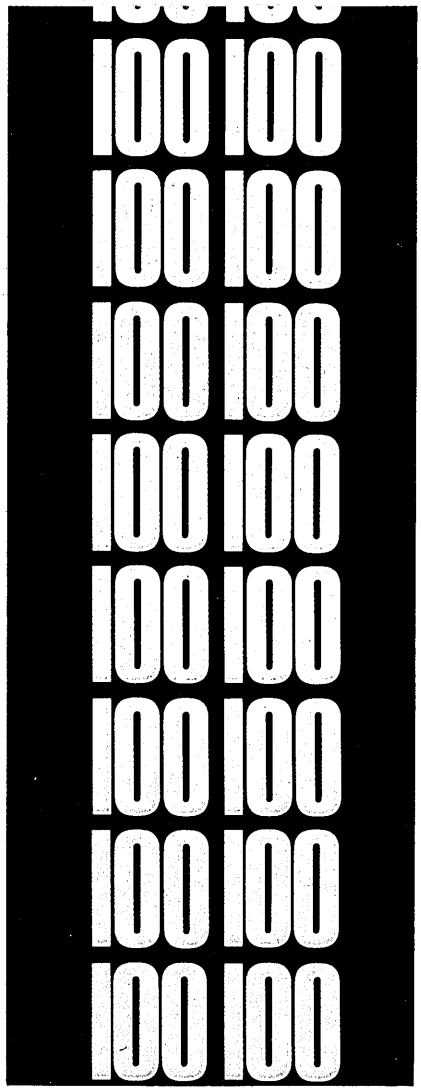
CIRCLE 5 ON READER CARD

DATAMATION 80®

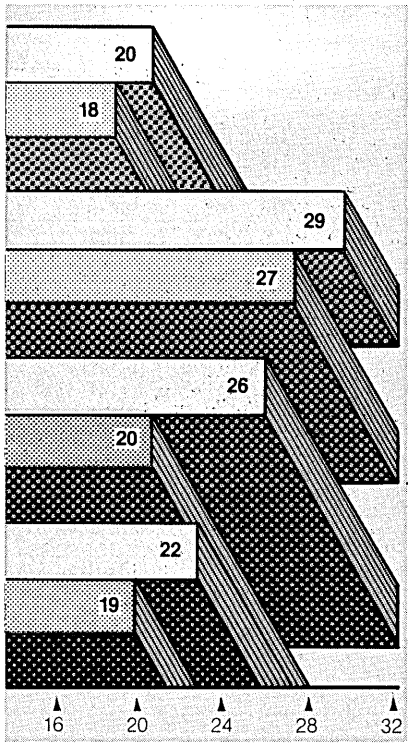
JULY 1980/4.00 U.S.A.
VOLUME 26/NUMBER 7
This issue, 156,800 copies

FEATURES





NEWS IN PERSPECTIVE



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Heading up the family is Intel's Integrated Data Dictionary, IDD. An indispensable tool for effective data administration, IDD helps you streamline and control your environment. IDD is an applications design aid, a documentation vehicle, a way to enforce standards and procedures, a master reference for determining the impact of changes to your data.

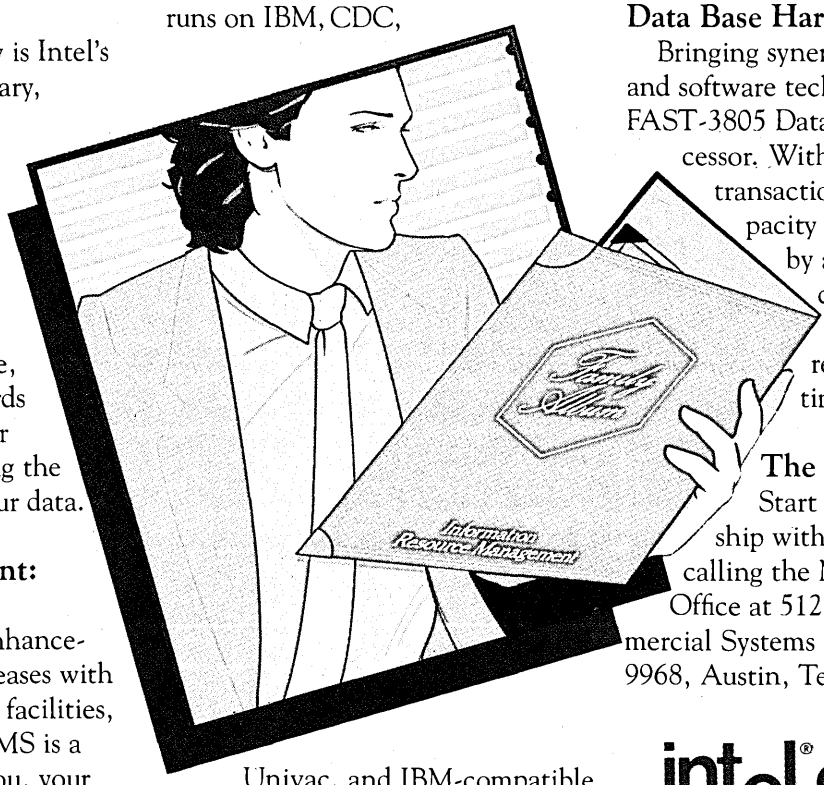
Data Base Management: SYSTEM 2000®/80.

Blending the finest enhancements from previous releases with a multitude of advanced facilities, SYSTEM 2000®/80 DBMS is a family member which you, your designers, programmers, data administrators, and end users will all appreciate. Each feature is designed to increase productivity and make your environment as flexible as possible.

Multiple languages. For designers and programmers, there's PLEX, Intel's Programming Language Extension to COBOL, PL/1, FORTRAN and Assembler. And for end users, Intel provides QUEST, an easy-to-use (but powerful) English-like language.

Multiple data structures. SYSTEM 2000/80 DBMS indexing and direct access keys provide fast access to relational, hierarchical, and network data structures.

Multiple operating systems and mainframes. SYSTEM 2000/80 DBMS runs on IBM, CDC,



Univac, and IBM-compatible mainframes. And Intel was first with a DBMS for IBM's new 4300 series.

Data Communications: DC.

Supporting your need for high volume, on-line production processing are Intel's communications extensions to the leading TP monitors, including CICS.

Distributed Data Base: DDB.

Intel's newest addition is Multiple Systems Coupling, MSC. Providing communications between two or more IBM processors, including the new 4300 series, our MSC software lets you execute applications and transactions in one CPU while accessing data managed by SYSTEM 2000/80 DBMS in another.

Data Base Hardware: DBH.

Bringing synergism to hardware and software technologies is the FAST-3805 Data Base Assist Processor. With this option, transaction throughput capacity can be improved by as much as 100 percent and with a 50 percent or better reduction in response time.

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Start your lasting relationship with our new family by calling the Market Information Office at 512/258-5171, Intel Commercial Systems Division, P.O. Box 9968, Austin, Texas 78766.

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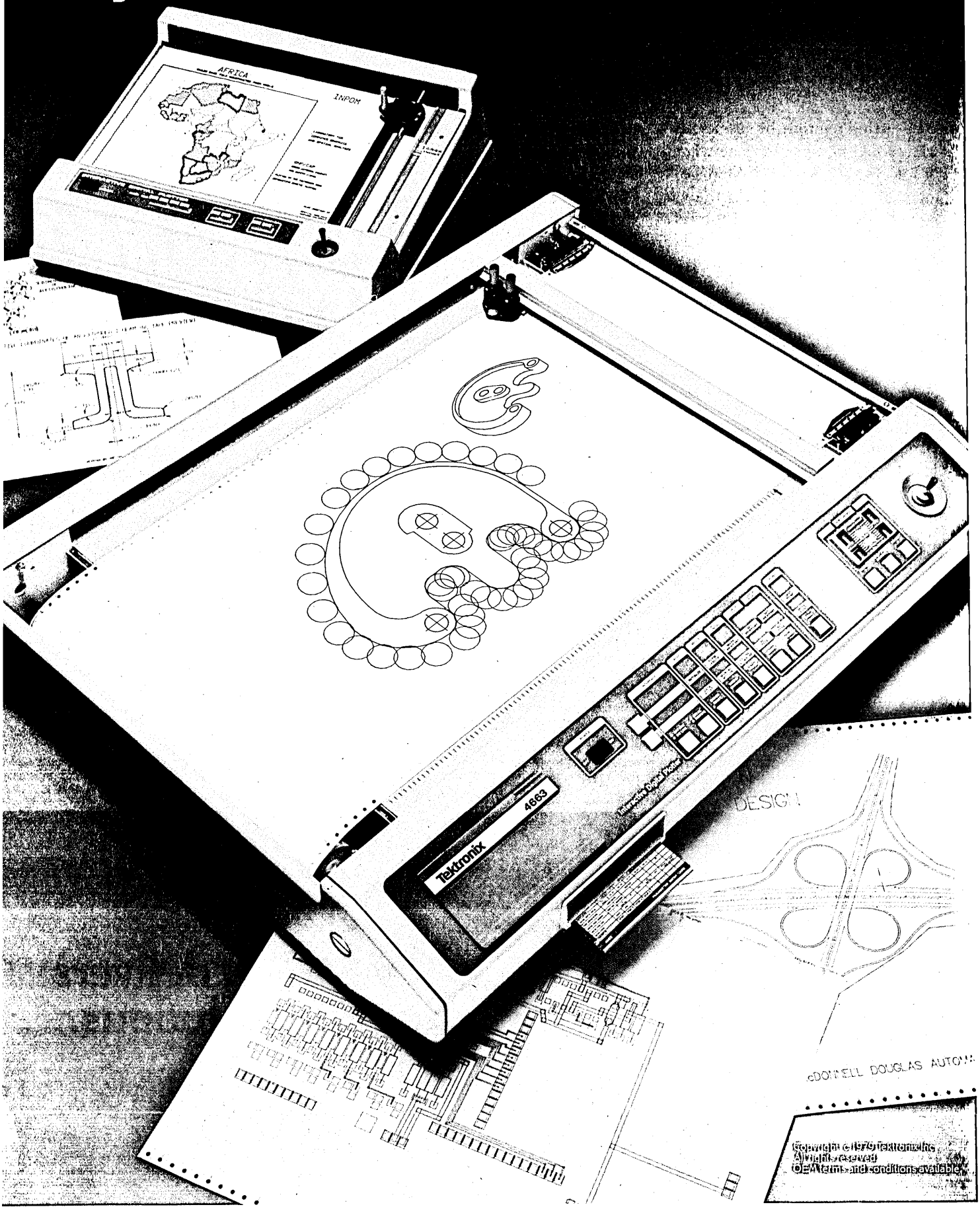
CIRCLE 8 ON READER CARD

From the graphics leader.

The Practical Plotters. By Tektronix.

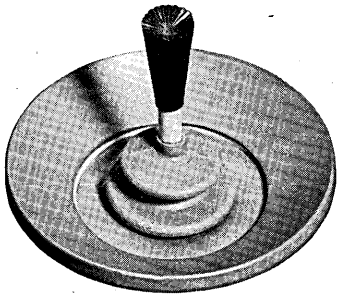


Do your big plotter work. At a small plotter price. That's practical!

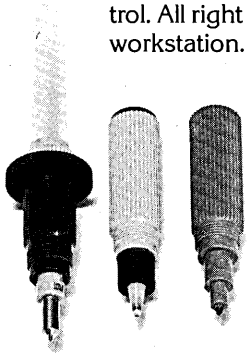
At Tektronix, we build plotters that pay for themselves.

Practicality is why Tektronix pioneered the smart small plotter. Why we led the move to more reliable, digital technology. We're proving that big plotter performance can take a small plotter price, with capabilities like those of our C-size (A2) 4663.

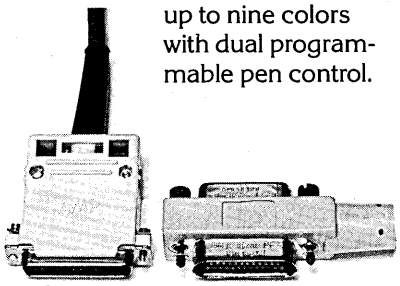
Economy. Instead of waiting in line for large plotter output, you can typically do two-thirds of your plotting on our 4663, with comparable quality. Faster turnaround. Tremendous cost savings.



Interactivity. Microprocessor intelligence not only makes the 4663 semi-independent, it lets you draw real curve forms. Rotate characters. Digitize with built-in joystick control. All right at your workstation.

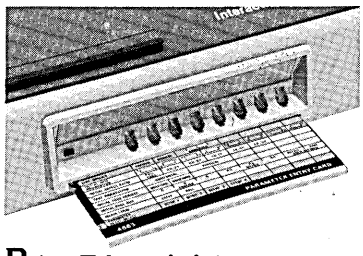


Versatility. The 4663 plots on paper, film or Mylar.® With felt tip, wet ink or ballpoint pens. In up to nine colors with dual programmable pen control.



Compatibility. From its RS-232-C and GPIB (IEEE-488) interfaces, to options like foreign language fonts and circular interpolation, our plotters mesh with your present system and particular needs. Powerful, wide-ranging software routines are both inexpensive and easy to use.

Simplicity. Our parameter entry card replaces rear panel straps and switches with a simple system for setting up to four sets of operating conditions right from the front panel, so one plotter can instantly accommodate four totally different jobs.



Bring Tektronix into your bidding picture. It's the only practical thing to do. Next time you're shopping for plotters, let your local Tektronix representative show you output samples of what our 4663 and B-size (A-3) 4662 can do for you. Call him directly, or call our toll-free automatic answering service at 1-800-547-1512. In Oregon, call 644-9051 collect.

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Information Display Division
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Beaverton, OR 97075

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The practical plotters

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COMMITTED TO EXCELLENCE

CIRCLE 9 ON READER CARD

LOOKING BACK

JULY/AUGUST 1960

Wernher von Braun once said, "The impact of large computers has been felt in the missile industry more than in any other area in our life. In a decade, computers have developed from a curiosity and convenience in space vehicle design to an integral, indispensable element of our work." The team of NASA's George C. Marshall Space Flight Center in Huntsville, Ala., and IBM (the center's prime source of computing equipment) started working together in 1951. At that time the first U.S. ballistic missile, the Army Redstone, was developed. The missile had a range of 200 miles, and for the first time in U.S. history, digital computers were used in a space program. A Card Programmed Calculator system was utilized, and two more CPCs were added later. In 1960, development of Project Saturn began. This was a superbooster with thrust of 1.5 million pounds, scheduled for travel around the moon and into deep space. Project Saturn used an IBM 7090, the center's first solid-state computer.

Dr. von Braun was director of the Marshall Space Flight Center, in charge of developing NASA space vehicles and conducting research. Working with him as director of the center's Computation Division was Dr. Helmut Hoelzer, another of the German Peenemuende colleagues who surrendered to the Western Allied Powers at the end of World War II. Hoelzer was assisted by Charles L. Bradshaw, deputy director for the division.

JULY 15, 1970

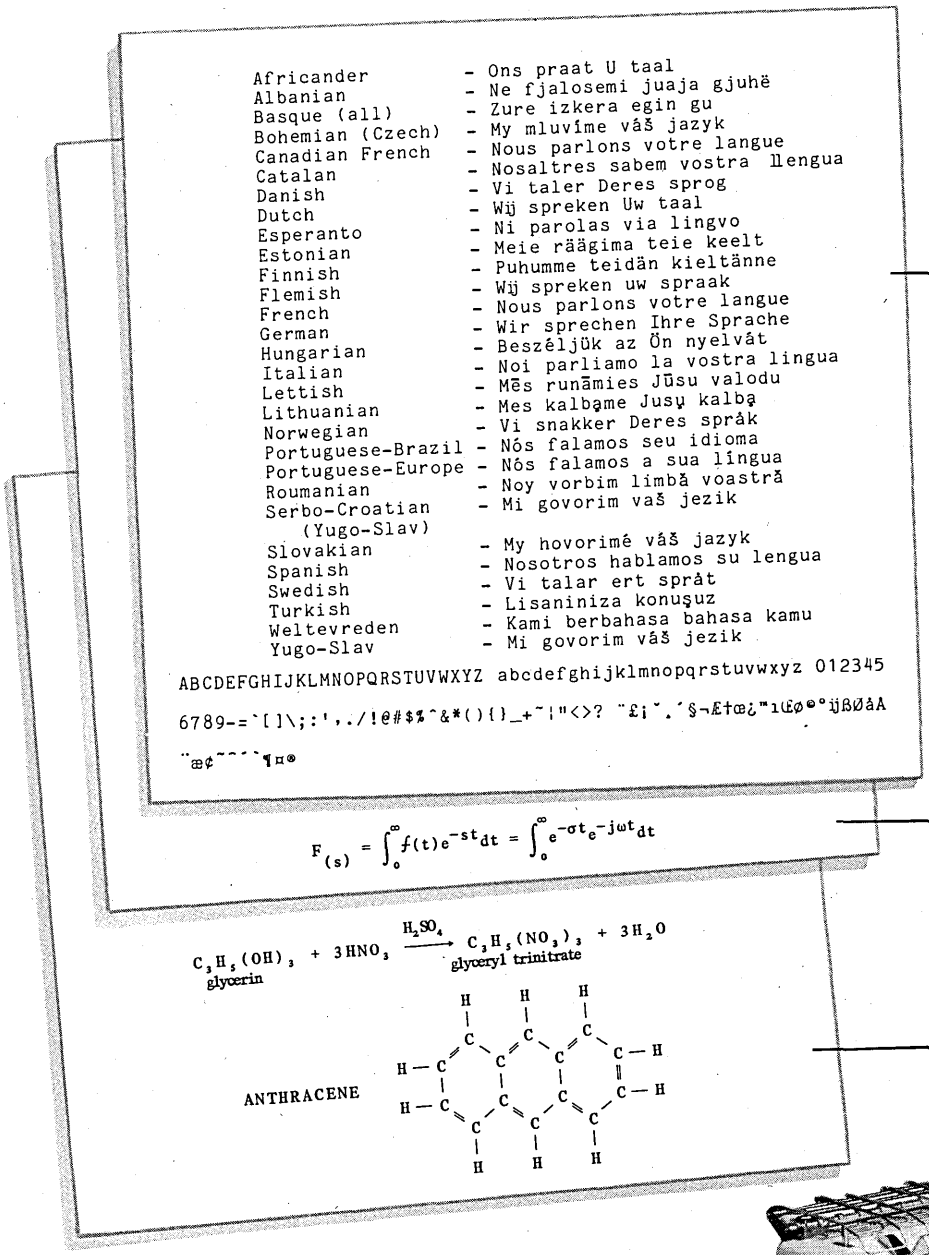
In July, IBM's "seduction of the user" continued with the introduction of two new System 370 computers, two mass stores, a printer, and an onslaught of new 360 compiler versions—featuring ASCII code support for the first time. Conversion seemed a breeze, but DATAMATION noted, "IBM did not announce any 370 software." The software would be developed and released over the next two years, but cost to the user would be high. Also planned was a new operating system, again, at high end-user expense. "So, though first startup costs (unbundled support services) may be minimal, look out for the second startup," the article warned.

At a recent IBM meeting, the company commented on performance levels of its machines. The 360/40 was at the top of the list and the 65 clung to second place, leaving room at the bottom for the 50. One panelist at the meeting related his experiences with these machines, adding credibility to the above-listed ranking order. He stated his 50 averaged one or two cpu failures per week, and moaned when his 40 went down once in three weeks. He gave no average for the 65.

The long-awaited Honeywell fourth generation computers (to be announced in 1971) were renamed again, from the 3200 series to ACS, or Advanced Computer System. Honeywell was expected to sacrifice computational speed for reliability and pricing gains in this newest line. Several semiconductor manufacturers received circuit development contracts for the new line, including Motorola, TI, Raytheon, and Fairchild. A "relatively new company", Intel, received development contracts for two circuits, a 64-bit scratch pad memory, and a 256-bit read-only memory. Sources in the semiconductor industry predicted up to 1 million ICs per month would be used by the new line through 1973. Cynics said Honeywell's slow moves in designing the new line were due in part to its need for General Electric's R&D capabilities to "put some zing in the new line." That might have been true, but even so, Honeywell just didn't need a new generation because its series was still selling well.

—Deborah Sojka

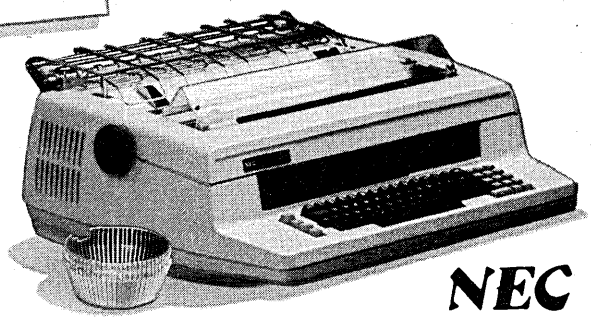
Pick a language. Any language.



NEC Spinwriter® print thimbles give you the greatest variety.

That's because NEC Spinwriter® thimbles have up to 128 characters—40 percent more than other character printers. As a result one NEC thimble can print in 35 different languages. Another has complete technical/mathematical symbols. Another a full scientific symbol font. And with NEC you can select from a library of more than 40 type styles. No other printer company even comes close.

NEC. Going after the perfect printer.



NEC

NEC Information Systems, Inc.

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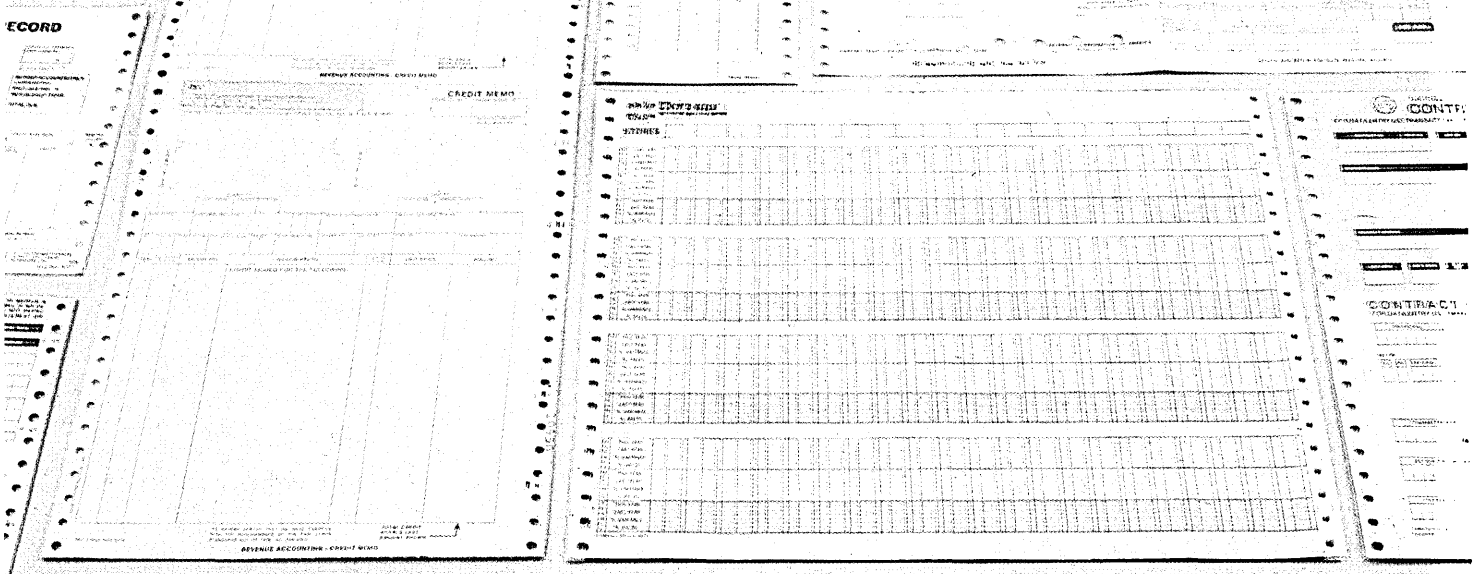
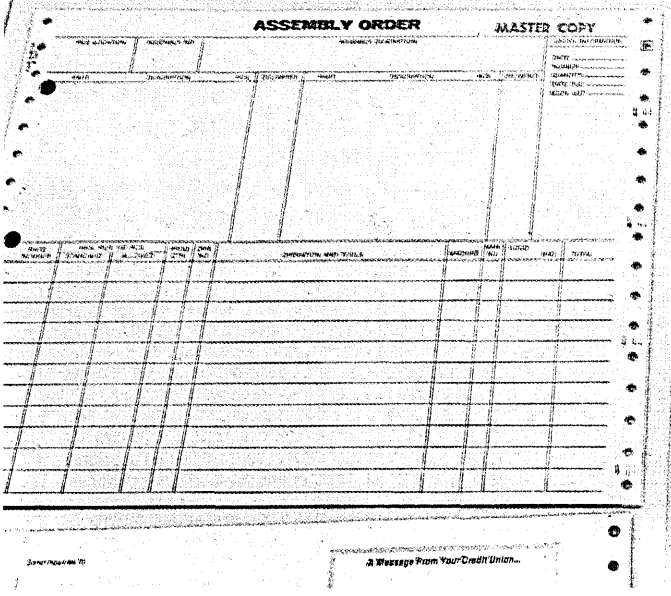
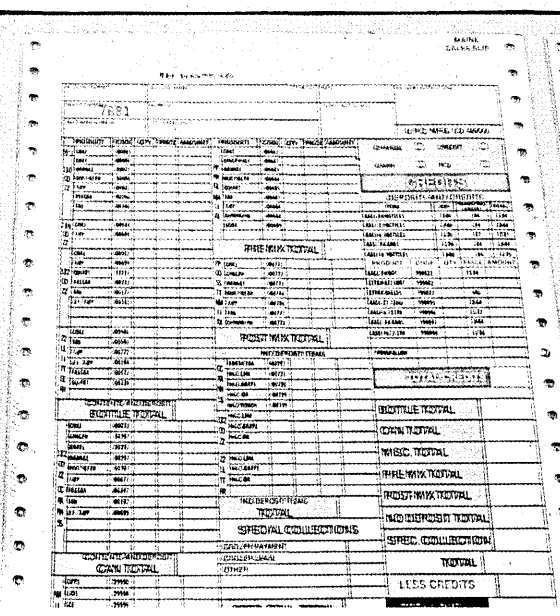
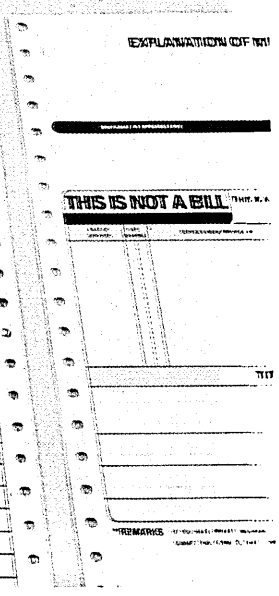
CIRCLE 11 ON READER CARD

DECwriter IV Model AA. The new forms-handling terminal that doesn't limit your choice.









You probably know the DECwriter IV for its flexibility in handling paper.

Well, now you can have that same flexibility in handling forms.

The new DECwriter IV Model AA with its snap-in tractor feed option can automatically handle both standard and custom forms. Forms as wide as 14⅞". And as narrow as 3". In up to four parts.

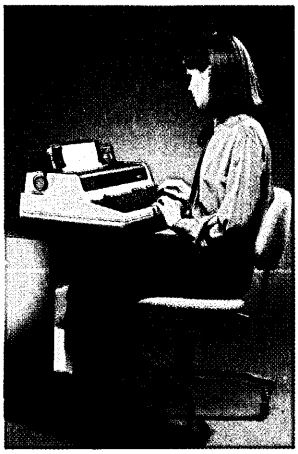
And you can control this new terminal either directly from its keyboard or from a computer.

With the DECwriter IV Model AA you can condense characters down to 16½ per inch. Or expand them up to 5 per inch. On a field of 132 horizontal and 84 vertical tabs. And a simple setting also lets you super-condense lines down to 12 per inch. So you get more information per line, per form.

You can also be sure of synchronized printing from one form to the next, no matter what form you're using. Because with the DECwriter IV Model AA you program "top of form." And parity is easily selected at the keyboard, simplifying communication with other computers.

Simply remove the tractor feed option and the DECwriter accepts all your roll feed or sheet paper up to a width of 14⅞".

Of course the new DECwriter IV gives you switch-selectable 110 and 300 baud rates. And a 45 CPS catch up rate so you get the true 30 CPS throughput found on our original DECwriter IV Model DA. You also get the extra attention to features you expect from Digital. Like foreign character printing, super/sub-script capabilities, keyboard-selectable local echo, and a print head that moves aside when desired so you can see the last character printed.



Best of all, Digital has put all this capability into a terminal that fits right into a wide range of environments—either on its custom stand or on a desktop. And the DECwriter IV's solid-state components and microprocessor controls continue to build on the reliability standards set by the DECwriter II. All at a surprisingly low price.

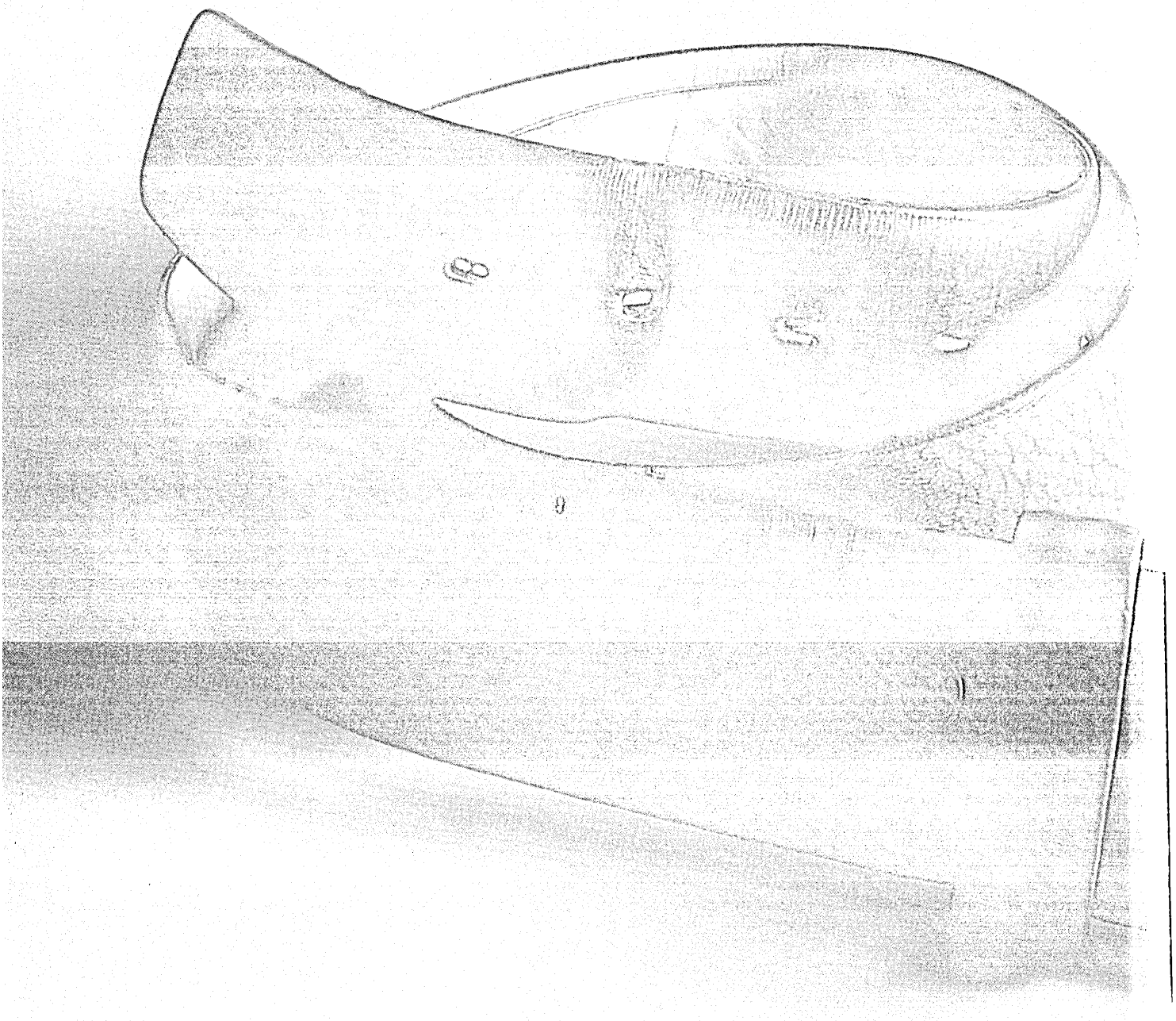
The DECwriter IV Model AA. For real forms-handling capability, it's your only choice.

To order your DECwriter IV Model AA, or the original DECwriter IV Model DA, call your terminals supplier or write **Digital Equipment Corporation,** Terminals Product Group, MR2-2/M67, One Iron Way, Marlboro, MA 01752. In Europe: 12 av. des Morgines, 1213 Petit-Lancy/Geneva. In Canada: Digital Equipment Corporation of Canada, Ltd.

digital

CIRCLE 12 ON READER CARD

DDP from Northern Telecom: it's a perfect fit for all the different sizes you're going to be.



Most DDP systems can be expanded somehow. But keeping your system cost-effective as your company grows —that's another story. Northern Telecom Systems Corporation has a collection of ways to ease your growing pains that's hard to match. Take a look—and think about where you're growing.

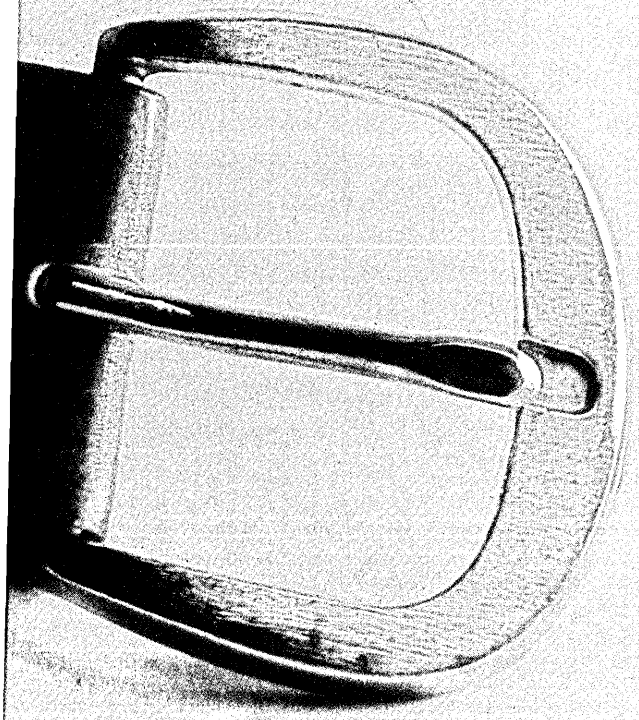
Starting small?

You can start a DDP system at any convenient size if you start with Northern Telecom. We have processors that work efficiently with just a single data station. Or with two. Or eight. Or sixteen. Upward compatibility makes it easy to use some of these processors in tandem.

Extra capability without excess capacity.

Our networking options let you link your processors for more processing power at the data station where it's needed. Easy access to all your processors means you won't have to buy excess capacity for peak loads in isolated places.

Our Multi-Task Operating Systems stretch the capacity of the data station still further. For example, each location can work on inventory, general ledger, receivables and order entry simultaneously. Even disk storage is unusually flexible—from .5 to 308 megabytes. So you never pay for more than you need.



We'll help you add big-time text-editing capabilities while a system is still small. So you can edit both files and programs in a speedy, simple way. Our text-editing ability saves programmer time. And it cuts the need for skilled people—because editing for any remote location can be done from any other location that has a programmer.

We speak your language.

You can start with any of four languages: COBOL, BASIC, RPG and TAL. And add any of the others whenever it becomes appropriate.

But it's not just our DDP systems that soothe your growing pains—it's our whole organization.

Right now, we can deliver state-of-the-art systems for Data Entry, On-Line and Remote Job Entry, as well as DDP. So when you work with Northern Telecom, one call can bring you factory-trained service for every part of your remote processing system.

The best reason to talk to us today is tomorrow.

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

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

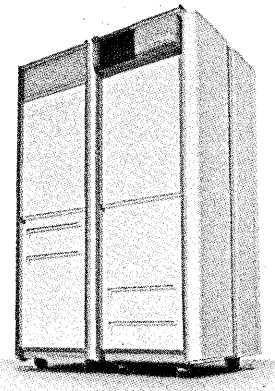
Talk to Northern Telecom Systems Corporation. Where computers and communications meet.

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

Northern Telecom Systems Corporation

CIRCLE 13 ON READER CARD

Introducing The entire BTI family of 32-bit multiprocessor systems.



Finally, there's a computer system that lets you grow by plugging in resources, instead of by changing models — the BTI 8000.

Our family secret is Variable Resource Architecture (VRA): a flexible mix of hardware resources controlled by a single, self-regulating operating system. The result is mainframe level performance at substantially lower costs, plus unequalled flexibility.

You can tailor the BTI 8000 to serve over 200 on-line, interactive users. Or to handle large batch loads. Or to do some of each. And, you can vary system performance **over a tenfold range** by merely adding or deleting hardware modules.

Additionally, built-in growth potential allows you to respond to changing requirements easily and quickly — without modifying either the operating system or your applications software.

As for reliability and support, they're established family traditions, proven by over 2,500 other BTI computers operating in the U.S., Canada and Europe. For full details about the BTI 8000, contact the BTI office nearest you.

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CIRCLE 14 ON READER CARD

LOOK AHEAD

FEUDIN' AND FUSSIN' AT IBM

IBM's sluggish 8100 sales, in the eyes of some Data Processing Division executives, are at least partially caused by poor management and insufficient support at the branch level. DPD reportedly has concluded that both IBM reps and service engineers are recommending 4300 distributed processing systems to users who would be better served by 8100 systems -- simply because the IBM personnel better understand the 370-like architecture of the 4300.

The problem is exacerbated by the narrowness of the 8100 product line, the lack of an evolutionary path, and DPD's own failure to control the amount of time SEs spend on one-machine installations.

Between 10% and 15% of the installed 8100 base today is single-unit sites, an IBM source explained, when the marketing plan called for multiple-unit sales. DPD is now pressuring the System Communications Division to expand the range of the 8100 product line ASAP.

FOUR PHASE FOR PHILIPS?

There are whispers in Europe that Philips N.V., the Dutch multinational, is interested in buying Four Phase. Philips now handles Four Phase marketing and distribution in Europe.

SON OF ANTELOPE

AT&T is preparing a digital PABX for mid-1981 announcement. It won't be the much-rumored "super-PABX" from the Labs, but it will be a spoiler to challenge Rolm and Northern Telecom until the so-called "Antelope" project, Bell's advanced PABX design, is ready for market in 1983.

Datapoint's multifunctional PABX design, code-named "Evergreen," is expected to be unveiled later this year, and IBM may yet validate the recurring rumor that it has a digital PABX for the U.S. market. Latest reports detail an 8100-based unit from IBM's System Communication Div.

HARD-HITTING DEC PORTABLE

Digital will have an impact-printing portable terminal on the market by the end of 1981, according to insiders. It will weigh more than TI's thermal 745 and cost perhaps $300 more (about $2,100), but it will take normal paper in a wide carriage.

HONEYWELL'S ITALIAN PCM

In Canada and overseas, Honeywell has introduced a midrange computer, the DPS4 -- developed and manufactured by its subsidiary, HIS Italia --

LOOK AHEAD

that could be the first PCM from a U.S. independent mainframer since RCA's ill-fated Spectra challenge.

Honeywell, in fact, does not plan to market the DPS4 in the U.S., but the PCM potential of the machine, about comparable to the 4331, has drawn a good deal of interest. Wall Street seers have been looking for a real PCM challenge from the American independents, a commitment beyond CDC's marketing the IPL Omega, for some time.

With an architecture built around internal parallel processors (including one for emulation and another for foreign disk processing), the DPS4 can concurrently run HIS software and can emulate IBM, DEC, etc. Priced from about $47,000 up, the DPS4 is described as having a "multiple personality."

EARLY DEBUT FOR PRESTEL

The British Post Office's Prestel International, now serving eight countries, is likely to get approval for full-scale marketing this summer, a year earlier than originally planned. With consumer interest high, the BPO wants to stay ahead of its international competition.

COMTEN PUSHING NCR

Recently acquired Comten has been urging its Dayton parent, NCR, to become more aggressive in data com. Suggesting enhancements to Comten's 3705-type front-end products, Comten execs are urging NCR to offer complete communications subsystems for specific needs: front-end, net software, perhaps even IBM-compatible terminals.

ANY TAKERS?

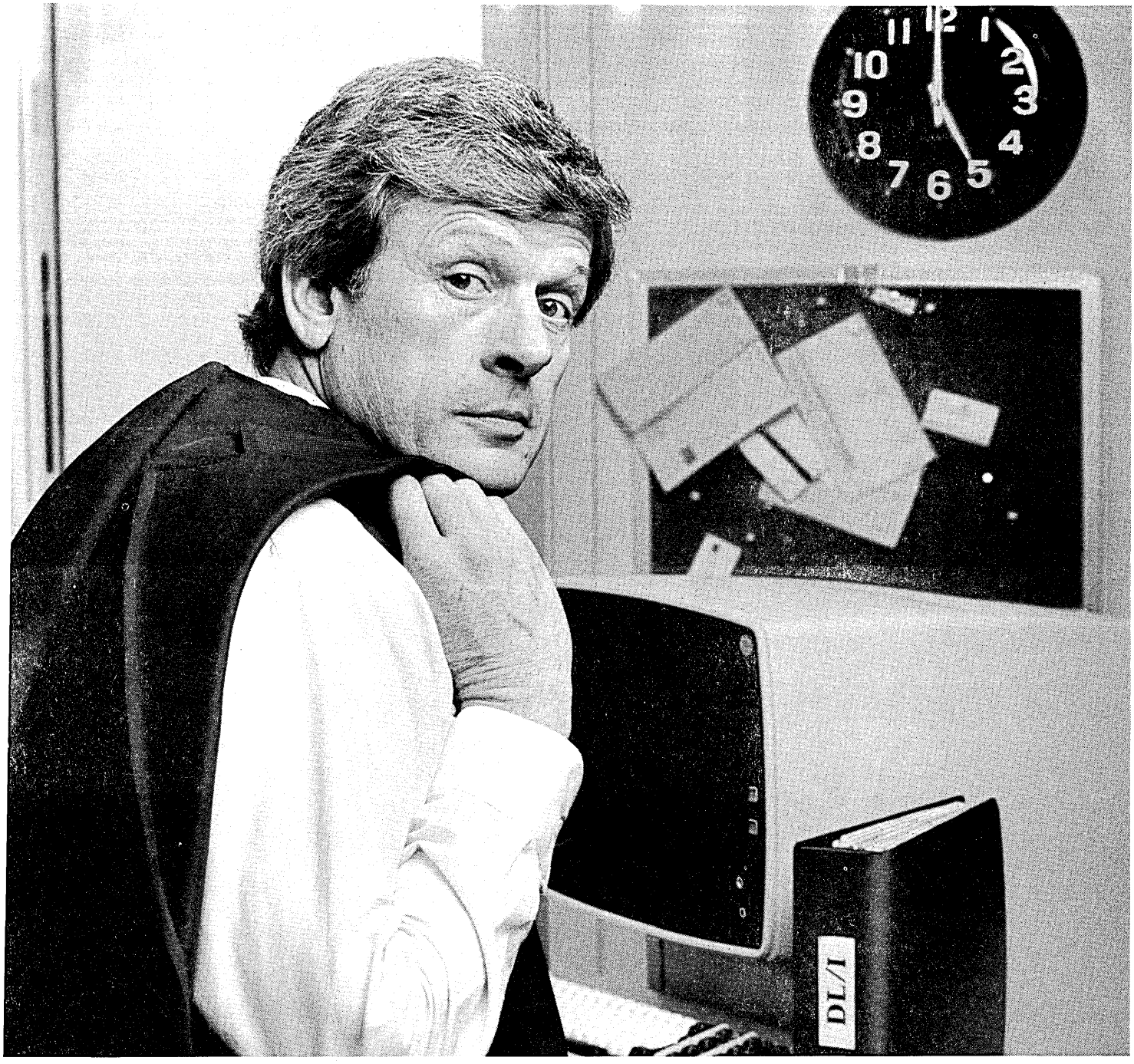
Hazeltine is "willing to talk to anyone" about buying or marketing its new wp system, Opus 80 -- but gossip is that if current negotiations with potential oem NCR Corporation fail, Hazeltine will reconsider its commitment. IBM's splashy entry into wp will likely trigger an industry shakeout, with a number of firms following MAI's Wordstream through the exit door.

HOW MUCH DOES A 370 WEIGH?

Intel, Motorola, and probably Fujitsu have all reportedly succeeded in developing LSI versions of the IBM 370 instruction set, with chip-based processors roughly comparable to IBM's 370/115. System design is complex and slow but making progress, according to the Silicon Valley rumor mill. IBMers claim they did it a while ago.

The 16-bit duel between Motorola and Intel chips reportedly forced an early announcement of Intel's 32-bit board to counter the Motorola 68000. Intel would have preferred to wait until its chip-based 32-bit system, scheduled for 1981

(Continued on page 49)



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More paths for your data. More ways to store it.

The 8000 Series is absolutely software compatible with IBM's 3350, but that's where the similarities end. You have a choice of string switch, dual port, or both — on the same subsystem. You get contiguous addressing, 64-volume support and 8-string addressing for configuration flexibility and increased availability. And you get a choice of the proven STC 8350 with 317.5 Mbytes per spindle and the double-density STC 8650 with 635 Mbytes per spindle. In short, it's the most powerful disk subsystem ever offered for mainframe computers.

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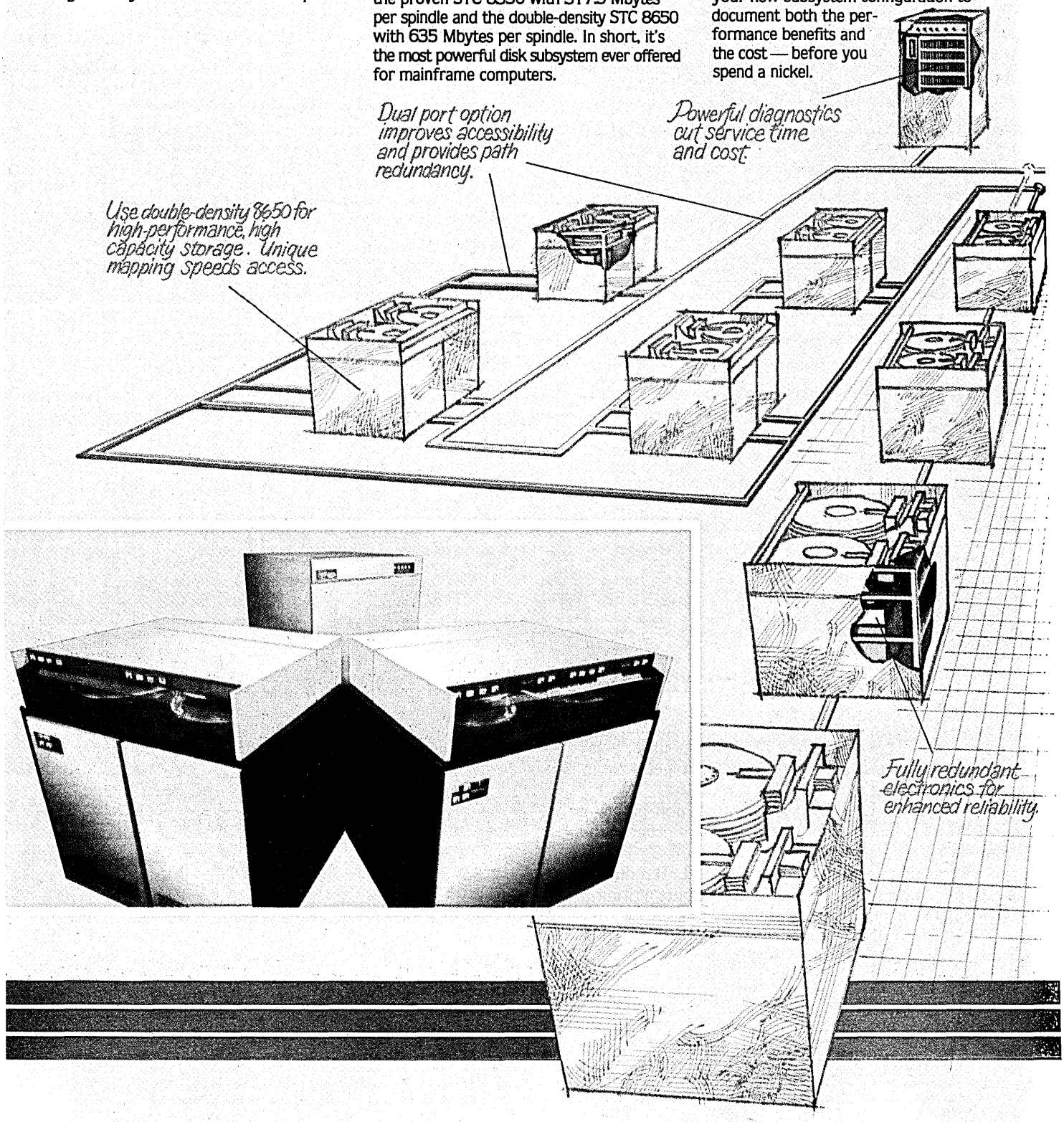
Hardware that extends well beyond mere compatibility is the foundation that permits skilled STC Systems Engineers to craft a solution tailored to your particular operation. Using powerful performance analysis and tuning software, they can virtually split open every pack in your shop to seek out performance bottlenecks and show how to eliminate them. They'll even simulate your new subsystem configuration to document both the performance benefits and the cost — before you spend a nickel.



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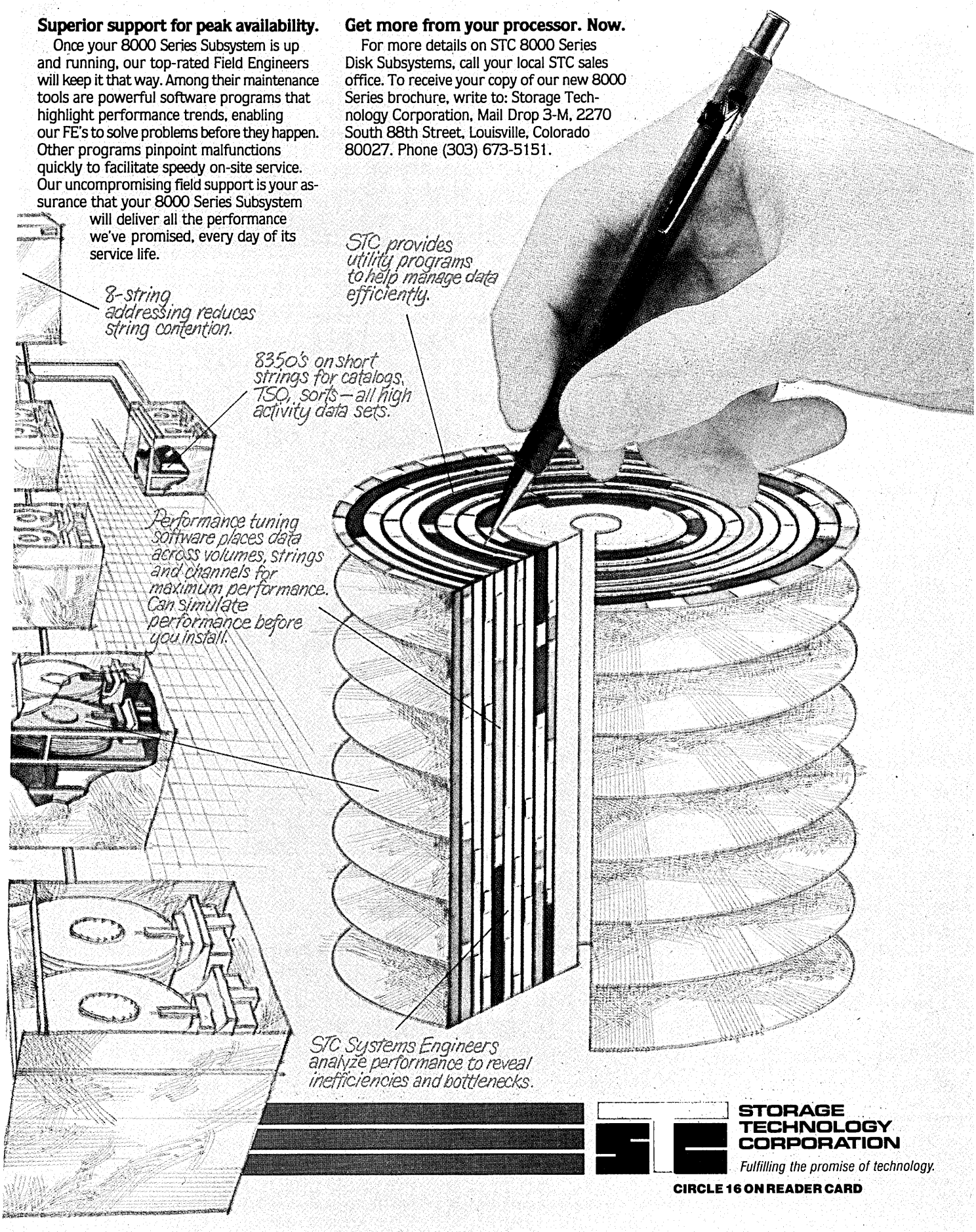

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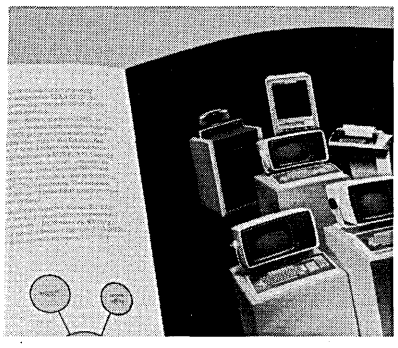

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We designed DG/DBMS to let you change as fast as the facts change. Company expansion and diversification plans, plus frequent changes in accounting regulations, EEO rules, EPA laws, privacy laws, all dictate the need to respond fast when changes occur.

Our DBMS begins saving you time and money right in the computer room. DG/DBMS is designed for ease-of-use so programmers can be more productive. One user, in fact, reported productivity gains of twenty-five percent. Beyond the computer room, our DG/DBMS interactive query facility provides fast data inquiry and report generation in user departments. That's why our DBMS is more cost-effective, reliable, and more manageable than any other. Put it together with our new XODIAC™ Network Management System, our new AZ-TEXT™ word processing, our RCX70 emulation software, and all our other fully compatible AOS-based ECLIPSE software tools and processors, and sophisticated languages. You'll have all the data processing power and growth you'll need to take care of business through the 1980's and beyond.

Find out about our new DG/DBMS and ECLIPSE Data Systems. Send for our brochure: RESULTS.

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CALENDAR

JULY

Harvard Computer Graphics Week 1980, July 28-August 1, Cambridge, Mass.

Five-day conference features business graphics and computer mapping in commercial, educational, and governmental areas. Contact Kathy Devaney, Center for Management Research, 850 Boylston St., Chestnut Hill, MA 02167, (617) 738-5020.

AUGUST

1980 Joint Automatic Control Conference, August 12-15, San Francisco.

Theme sessions include adaptive control, direct digital control with small computers, and energy. Contact Dr. H. Austin Spang, III, GE Research and Development Center, Bldg. 5, Room 207, Schenectady, NY 12345.

First Annual National Conference on Artificial Intelligence, August 18-21, Palo Alto, Calif.

Sponsored by the American Association for Artificial Intelligence, a newly formed group, the conference will be held in conjunction with an Artificial Intelligence Trade Fair at Stanford. Contact Louis G. Robinson, Conference Coordinator, Stanford University, P.O. Box 3036, Stanford, CA 94305.

SEPTEMBER

Workshop for International Marketing Decision-Makers, September 8-9, Washington, D.C.

Exporting products in the '80s is the theme. Cosponsored by DATAMATION and the U.S. Department of Commerce. Contact Graydon Associates, P.O. Box 566, Red Bank, NJ 07701 (201) 741-2690.

MIMI '80, September 9-10, Montreal, Quebec, Canada

13th International symposium and exhibition on mini and microcomputer applications. Contact Prof. M.H. Hamza, Department of Electrical Engineering, the University of Calgary, Calgary, Alberta, Canada T2N 1N4.

Integrated Systems Expo '80, September 9-11, Washington, D.C.

The National Micrographics Association will feature the development and promotion of the effective uses of micrographics, including interfaces with other information-processing technologies. Contact John Bidwell, NMA, 8719 Colesville Rd., Silver Spring, MD 20910, (301) 587-8202.

Internepcon/Semiconductor International Expo, September 11-13, Singapore.

Keyed to the specific needs of engineering, manufacturing, and support personnel of Southeast Asia. Contact Industrial and Scientific Conference Management, Inc., 222 W. Adams St., Chicago, IL 60606, (312) 263-4866.

DPMA Symposium on Office Automation, September 15-17, Chicago.

The Education Foundation of the DPMA announces a one-day series of workshops, followed by two days of general conference. Contact DPMA, 12611 Davan Dr., Silver Spring, MD 20904.

Wescon '80, September 16-18, Anaheim, Calif.

This convention is the largest high technology assembly in the U.S. Contact Robert Myers, Communications Counsel, Wescon, 999 N. Sepulveda Blvd., El Segundo, CA 90245, (213) 772-2965.

SICOB '80, September 17-26, and Convention Informatique, September 15-19, Paris, France.

These back-to-back exhibitions and conferences cover personal computing to office equipment, and constitute the largest French international show. Contact Pierre Wagner, International Trade Shows in France, 1350 Sixth Ave., New York, NY 10019, (212) 582-4960.

IPAD National Symposium, September 17-19, Denver.

NASA and an Industry Technical Advisory Board (ITAB) to report on progress of the joint industry/government computer-aided design project called IPAD (Integrated Programs for Aerospace-Vehicle Design). Contact IPAD Project Office, Mail Stop 246, NASA Langley Research Center, Hampton, VA 23665, (804) 827-2888.

Federal Computer Conference, September 22-24, Washington.

Cosponsored by DATAMATION. Will address the management of change in the 1980s for federal dp users. Contact Ms. Lynn Green, P.O. Box 368, Wayland, MA 01778, (617) 358-5181.

12th Annual Conference of the Society for Management Information Systems, September 22-25, Philadelphia.

The conference theme will be "MIS Management in the Emerging Information Age" and will examine the challenges facing the MIS Executive. Emphasis will be on the impact of converging technologies on the role of the MIS executive in the 1980s. Contact M. Rippey, the Society for Management Systems Information, 111 East Wacker Dr., Chicago, IL 60601, (312) 644-6610.

OCTOBER

IFIP Congress '80, October 6-9, Tokyo, Japan, and October 14-17, Melbourne, Australia.

Challenges of a computer presence is the theme of the Eighth World Computer Congress. Contact AFIPS, 210 Summit Ave., Montvale, NJ 07645.

INFO '80, October 6-9, New York City.

Returning to the New York Coliseum is the Information Management Exposition and Conference. Contact Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017, (212) 661-8410. ✻

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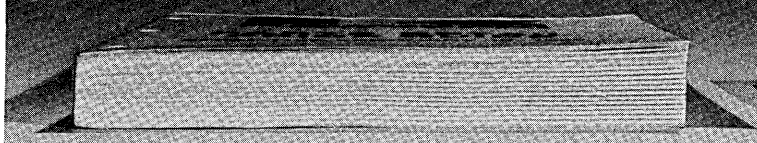

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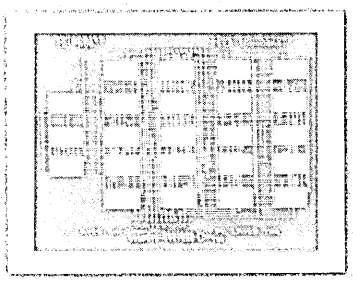

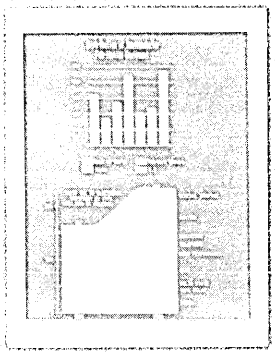

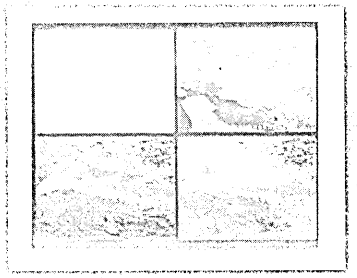

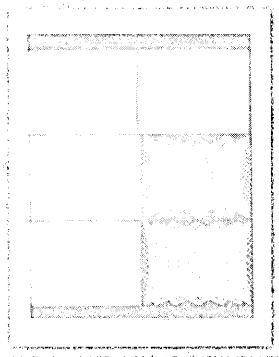

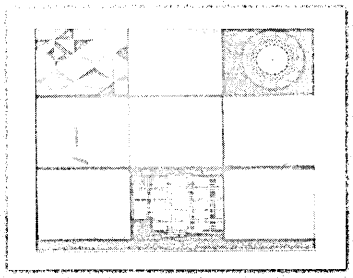

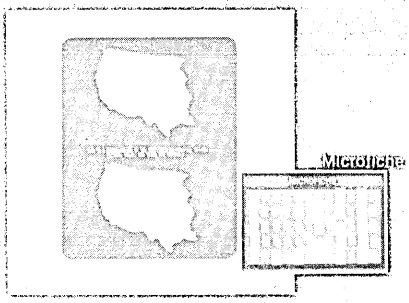

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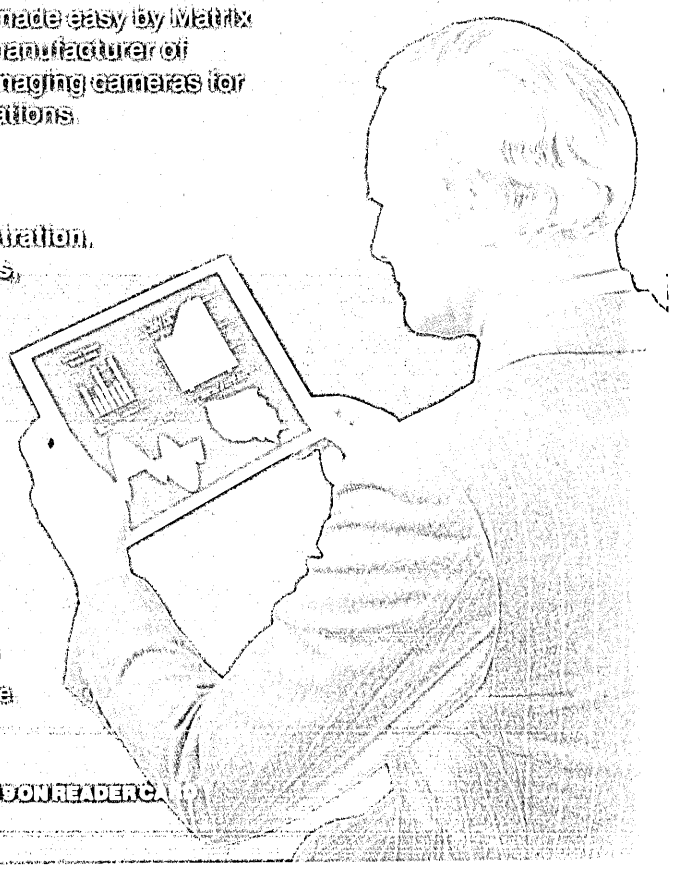

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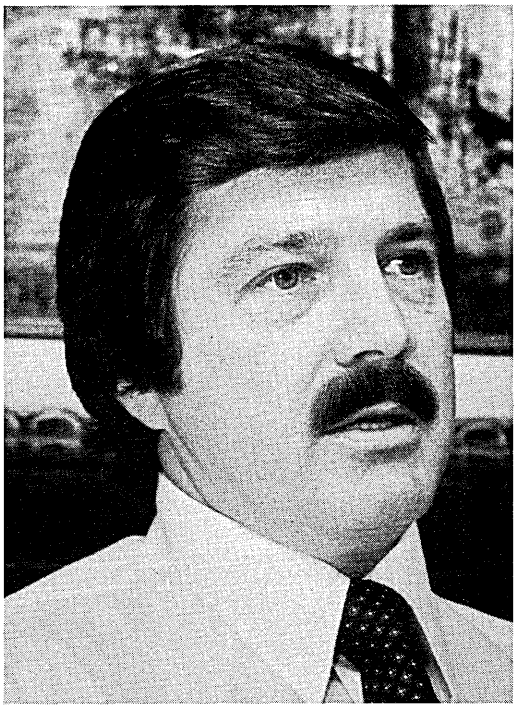

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"Our Pitney Bowes Computer Output Mailing System can do the work of 28 people at a savings of $301,000 a year... but that's just the start!"

"Every day our 4,000 company-owned 7-Eleven stores accept personal checks and, needless to say, we pick up quite a few 'hot' ones.

"It used to be a costly hassle to have our local store managers get local collection agencies to follow up on these small checks. But by adding a Pitney Bowes Computer Output Mailing System we've been able to totally automate and centralize our 'hot check' collection system. In the process we've freed up our local store managers, significantly reduced our collection costs, speeded up our cash flow and turned our credit department into a profit center. Yes, a profit center!

"The beauty of the Pitney Bowes system is that it does the work of so many people and saves so much money in the process. Right now, we have five divisions on line, processing 6,000 letters a day. One man handles the entire job. The same man will be able to handle the output from 16 divisions—36,000 letters a day!

"This fantastic machine does all the work. Our man simply loads the computer-generated letters into one end, pushes a button and walks to the other end. In seconds, completely bursted, trimmed, folded, inserted, sealed, metered and presorted letters come out ready for bagging and mailing.

"The automatic presort feature is a money-maker. It lets us take easy advantage of Uncle Sam's 2¢ presort first-class discount. Last month it saved us over $1,000. At peak volume we'll save over $131,000 a year with the presort alone—more than enough to pay for the system.

"And, in the first four months we've never had a service call. That fact alone speaks well of Pitney Bowes' commitment to quality. But what really helped sell us on this machine over the competition were the people—the sales and service staff at Pitney Bowes. These people know the mailing business like no one else."

For complete details return coupon to Pitney Bowes, **2117** Pacific Street, Stamford, CT 06926. Or call toll free anytime (except Alaska and Hawaii) 800-621-5199 (in Illinois 800-972-5855). Over 600 sales and service points throughout the United States and Canada. Postage Meters, Mailing Systems, Copiers, Dictating, Labeling and Price Marking Systems.

Name_____

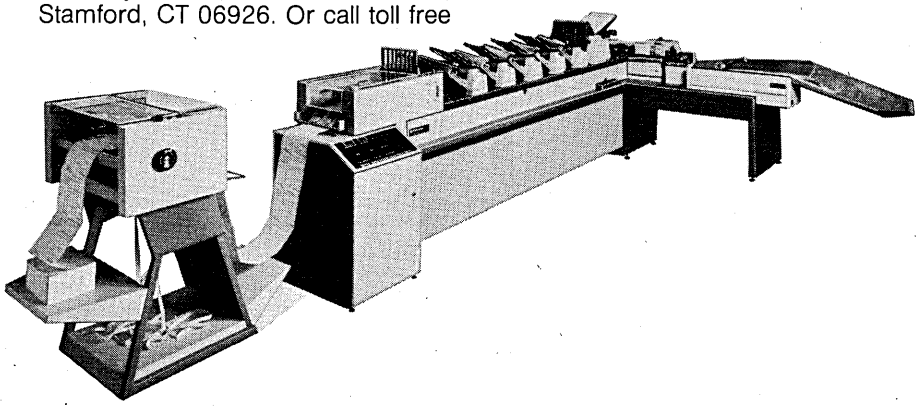
Title_____

Company_____

Address_____

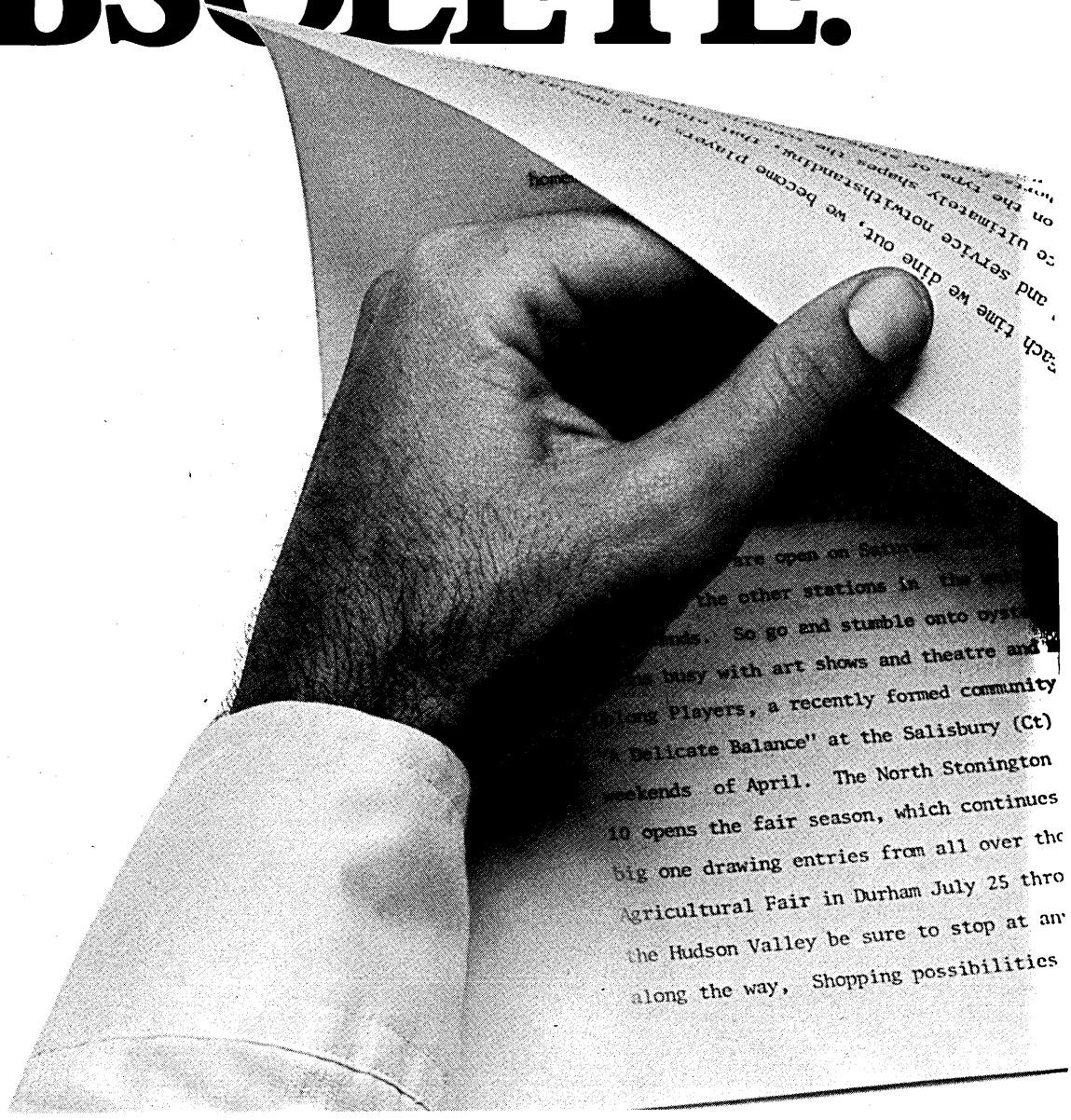
City, State, Zip_____

Pitney Bowes



CIRCLE 20 ON READER CARD

YOUR COMPUTER PRINTER IS NOW OBSOLETE.

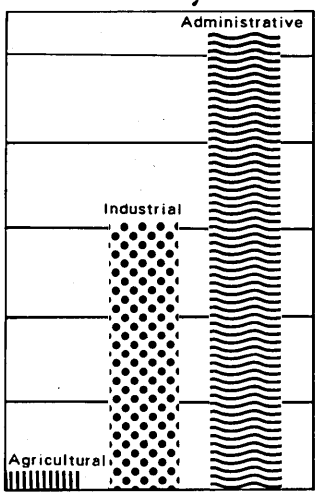


Now there's the Xerox 9700 Electronic Printing System.

Only one electronic printer has a graphic difference.

Of all the printing devices currently on the market, one is in a class by itself: The Xerox 9700 Electronic Printing System.

It's the only electronic printer that can print using unlimited type and styles, corporate logos, and graphics. It can even print your signature. And that's only the beginning.



Only one electronic printer makes obsolete forms obsolete.

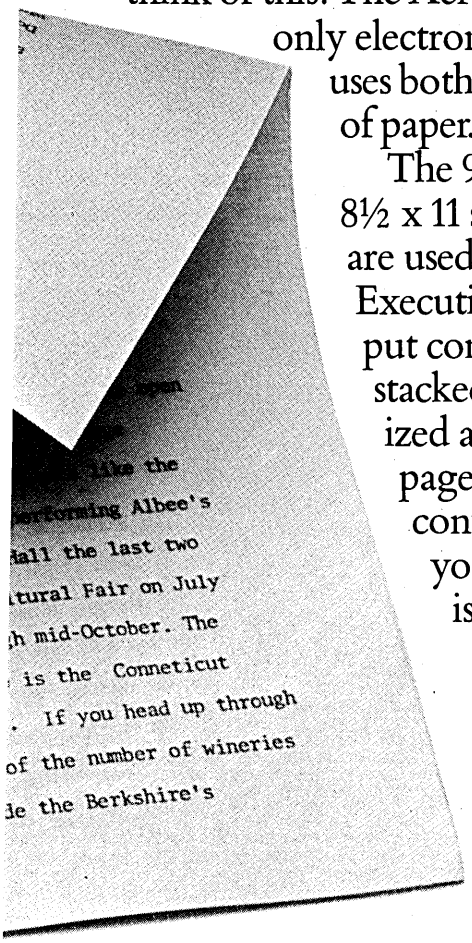
The next time one small change makes you throw out a ton of forms, think of this: The Xerox 9700 creates and stores forms electronically. So when a change is made to an existing form, there is no wasted paper or time.

Forms are printed vertically or horizontally with bar charts, graphs, and company logos. No storage expense. No waiting for printers.

Only one electronic printer cuts paper costs in half.

The next time you pay the paper bill your computer printer is running up, think of this: The Xerox 9700 is the only electronic printer that uses both sides of a piece of paper.

The 9700 prints on 8½ x 11 sheets that people are used to reading. Executive-quality output comes collated, stacked and containerized at the rate of 2 pages a second. And conversion from your present system is easy.



Only one electronic printer makes you look this good on paper.

The 9700 will make your business look more businesslike. It will improve the appearance of all your printed communications. And help improve the communication itself.

Logo

For more information on the Xerox 9700 Electronic Printing System, call or write: Xerox Printing Systems Division, 880 Apollo Drive, P-1, El Segundo, CA 90245. (213) 615-6329.

XEROX

CIRCLE 21 ON READER CARD

"We switched to NCR," says Joseph A. Dee of Brooks Camera, Inc.

DEE:
Brooks Cameras is the largest photographic dealer in Northern California. And we're growing fast. We just outgrew the processing center that had been doing our computer work. We needed faster turn-around. And we wanted to establish our own priorities.

NCR's SWEENEY:
So you went to your own NCR system.

DEE:
Yes, but not directly. First, we selected a competing vendor's newly announced system. But as we started to plan, we began to see problems ahead. No tape drive. Perhaps no COBOL. Perhaps no match-up with our sales terminals. And all we could get from the supplier were vague assurances that the problems would somehow disappear. So we switched to NCR. Very fortunately, as it turned out, because our NCR system is up and running. While the other vendor is still not delivering the other system.

NCR's SWEENEY:
We are not only delivering, our operating software is fully tested.

DEE:
We had a shirtsleeve session with the NCR software people that was refreshing. They told us exactly where they stood. What we could expect and when. And that's the way it's turning out. They gave us the hard answers.

Joseph A. Dee (left) is president and chairman of Brooks Cameras, Inc. in San Francisco. Jim Sweeney is his NCR Account Manager.

NCR's SWEENEY:
You liked Migration Path Engineering, too.

DEE:
Our requirements are too unique for us to expect off-the-shelf application software from any supplier. We have every kind of sales transaction. We accept all the regular charge cards as well as our own. We have rentals, repairs and layaways. And our own special promotions. So once we made the investment in our own specialized programs, we wanted to protect it. Even when our growth forces us to move to a larger system. With Migration Path Engineering, NCR can give us that protection.

NCR's SWEENEY:
And finally, you wanted one supplier who would assume responsibility for the entire system from A to Z — including the terminals.

DEE:
You're absolutely right, Jim.

In the NCR office nearest you, there is an account manager like Jim Sweeney who knows both NCR systems and your industry. To learn more about what an NCR system can do for you, phone him at your local office. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

NCR
Complete Computer Systems

CIRCLE 22 ON READER CARD

Attn:
HAZELTINE users

Sooner or later, even a quality product like your Hazeltine video terminal will need some kind of maintenance service. Maybe it will be just a cleaning. Or an adjustment to the power supply. Or a failure of a printed circuit board.

And that can get expensive.

Fortunately, you have a cost-effective solution.

In many cases, for less than the cost of just one field service call a year, TRW–the exclusive maintenance service representative for Hazeltine video terminals in the U.S.–can provide you with a complete Service Agreement program.

Today, time spent waiting for inoperative equipment to be repaired can affect your productivity...and profitability. TRW minimizes this by offering you access to over 2,000 nationwide field service representatives. Many specialize in servicing Hazeltine terminals, just like yours. And they're backed by a nationwide computerized parts network. We stock virtually every Hazeltine part and printed circuit board you'll ever need. Regardless of where you're located, we're never out of reach of your needs. We've committed over $4.8-million in parts, training, diagnostics, documentation, and new testing equipment to assure this.

As the largest independent national service organization in the computer industry, TRW Customer Service is dedicated to service and service alone. What you receive is virtually all the benefits of having your own personal service staff and inventory.

For just pennies a day.

For a free copy of a capabilities brochure that explains TRW's Hazeltine Service Management Program...or for a free inspection and cleaning of your Hazeltine terminal as part of your new, low-cost maintenance agreement, simply fill out the coupon. Or, for faster response, call Joan Gillman now at TRW Customer Service Division, 70 New Dutch Lane, Fairfield, NJ 07006. (800) 526-2273 (from NJ dial (201) 575-7110).

A COMPANY CALLED TRW

Exclusive Service Rep HAZELTINE Terminals

I am interested in:

☐ Free inspection and cleaning as part of a new, low-cost maintenance agreement (parts excluded).

☐ Capabilities Brochure on TRW Hazeltine Service Management Program.

My installed equipment is _____

Name _____ Phone _____

Title _____

Organization _____

Address _____

City _____ State _____ Zip _____

CIRCLE 23 ON READER CARD

Introducing the office of tomorrow with everything you need today.

Prime's Office Automation System has word processing, data processing, electronic mail, correspondence management, scheduling, automatic proofreading, language translation, networking capabilities – virtually everything you need – all integrated into a single incredibly efficient system with three major functions.

Word Processing includes a screen editor that displays text as it's entered. Menus that lead the user through the system. Labelled function keys that eliminate the need for heavy user memorization. And storage that will easily handle about a million pages of information.

It also has management and administrative workstations. Powerful text creation and editing facilities. A user-created boilerplate library. Comprehensive filing and retrieval capabilities. List processing. And a printer that provides letter-quality output.

Management Communications/Support has electronic mail that can forward documents and notes to offices down the hall, across the city, or around the world.

Correspondence Management cuts paperwork and simplifies filing. An Electronic Intray receives and stores notes, documents, and appointment requests. A Tickler File reminds you when certain tasks have to be done. Calendar Management allows you to maintain a confidential two-month personal calendar.

And scheduling lets you request a meeting, get confirmation of a specific date and time, then actually schedule the meeting.

Advanced Text Management employs a 60,000 word electronic dictionary. The contents are user-defined, so medical, legal, or industry terminology can easily be added. Spelling is electronically compared with the dictionary for accuracy, and hyphenation is done automatically.

It will also support multi-lingual dictionaries for creating foreign language documents or translating one language to another.

Hardworking workstations.

Prime's Office Automation System is supported by two workstations; one administrative and one management. They both can access all capabilities of the system, but each is tailored to the specific needs of its users.

The System operates on a multifunctional Prime 50 Series computer system. All Prime computers share the same operating system, file system, and communications products. So no matter what size computer you start with, you can easily upgrade to over sixty users.

In short, Prime's Office Automation System can deliver what you need. So if you're ready for this kind of office, we're ready to deliver the System. Write Prime Computer, Advertising Department, 3 Newton Executive Park, Newton, Massachusetts 02162.

PRIME Computer

CIRCLE 24 ON READER CARD

LETTERS

OFF THE MONEY

Re: "1980 Salary Survey" (April, p. 110), once again technical writers, documentation specialists, et al have been ignored. Throughout the industry virtually every computing site has one common problem: the documentation is in less than satisfactory condition. While we as a profession must continually struggle to convince our associates in the industry that without effective, well-structured documentation their problems will remain insurmountable, it is lamentable we must also chide respected industry publications for their shortcomings in emphasizing our contributions.

Please do not ignore us again next year. We make this plea not because our professional pride has been slighted but because the importance of an installation's documentation has been denigrated.

JAMES H. MARTIN
Supervisor, Technical Writing
ROBERTA BARNES
JEANNE DE REMER
JANET PRINKEY
CARROLL SCHIAVONE
WILLIAM SCHLANSKY
MARY ANN THARALDSON
JOHN URTON
Technical Writers
Blue Cross of Northern Calif.
Oakland, California

The line of demarcation between Manager of Systems Analysis and Lead Systems Analyst is not clearly defined, although the salary disparities are certainly clear.

After 10 years of work with three different organizations in the federal government, I have not yet worked in an organization where the salaries for the positions defined in the survey were in the ranges noted.

On what organizations did you base your survey? For example, in the activities in which I have worked, the journeyman level for a senior systems analyst is GS-11 and the salary schedule for GS-11 ranges from $20,611 to $26,794 (not the $34,000 quoted in the survey).

A lead systems analyst is generally, in my experience, a GS-12, with a salary range between $24,703 and $32,110 as opposed to the $34,000 figure quoted in your survey.

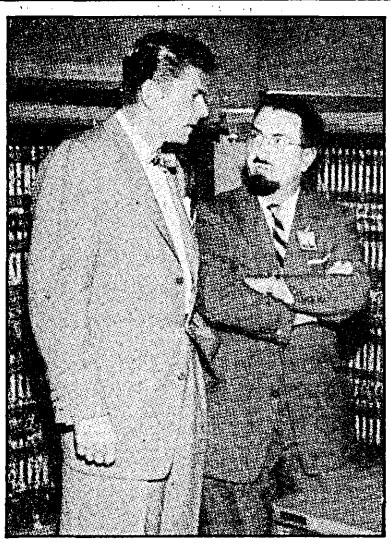
So, since I function as a Manager of Systems Analysis and/or a Lead Systems Analyst (both descriptions fit my job), I am receiving less than my counterparts in other federal government jobs and more than many of my counterparts in private industry.

MARY E. GRUSETSKIE
Exeter, New Hampshire

It was disappointing to discover that Houston was excluded in the metropolitan areas survey. The Houston marketplace is volatile, and comparing the limited salary information I have to the other parts of the country, Houston salaries are higher!

Was there some reason Houston was excluded?

VANCE PAYNE
Manager, Business Systems
FMC Corp.
Houston, Texas



DPVP?

I am trying to find out if there is any truth to the rumor that Ronald Reagan is going to name Herb Grosch as his running mate.

The above photograph is the only item I have been able to find which might explain how such a story got started.

JAMES L. ROGERS
Associate Professor
Computer Engineering & Science Dept.
Case Western Reserve Univ.
Cleveland, Ohio

The survey disclosed the beginning of a trend that could end dp as we know it. Specifically, I'm referring to the disproportionately higher salaries paid to federal government employees. The comparison of salaries by industry showed that federal salaries exceeded the U.S. private sector's pay scale in 24 out of 49 job titles. If the trend of higher federal salaries continues, everyone will eventually work for the government. And since we all know how well the government "works," this will surely be the end of the man-machine interface.

WAYNE J. SOCHA
Phoenix, Arizona

Gone are the days of the aerospace hack who didn't know a bit from a Boeing. Today's software writers have advanced degrees in math, physics, and computer science. Our wordsmiths speak COBOL, FORTRAN, and MIS. They possess the ability to translate jumbled technical jargon into lucid, usable text. They contribute to the success of products every bit as much as their more widely recognized engineering and programming counterparts.

MARY ST. JOHN
Manager, Documentation
Transaction Technology, Inc.
Los Angeles, California

I would like to bring up a missing job title. You have seven trainee titles but no educator titles. You do have one staff consultant/trainer position, but that seems to be a senior programmer type not an instructor. It is amazing how little attention is given to upgrading a programmer's skills. What I have heard from the new hires is that most shops assume that a programmer will learn all he needs to know from experience. Most feel that education is too expensive. If I may paraphrase—"if you think education is too expensive, consider the cost of ignorance."

I hope in the future the salary survey will include the title "Training Coordinator" or equivalent position. If there are not enough to these people in the industry to justify a sampling, then we have no one to blame but ourselves for the continuing problems due to lack of education.

HARVEY CARLIN
Training Coordinator
Computer Systems Div.
First Pennsylvania Bank
Philadelphia, Pennsylvania

LETTERS

I found it disturbing that computer security was omitted. In recent years, both the public and private sectors have placed considerable emphasis on the protection of data and computer resources. Computer security specialists are rarely organizationally placed within the dp organization. However, these people are required to have extensive knowledge of hardware, software, operations, telecommunications, etc., and must demonstrate a high degree of competence in a wide range of technical and administrative skills. As a computer security specialist for over four years, I am curious to know what the industry is paying and where computer security salaries rank among the other jobs in the industry.

LARRY MARTIN
Computer Systems Security Officer
Energy Information Administration
U.S. Department of Energy
Washington, D.C.

ROTATING STORAGE

Re: "Ferrite's Out, Thin Film's In" (Feb., p. 67), it has always bothered me that in spite of exciting advances in the potential of the rotating disk as a medium for storing data, it has never been fully realized.

By using dedicated heads/tracks, and reading all tracks simultaneously, it must be possible to scan all the data on a disk in the time it takes it to complete one revolution. With multiple disk drives, there is no limit to the amount of data that could be read in a matter of 20 milliseconds.

Assuming fixed-length 128-byte records written radially with one bit per track/head, a total of 1,024 tracks/heads would be required. If each group of 1,024 heads were controlled by an independent microprocessor, it should be possible for the cpu to issue a command to all the microprocessors to simultaneously search for all records satisfying a given search mask without any cpu overhead.

The concept seems so simple yet it obsoletes all disk sorts, index files, and data base management systems. If the entire data base can be scanned intelligently in 20 milliseconds, then the data can be arranged on disk in a completely haphazard fashion.

Wherein lies the snag?

L. R. HOLCROFT
Pretoria, South Africa

POSTSCRIPT

Re: "The Emotional Logician" (March, p. 221), I was very pleased to read Molly Gleiser's article on Emil Post. Many readers, I am sure, would enjoy more articles that go outside the bounds of the doings of corporations in the computer business and business applications of computers. Gleiser's article could have been twice as long, with a careful description of some of Post's technical contributions and how they relate to various areas of logic and computer science that are currently pursued.

GARY D. KNOTT
National Institutes of Health
Bethesda, Maryland

WOMEN IN DP

Re: "Women in Management: A Conversation" (April, p. 131), I found it most interesting and enlightening. More articles should be written on career opportunities and management styles for women in information management. As women are entering the managerial threshold, we need to know what other successful women are doing.

P. BURTON
National Systems Analyst
Tab Products Co.
Cincinnati, Ohio

CORRECTIONS

Charles Harwood is the president of Signetics, not Intel, as we erroneously published in our April issue, p. 168.

We neglected to credit Jerome T. Nolté, coauthor of "Grow Your Own" (April, p. 122). Dr. Nolté, currently working on an MS in management at MIT's Sloan School, was involved in the survey of systems analysts and their working environments on which the DATAMATION article was based.

Wang's 2200 Series Small Business Computers deliver custom solutions to specific business problems.

Too often, buying a small business computer means settling for a general-purpose answer.

But not with Wang. Because in addition to high performance, low cost and ease of use, our 2200 Series interactive computers offer something very rare: customizing.

From our entry-level PSC II to our multi-job, multi-user 2200MVP, our 2200 computers are designed to be specially tailored—in both hardware and software—to do exactly what you need done. Payroll. Accounts receivable. Inventory. And plenty more.

Also, they let you expand into new applications easily—without giving up the investment you've already made. And our direct hardware and software support means you'll get all the help you need in planning and developing your system.

So instead of buying a computer that's just right for everybody, call Wang. And get a computer that's just right for you.

Wang Laboratories, Lowell, MA 01851, (617) 459-5000.

I'm interested in a fitting. Tell me more.

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Title_____

Organization_____

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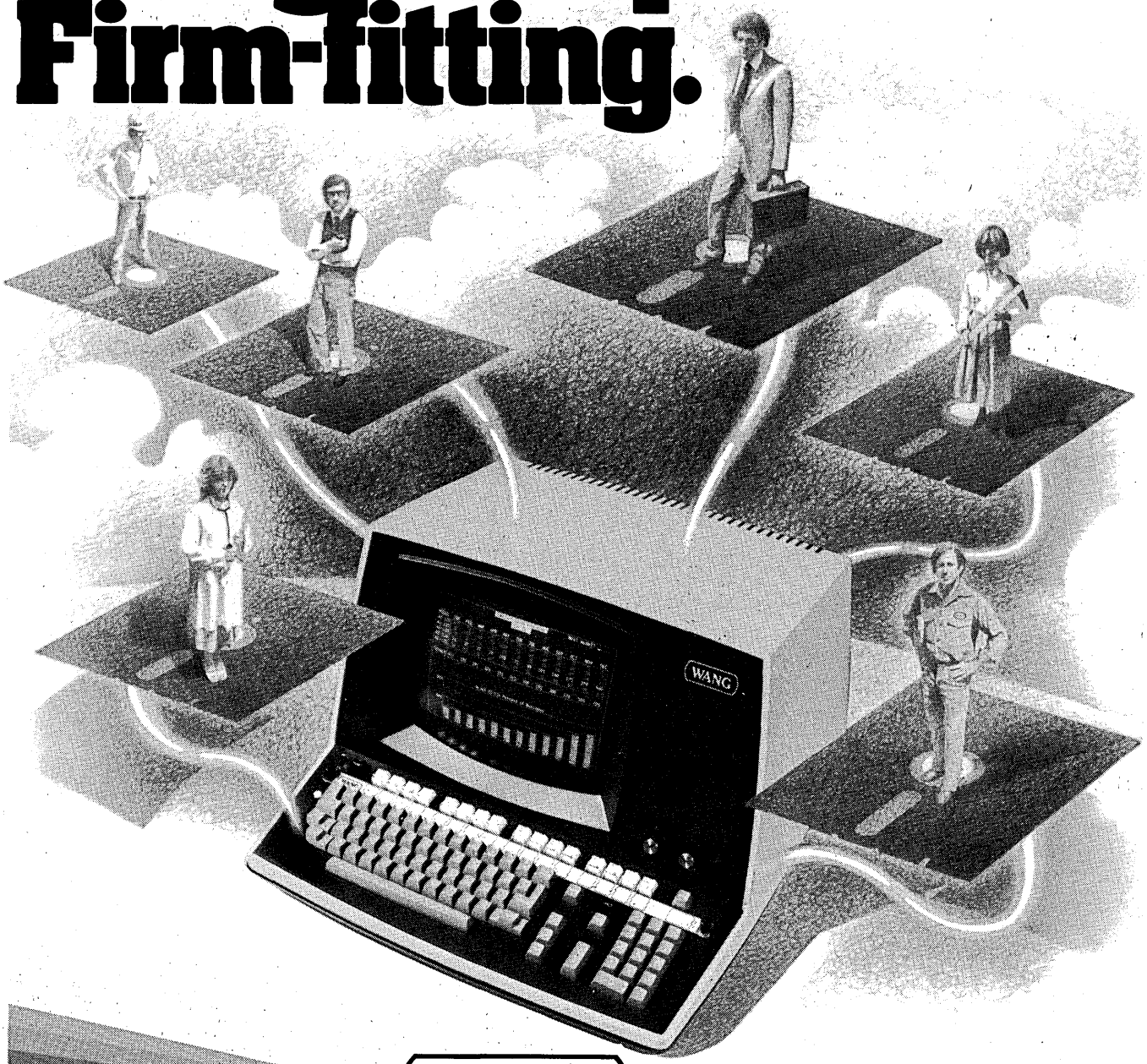
DD98/D70

Wang computers: Firm-fitting.



WANG

Making the world more productive.

CIRCLE 26 ON READER CARD

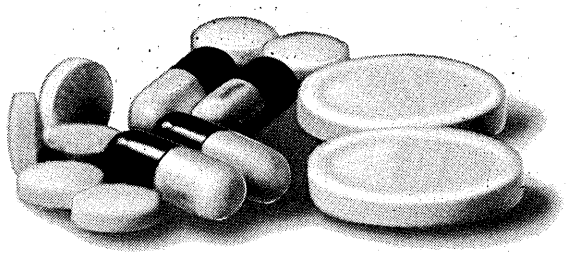
Take one Powercenter and a glass of water. Your electrical headaches are over.

It seems every time you install a system, upgrade, reconfigure or relocate you face another wiring change and expense. Your computer gets put out of commission. Your work backs up—often you need to buy outside computer time.

POWERCENTER eliminates these headaches. This self-contained moveable power system distributes power to your hardware through *flexible* cables. It even includes an isolation transformer to give you the required voltages and isolate you from spikes and transients.

Arrange, rearrange, upgrade, add to or move your equipment whenever and wherever desired. POWERCENTER, another product from Topaz, the company that specializes in solving computer room power problems.

...or take two of these.

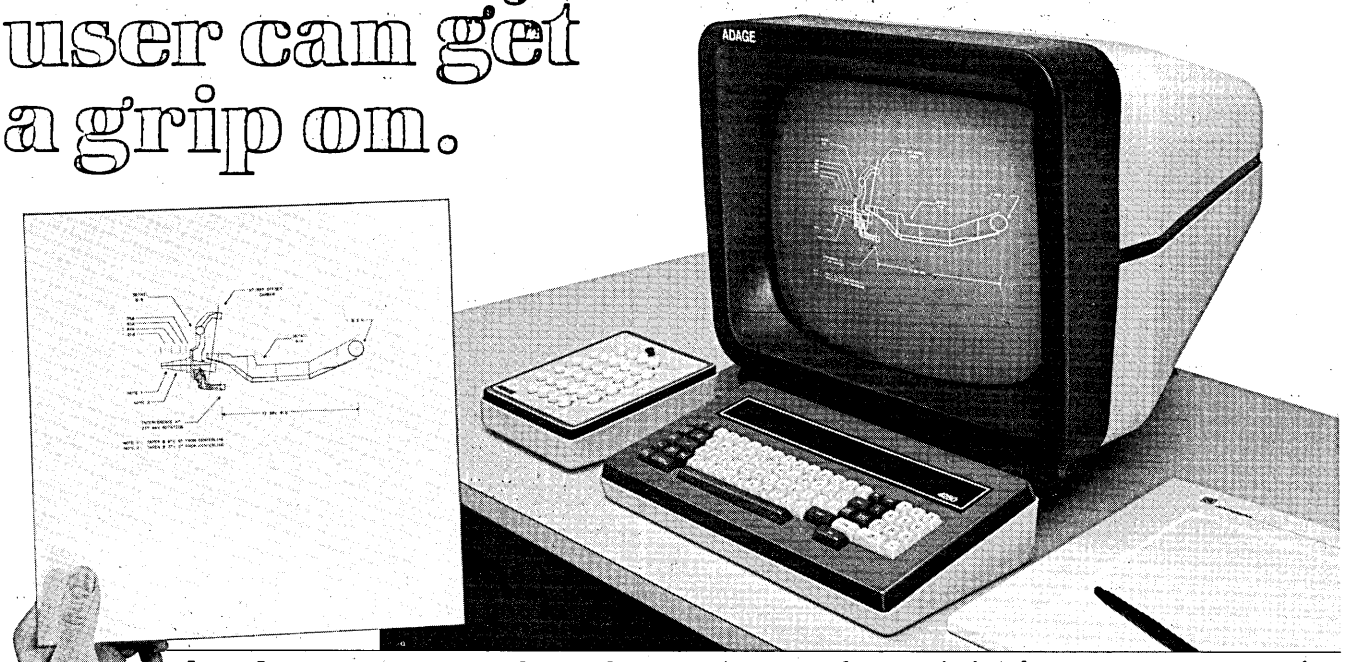


For more information, contact

TOPAZ
DPP DIVISION
12638 BEATRICE STREET
LOS ANGELES, CALIFORNIA 90066
PHONE: (213) 390-8931

CIRCLE 27 ON READER CARD

CAD/CAM GRAPHICS
The IBM System 360/370 user can get a grip on.



The Adage 4250 is a plug-compatible improvement on the costlier IBM 3250 Display. With superior graphics, local hard copy output — and a host of advanced, user-oriented features — the Adage 4250 is, quite simply, the best interactive display system available for use with large mainframes.

Basic 4250 System advantages include:

- More terminals per I/O channel, giving you a better ROI.
- Faster full duplex transfer rate, for lower channel loading.
- Larger refresh buffers, so you can locally store and display larger portions of your data base.
- Data tablet input, which is more convenient, less tiring than light pen.

For demanding CAD/CAM applications, these special Adage 4250 features give you an even better grip on the toughest graphic problems.

Local hard copy — at the touch of a button. In seconds the 4250 interface captures and processes full, or partial, CRT images for plotter output from 8½" to 72" wide. No CPU interaction required.

Local zoom — allows operator to "scale up" the image for better readability. Again — no burden on your CPU.

Enhanced keyboard — which can include a numeric keypad for easier entry.

Microwave adapter — enables high-speed (1.544 Mbps) transmission between remote terminals and CPU via telephone, microwave or fiber optic links.

Full 3D graphics — available with Adage 4370 System. Provides an extra dimension in interactive graphics for special applications on large mainframes.

To learn more about the Adage advantage, call or write the leader in interactive graphics.

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West Germany
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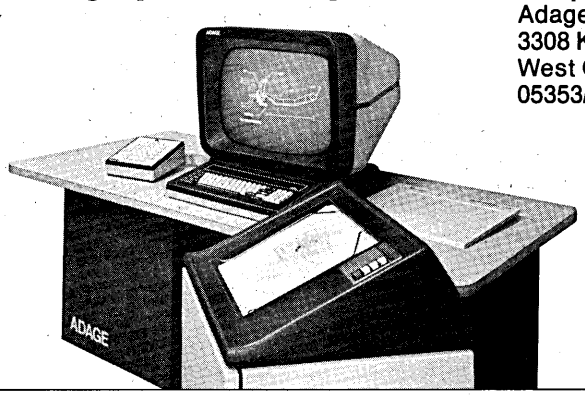
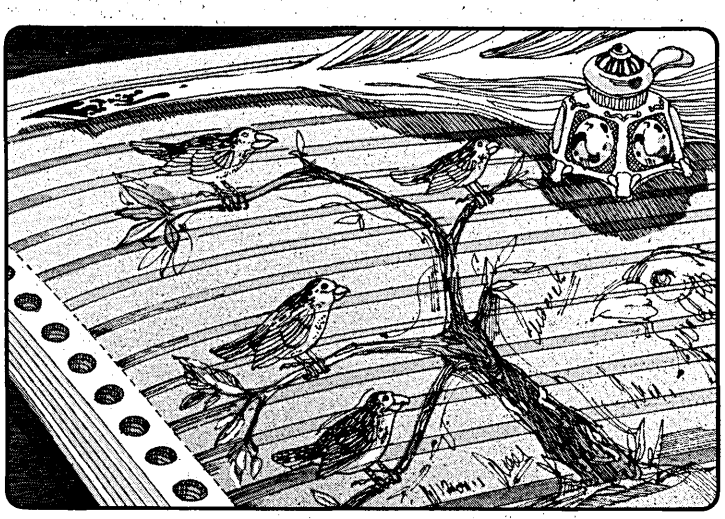


See us at SIGGRAPH '80, Booth 432

CIRCLE 28 ON READER CARD

If Alfred Russel Wallace had used SPSS®, we might never have heard of Darwin.



It took Darwin twenty-three years to sort through and interpret the mountains of data collected on his famed voyage of the Beagle. Only then could he see the patterns which led him to the theory of natural selection.

He was lucky. Another scientist, Alfred Russel Wallace, was simultaneously sorting through data that led him to the same conclusions . . . one year later. Since Darwin published first, history calls the theory "Darwinism," not "Wallaceism."

If Wallace had been able to use the SPSS® Data Analysis Package, he would have been able to explore his mountains of data—quickly, efficiently, *creatively*—with easy to generate tables, graphs and reports, as well as sophisticated statistical analysis. He wouldn't have needed any special training in computer language either, because SPSS talks, listens and reports in the *researcher's* language. He would not have required a statistics and data programming staff either: with its excellent self-teaching manual, he could have done it on his own.

Think that over when you decide which software package *you* need to facilitate data analysis. SPSS is sophisticated in output, yet simple to input. It works in just about any hardware environment. And you needn't hire any data processing people to generate the results. It simply helps your data gatherers do their job, on their own, and lets *you* survive as the fittest.

WHAT SPSS IS:
The world's largest selling data analysis system, it is a research tool sophisticated in data handling and statistical research capabilities. Yet, it is easy to use, obeying simple English language commands. Easy to learn, too: its self-teaching manual is universally recognized as the most comprehensive and easiest to read in the industry.

WHAT SPSS DOES:
SPSS performs over 49 major procedures, including:
• Complete data selection and transformation capabilities • Crosstabulation • Regression • Factor analysis • Discriminant analysis • Analysis of variance • Manova • Time series • Color graphics • All purpose report generator • General-purpose data management functions.

HOW SPSS IS USED:
SPSS' 3000 plus customers use SPSS for such applications as:
• Survey and marketing analysis • Personnel studies • Government report preparation • Mailing list screening to increase response rates • Census data analysis • Peak load forecasting for utilities • Statistical modeling.

For more information call or write:

Roger Sack
SPSS, Inc. Dept. D7
Suite 3300
444 N. Michigan Ave.
Chicago, IL 60611
312-329-2520

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SPSS

DATA ANALYSIS
MADE SIMPLE

SPSS runs on: IBM 360, 370, 4300, OS, DOS, CMS and all IBM compatibles / Burroughs Medium and Large Systems / CDC CYBER & 6000 Series / Data General Eclipse & Nova / DEC Systems 10, 20, VAX, PDP-11 / HARRIS 4, 7 / HEWLETT-PACKARD 3000 / Honeywell 60 / ICL 2900 Series / Perkin-Elmer / Prime 400-750 / Siemens BS 2000 / Univac 70, 90, 1100 / Other SPSS Conversions are available. Contact SPSS, Inc. for more information.

CIRCLE 29 ON READER CARD

NCC: EVERYTHING THE TRAFFIC WILL ALLOW

NCC is more than the world's largest computer conference; it's a gathering place for the movers and shakers in this industry.

LET'S GO ON WITH THE SHOW

For five days in May, Mickey's Magic Kingdom was no more of a fantasyland for kids than the NCC was for computer mavens. More than 80,000 people paraded through the Anaheim Convention Center for what proved to be the biggest National Computer Conference ever. While some expressed doubts about big being beautiful, no one could say there wasn't something for everyone at this show of shows.

The NCC has become more than the world's largest computer confab. It's a gathering place for both business companions and competitors. It's conducive to both the telling and the keeping of confidences. Nowhere else does one hear more "off-the-record" stories, ploys, problems; no where else can on observe more ex parte meetings between unlikely associates and in the corners of every nearby restaurant and hotel lobby—perhaps the places where the real business of NCC is conducted.

There was one marked difference between the 1980 NCC and those of years past. It had a decidedly international flair—noticable in the numbers of foreign firms exhibiting, the numbers of foreign visitors, and even in the topics selected by American speakers for their keynote addresses. Remarking about the large number of foreigners who had visited his company's booth, a spokesman for Harris Corp. commented, "We didn't need interpreters on hand this year, but I can see that becoming a real possibility in the future."

Conference sponsor, the American Federation of Information Processing Societies Inc. (AFIPS), sold booth space to more than 400 companies this year, and even then a sizable waiting list was maintained until the last minute. Next year's show at Chicago's McCormick Place is already sold out. That's one indication of the show's success.

But there are many other indicators. In the end, NCC is show business at its best. It's more apparent every year that, just like the song says, NCC is "everything the traffic will allow." And maybe then some.

PHOTOS BY RONALD A. FRANK

THE VIEW FROM THE TOP

"There is more enthusiasm over the announcement of the Apple III than that of the H series."

That comment by John P. Imlay, chief executive officer of Management Science America, Inc., reflected the theme of talks by five computer industry leaders who addressed plenary sessions at the NCC. They suggested that computer technology, once the exclusive reserve of data processing practitioners, will become as pervasive and almost as accessible as the telephone in the decade of the '80s. (Imlay, of course, was referring to the recently announced business-oriented computer by Apple, a hobbyist supplier, and IBM's supposedly low-priced big computer.)

The U.S. working force, warned Edson de Castro, president of Data General Corp., won't be able to match the productivity gains of overseas industrial nations without the right tools. "These tools are small computers," he said. Data processing has no national boundaries, as evidenced by the efforts of international standards making bodies, said Robert T. Cowan, vice president of C. Itoh Electronics, Inc., in a talk on worldwide computer suppliers and their impact on today's computer markets. Donn B. Tatum, chairman of Walt Disney Productions, told a crowded NCC noon session that computers will have a key role in tomorrow's communities, as he explained his company's recent project, the Experimental Prototype Community of Tomorrow.

But these good things won't be realized if there's a shortage of the highly educated, skilled, and motivated people needed to make them happen. NCC keynoter David Packard, chairman of Hewlett-Packard Co., warned that demographic changes in the next 15 years will reduce the number of persons aged 18 to 24 by 21%, and that the computer industry should do two things about it: increase its financial support to universities and colleges that offer courses in computer technology, and second, stimulate people at the high school level in computer-related science. "Career patterns are often set at an early age," he said.

Imlay, who addressed a crowded luncheon on NCC's opening day, agreed with Packard's admonition, but also felt the enthusiasm already was there, albeit in a stilted fashion. "The campus hero is no longer the football player. The hero is the kid that can key in and crash the computer. And they worship Stanley Rifkin (the computer consultant who used secret Fed Wire codes to transfer $10.2 million from a bank to his personal account)."

Noting that the IBM-Comsat-Aetna Life consortium, Satellite Business Systems, will launch its first satellite late in 1981, Imlay said this event places IBM and AT&T on a competitive collision course, the effect of which will drastically reduce communications costs. The emergence of Exxon in the office automation business will spur technological advances in that arena. Imlay forecast that before the end of the decade, IBM will adopt a banker's role, financing lease purchases for the computer industry like General Motors Acceptance Corp.

DR. GENE AMDAHL GETS PERSONAL: He's pleased to plug the products of his Paderborn compadre, Heinz Nixdorf.

PRODUCT PARADISE

Crowded aisles, swinging shopping bags, and elbows in the ribs. It takes a few minutes to realize this isn't the Christmas rush at Macy's, but the exhibition floor of the world's largest computer conference.

At the convention center, four separate areas housed the displays of seemingly countless mainstream dp vendors, and an oveflow section occupied a basement parking garage at the Disneyland Hotel. Personal computing, apparently a bastard son to the AFIPS organizers, got slightly better treatment—it had exhibit space above ground in a Disneyland Hotel exhibition room. (For next year, AFIPS has promised to allow the personal computing vendors to join in on the main exhibit floor.)

The West Hall held several interesting products, including a tabletop OCR unit from Toshiba. The Japanese company wasn't ready to release pricing information (at least to the press) for its page reader OCR-100, an OCR-A and OCR-B system for word processor data entry.

Also in the back hall, General Electric displayed an 8,000 lpm nonimpact printer. Using magnetic imaging, billed by GE as "the newest approach to high speed nonimpact printing," the TermiNet 8000 uses standard paper and prints with a resolution of 120 points per inch, both horizontal and vertical. But GE said the unit isn't yet a commercial offering. A spokesman guessed that pricing for an off-line, mag tape driven unit would fall in the neighborhood of $70,000.

In the same hall, only a booth away from Digital Equipment, C. Itoh unveiled its DEC VT-100 compatible VIT-100 crt. With a quantity-one price of $1,995, the VIT-100 provides several features over and above those on the VT-100, including additional character attributes, and clear/home and auto repeat keys.

Moving out of the back room and into the crowded pair of exhibit halls in the convention center proper, attendees got a chance to see Harris Corp.'s latest communications system, the multimicroprocessor-based 9200 system that supports bisync and SNA/SDLC communications for up to thirty-two 3270-type terminals. Paradyne Corp. also exhibited 3270-type communications systems with its new PDS 270 terminals, the Response system (a 370 code compatible processor for distributed processing), and Pixnet.

Fujitsu, which recently acquired the word processing activities of DPF, the Con-

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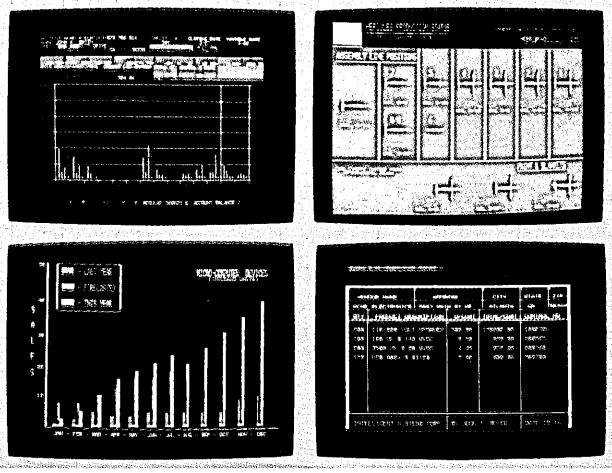

Unretouched photo of screen. *U.S. domestic price.

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necticut computer leasing company, showed its product under the name of Word Machine 1000. Based on intelligent terminals that accept word processing code down-line loaded from an IBM host, the system's most significant feature, according to some word processing mavens, is its host-resident software for filing, indexing, retrieving, and archiving documents. Fujitsu's newly formed Word Machine Company will be selling the system for $8,500 per terminal (minimum of 10 terminals).

Fujitsu also showed an 80cps letter-quality impact printer with interchangeable type elements. Called the CP-811, the unit's type element is neither a thimble nor a daisywheel, but a rotating drum about two inches in diameter and an inch tall.

Over at the Disneyland, Apple Computer bought booth space in the overflow area. With the introduction of the Apple III, and the flashy Apple II, the company's booth seemed to draw the most attention of any located in the subterranean exhibit hall.

While Apple held court downstairs, Hewlett-Packard, a longtime stay-away from the mad crush of NCC, opened shop upstairs to show its Model 85 personal/professional computer.

Atari, too, held space in the personal computing exhibition, while Commodore covered all bases with space in both the lower overflow area and in the upstairs personal computing area.

Also at the personal computing exhibition, Personal Micro Computers Inc. showed a personal computer plug-compatible with Radio Shack's TRS-80. As with mainframe pcms, the company has priced its offering at less than the original, with a Level II look-alike coming in about $200 less than comparable equipment from Radio Shack. The firm also showed a high-speed cassette tape interface that loads TRS-80 tapes at roughly 8,000bps, as opposed to the 500bps speed commonly encountered.

Another personal computing exhibitor that seemed to attract a fair amount of attention was Exidy. One corner of its booth featured demonstrations of Rosetta Smalltalk. Although not yet a commercial product, Rosetta Smalltalk drew the attention of quite a crowd, including at least a quick glance from a staffer from the Xerox Palo Alto Research Center, the developers of Smalltalk. At this point it is appropriate to stress that Rosetta Smalltalk has only a passing, conceptual relationship to the mostly unpublicized Xerox PARC language.

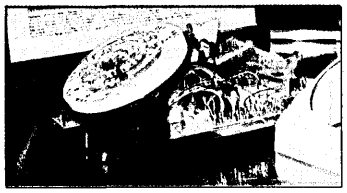
HEARD ON THE FLOOR

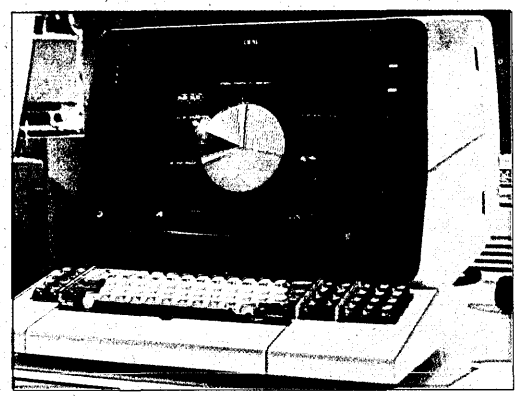
A "technological Tupperware party"—that's how one more-seasoned showgoer summed up this year's NCC. And much like a Tupperware gathering, there was gossip galore on an exhibit floor filled with gimmicks, gear, and gadgetry. The following is a potpourri of some of the more interesting sights and sounds overseen and overheard by our roving reporters at the show.

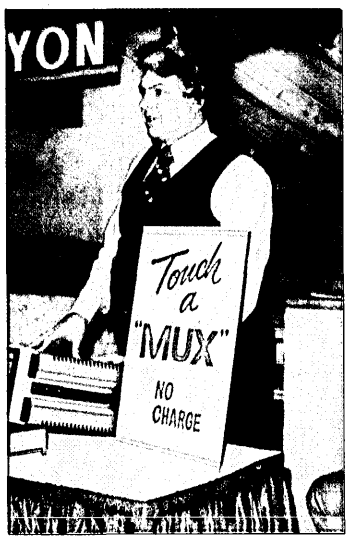
SPOTTED: Dr. Gene Amdahl, making a quick and surreptitious tour of the exhibits, lingering at the Nixdorf booth, where he played with the company's personal computer and was treated to a technological tutorial on the product by an unsuspecting sales rep. No sour grapes here; Amdahl had just been named Commandere Bontemps de Graves et des Médoc, the premiere wine tasting society of Bordeaux . . . Who was that masked man destined for Disneyland on a DC 10 flight out of Dulles airport? None other than Univac's Dr. Carl Hammer, who donned a black mask to catch a few winks to prep for the weary week ahead . . . The ever-effervescent Sherri Moreau, who does her shtick for Racal-Milgo, again convincing everyone that "there's no business like show business" . . . Fun Bus driver Roger Hines, who won Best Personality plaudits from the NCCers he shuttled back and forth between the Disneyland Hotel and the convention center. A former truck driver, Hines crammed his bus to SRO capacity, entertaining frazzled showgoers with one-liners like: "Enjoying your expense accounts?"

EYE-OPENING PRODUCTS: Tandberg Data's TDV 2200 series of ergonomically designed terminals, which created a stir in Europe when they were debuted by the Norwegian company at the recent Hannover Fair. Introduced to the U.S. market for the first time at the NCC, the display terminals include all the crucial human engineering design factors that are so big these days in Europe . . . The latest models of the famed Los Angeles Rams cheerleaders trotted out as attention-getters for Univac. The scantily clad squad earned the company the dubious distinction of having the gauchest exhibit at the show. Potential buyers, puzzled and put off by the display, were heard to remark: "So this is how Univac sells its products to professionals?" Another pointed comment: "That's why Univac will never be an IBM of the industry."

SHOW SCUTTLEBUTT: Will the NCC become a two-timer show? Some vendors, who favor a return to the spring and fall joint conference format, dropped this hint regularly during the show . . . As usual, virtually all the vendors were pleased with the turnout, claiming to have turned up solid prospects . . . More reserved in their praise were a few foreign firms, some of which felt the show had grown too large and too expensive for their liking. One disgruntled rep from a major overseas peddler complained of the difficulty in getting an NCC niche. "It's a seemingly subtle attempt," he charged, "to cut us out of the American-market."







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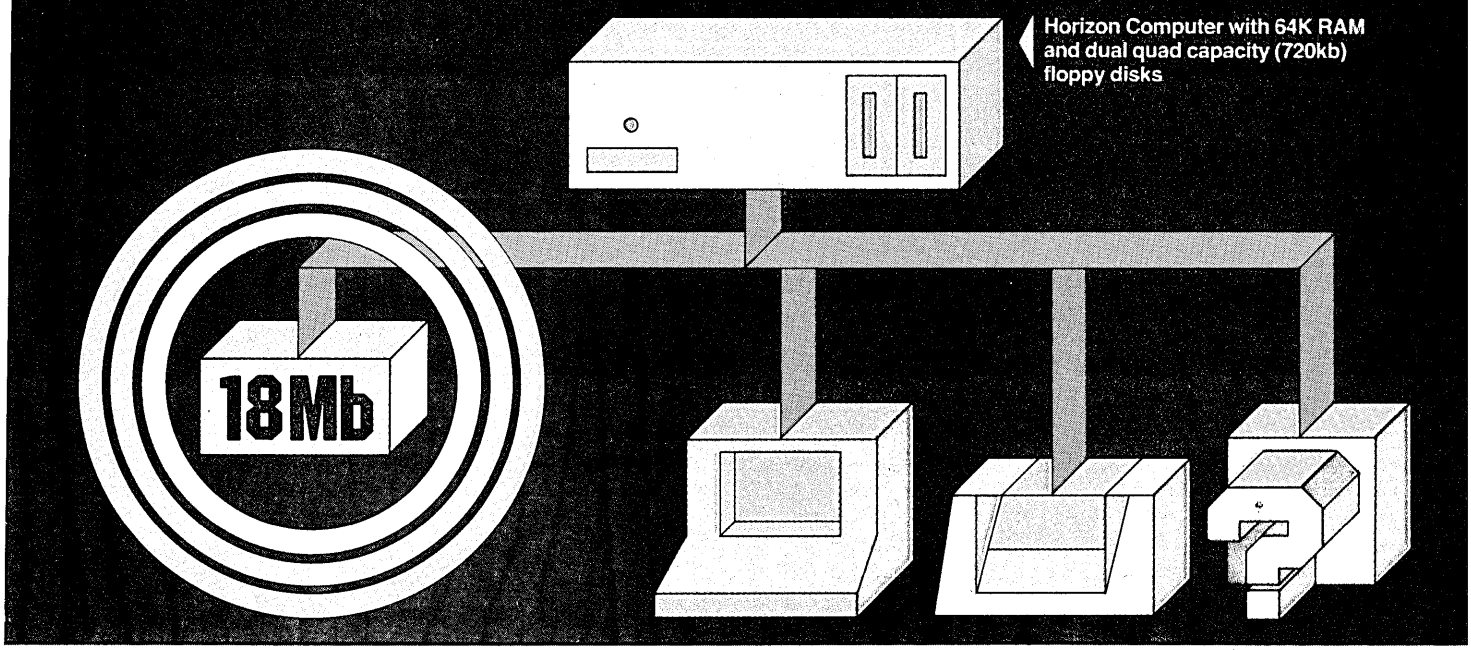

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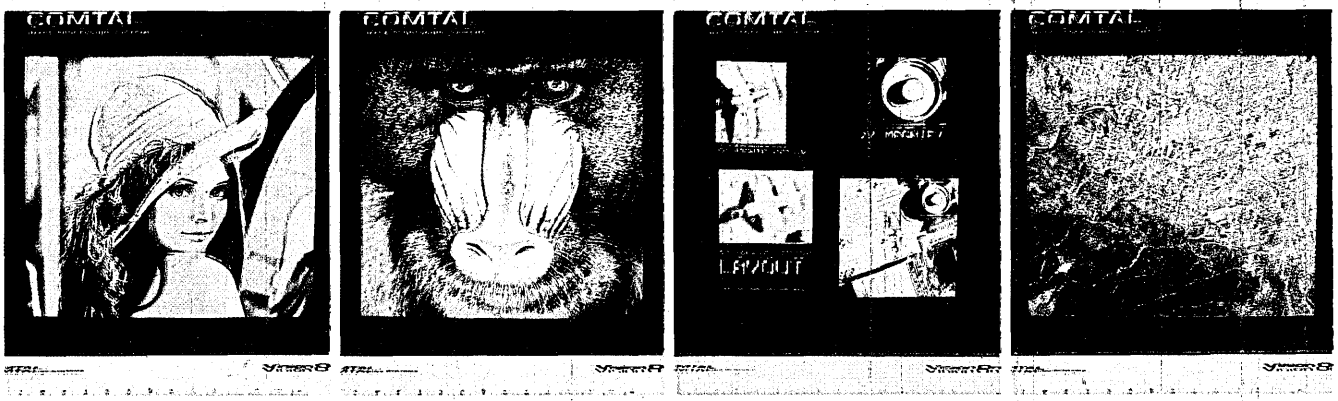

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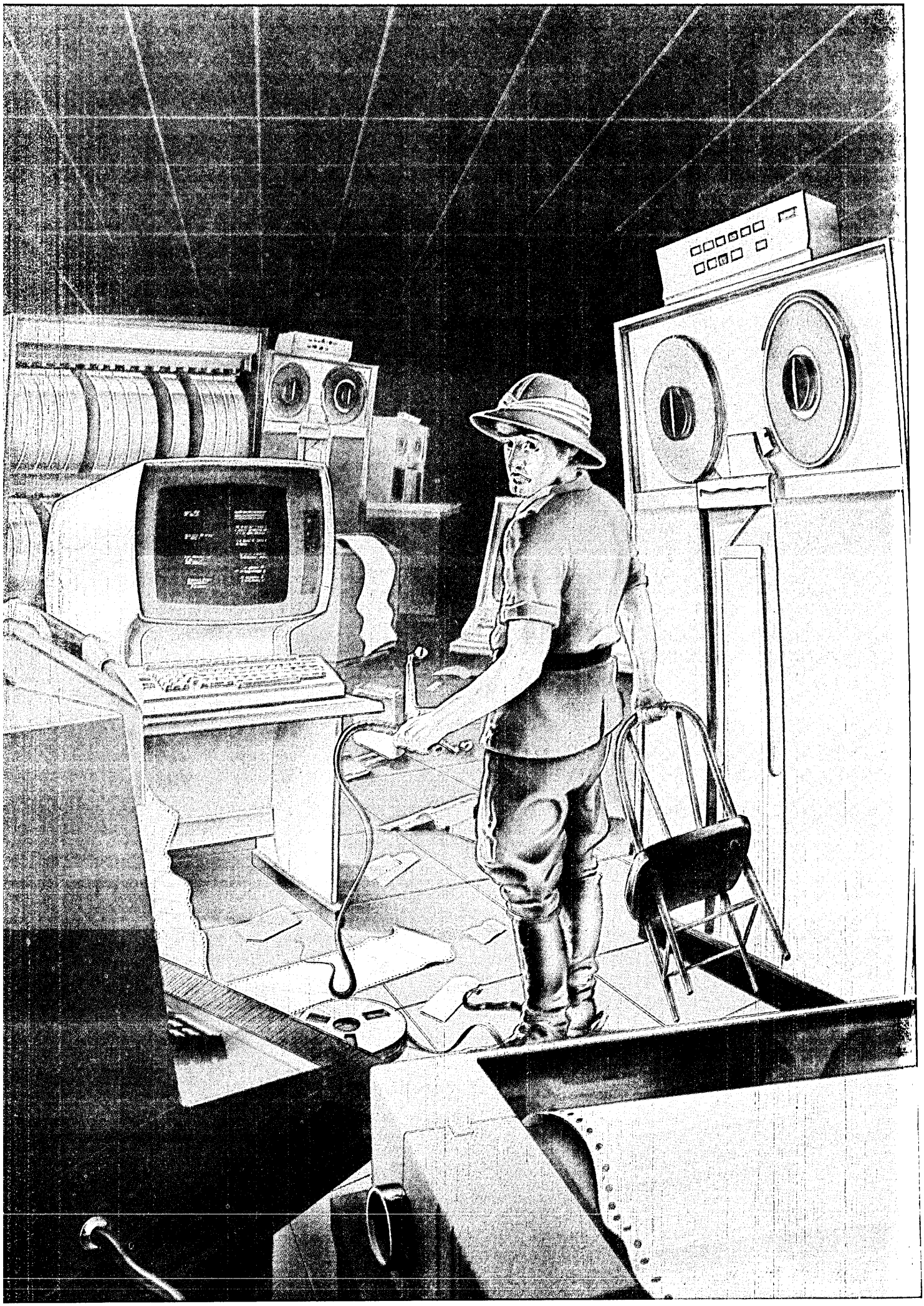

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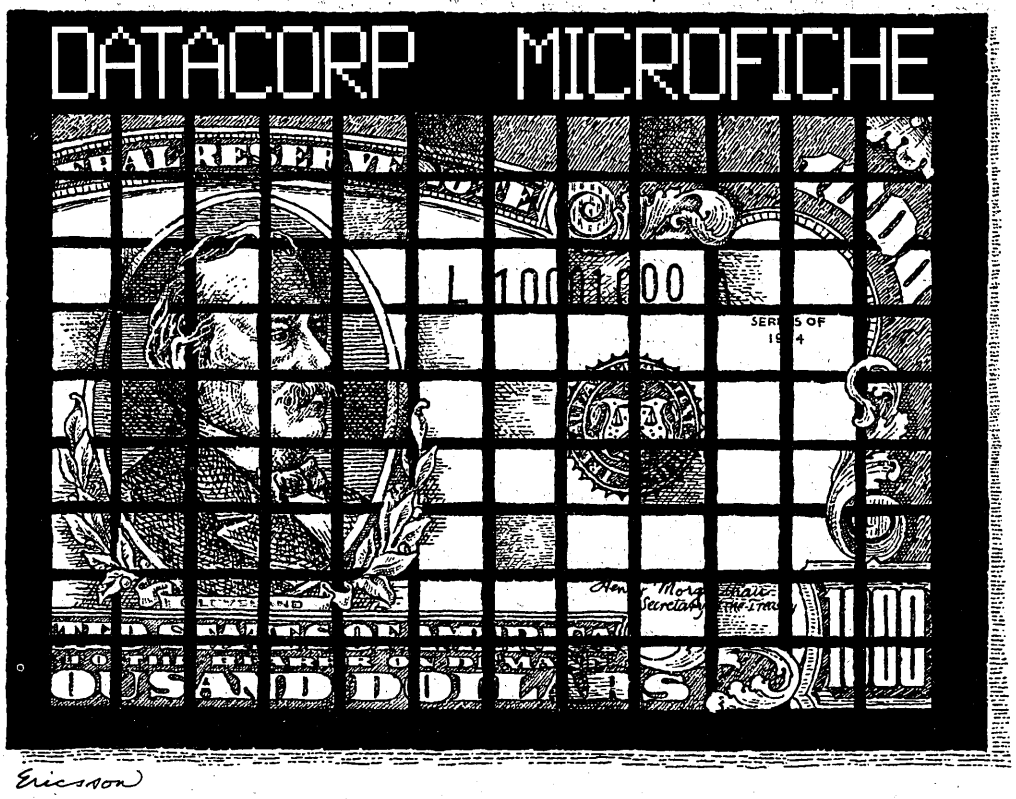

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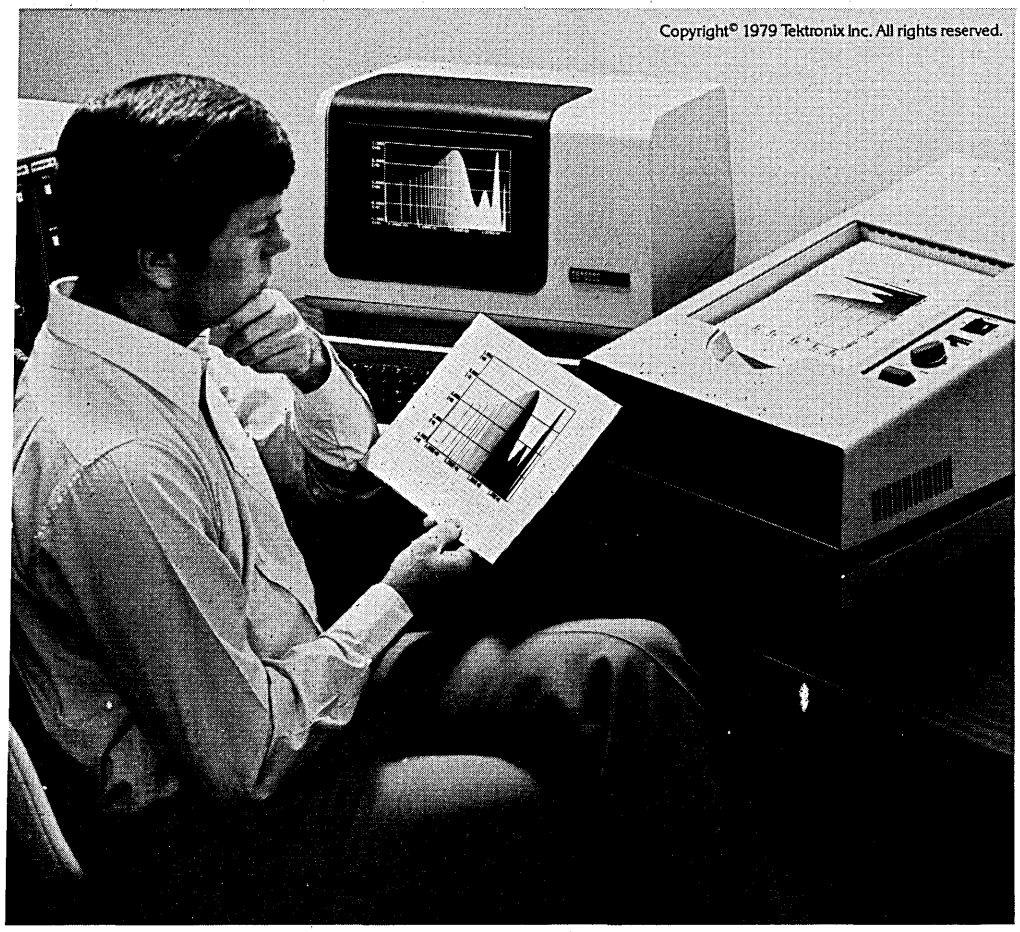

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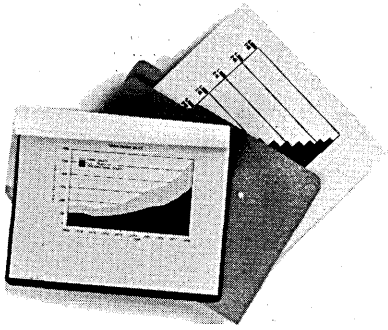
RS170 interface makes the 4632 a natural companion to most video systems. Users of video terminals and systems like the DEC MINC system shown here, are taking advantage of the 4632's high resolution hard copies, available at the push of a button. Our dry process means no liquid toner mess, no wasted copies. Operation is quiet and thoroughly dependable.



For years, Tektronix has been a leader in the fiber optic technology that provides fast, finely detailed raster scan reproductions. Find out what the 4632 can do for your system. Call your local Tektronix representative or our toll-free, automatic answering service at 1-800-547-1512. In Oregon, call 644-9051 collect.

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CIRCLE 45 ON READER CARD

SCIENCE/SCOPE

Ultra high-speed satellite communications are closer to reality with the development of unique pseudo-random code generators. The hybrid circuits, which operate at more than 1 billion bits per second, were built with gallium-arsenide field-effect logic. They demonstrate that the problems of making such chips -- problems including layout, construction, die and wirebonding, and chip handling -- can be solved. Researchers at Hughes will use the chips as signal sources for gigabit logic experiments.

The unique method for ejecting Leasat satellites from the cargo bay of NASA's Space Shuttle -- a process that has been likened to flipping a flying disk -- has been proven in simulation tests. In a test designed to imitate the zero gravity of space, small explosive charges were fired to release a mock spacecraft weighing 15,000 pounds and measuring 14 feet in diameter. The simulated craft, hung from a 70-foot cable attached to a low-friction trolley, cleared its cradle and the bay as expected. Hughes is building five Leasat satellites to fill the communications needs of the U.S. Navy and other armed services. The spacecraft are to be launched aboard the Space Shuttle into low orbit, then released and boosted into synchronous orbit 22,300 miles above the earth.

Designers of computer software systems can expect help from other computers in the near future. A computer aid being developed by Hughes serves as draftsman, librarian, and report writer of a design session. The system, appropriately called AIDES (for Automated Interactive Design and Evaluation System), converses with the designer in near English and draws charts on TV-like terminals and plotters. It also analyzes designs for soundness and testability. AIDES reduces the labor intensity associated with software design, while improving consistency and overall quality. Studies indicate the system trims design time by 30 percent and slashes costs for structure chart documentation by 95 percent.

Hughes is seeking engineers to develop advanced systems and components for such weather and communications satellites as GOES D, E, and F, Anik C, GMS II, Leasat, SBS, Westar IV, and Palapa B. Immediate openings exist in advanced communications, scientific and engineering programming, systems test and evaluation, microwave and RF design, power system design, spacecraft alignment, thermal and vibration test, and reliability and quality assurance. Please send your resume to Tom W. Royston, Dept. SE, Hughes Space & Communications Group, P.O. Box 92919, Los Angeles, CA 90009. Equal opportunity M/F/HC.

Better ways to help pilots visualize the performance characteristics of their weapons, particularly during the stress of combat, should reduce the chance of missiles being fired in such instances as when the aircraft is in the wrong attitude or the target too far away. Hughes, under U.S. Air Force sponsorship, is evaluating new display techniques and algorithms (data processing formulas) for fire control systems. After these concepts have been analyzed in ground simulations, the best will be demonstrated in flight tests in an F-15 fighter.

LOOK AHEAD

(Continued from page 16)
announcement, was further along. (Intel, incidentally, has canceled its little-known PCM development project in Phoenix.)

WHAT'S AHEAD FOR IBM

Yankee Group of Boston predicts IBM will announce quantity discounts on the 8100 by year-end. IBM will also offer an X.25 interface this year, said the research group, probably supported on the 8100.

On the other coast, Strategic Business Services in San Jose predicts IBM will provide MVS on the 4300 processors later this year, simultaneously unveiling Central Site Support for MVS. An SBS study also says IBM will offer Fixed Block Architecture on the new 3380 and 3375 disk drives.

IF, WHEN, AND HOW MUCH

Leasing companies are awaiting the expected 303X price cuts this fall even more eagerly than most users. If IBM lowers purchase price but not rental in another attempt to generate cash, it will likely open a window for the battered third-party leasing industry. IBM decision is expected between September and November, but one or two large leasing firms may collapse before then.

AGILE EXTENSION

Agile Corp. is extending its daisywheel terminal offerings into the IBM SNA world with the introduction of a 3287 replacement. Supporting only SNA/SDLC communications (to the exclusion of bisync), Agile's Type A terminal adaptor connects to the controller (3274 or 3276) via co-ax cable. Three terminal interfaces are provided -- RS232, Diablo, and Centronics. Initially the RS232 interface will be used to drive the terminal; directly driving a HyType II through the Diablo interface is next on the agenda. Using the EBCDIC Special Character Set (SCS) provides access to the terminal's form control features. Initial deliveries are slated for September.

SLOW STORE IN THE SKY

A Seattle-based specialty store chain, Nordstroms, has set up a point-of-sale network -- via satellite -- for its stores in Alaska. Based on NCR POS terminals and eight satellite controlled channels, the system has a "response time problem," but it works.

RUMORS AND RAW RANDOM DATA

California buzz: Exxon could/would/will buy both Amdahl and Storage Tech...and Xerox wants Apple Computer. Wang is contacting vendors of voice recognition technology.

NEWS IN PERSPECTIVE

SERVICES

BUCKING THE SYSTEM

The computer services industry expects not only to survive the recession, but to thrive in it.

In some respects, the U.S. computer services industry looks like a horse of a different color.

While most companies are currently thrashing around for ways to be recession resilient, some 60% of participants in the computer services industry claim the recession will have a positive impact on their business.

While most companies complain that the severe shortage of skilled dp personnel is a major growth inhibitor, computer services firms often find that the overall people pinch is a boon to their business.

And while merger and acquisition activity in all industries has taken a drastic dive in the last decade, such activity in the computer services industry is on a steep upramp.

So, one man's pleasure is another man's pain. For now, the computer services industry appears to be one of the few that's experiencing pleasures.

At last month's financial analysts meeting in New York, the Association of Data Processing Service Organizations Inc. (ADAPSO) and Input Inc. presented their annual compendium of statistics and analyses on the state of the computer services industry. The picture they painted was one of health and prosperity.

Based on the analysis prepared by Input, as presented by president Peter Cunningham, the computer services industry once again grew faster than the computer industry as a whole, jumping 22% in revenues between 1978 and 1979. The survey showed that the traditional computer services industry, including software products, processing services, and professional services firms, had total gross revenues of $9.52 billion last year, a larger than expected boost over 1978's $7.5 billion total.

Profitability, however, was not as high as had been hoped for. While pretax profit margins in '78 were 9.7%, '79 margins were down to 9.1%, as a pattern of flat to mild declines in margins was evident in all major subcategories of the industry. On the whole, the industry earned $865 million in gross profits last year.

In preparing the annual survey, Input excludes the services revenues of hardware manufacturers who offer services and software solely to support the use of the hardware they manufacture. It also excludes the many small companies considered "cottage industry" vendors. For last year, Input identified 4,300 services companies employing some 232,000 people. While the '78 survey did not attempt to quantify the work force, it's believed it numbered no more than 188,000, meaning the computer services industry filled about 44,000 new jobs in one year's time.

Looking to the future, Input expects the industry to enjoy a healthy 19% per year growth rate for the next five years, leading to a 1984 revenue forecast of nearly $23 billion. And by 1985, Input foresees the industry representing a $30 billion business.

Regarding 1980 performance, inflation is eyed as the number one negative factor. As was pointed out by Richard Crandall, president of Comshare Inc. and the ADAPSO member asked to analyze the Input survey data, "Clearly one of the main challenges of the 1980s is to seek productivity gains from areas other than pure hardware cost/performance."

Crandall noted that one productivity measure is in revenue per employee. And for the computer services industry, the present picture is not terribly positive. Looking at revenue and employment figures for services firms with greater than $10 million in sales, revenue per employee was $42,400 in '78; for '79 that number was $41,800, a 1.4% decline.

To improve productivity gains in this industry, Crandall suggested three avenues: automate data entry and turn these functions over the end user; fully employ telecommunications as well as distributed processing for automating data delivery; and standardize product offerings to reap greater return from software development costs.

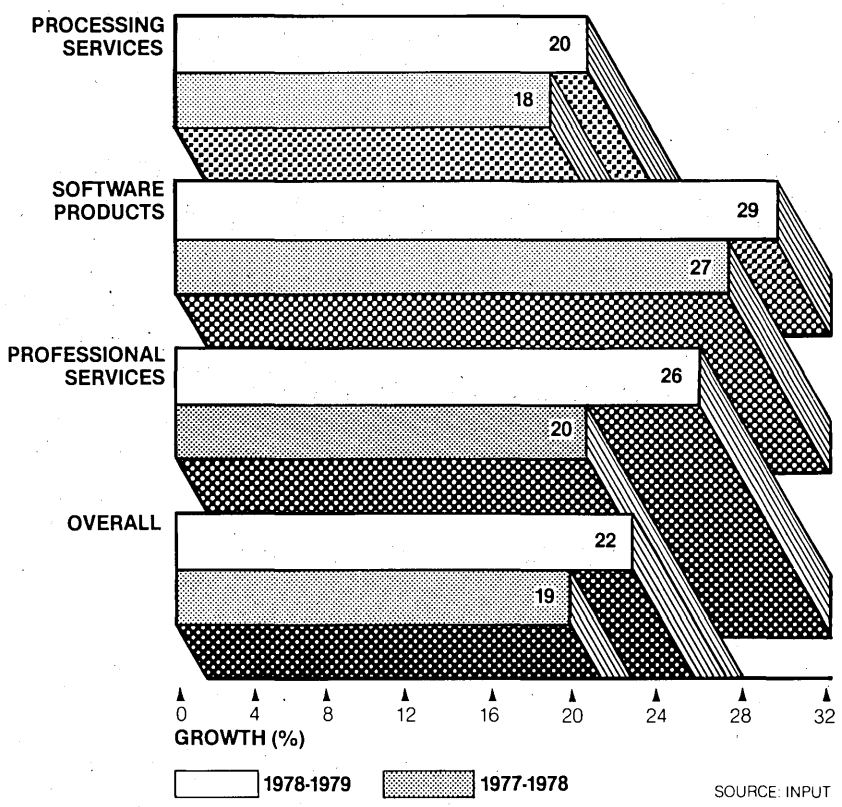
By 1985, Input expects the services industry to represent a $30 billion business.

Conceding that it's easier said than done, Crandall added, "This will not have been the first time the computer services industry will have contributed to national productivity—but this time we're operating off a nearly $10 billion revenue base and the opportunity exists to be one of the leading forces contributing to national economic recovery."

In addition to inflation, Input cited three other factors that could have a negative impact on 1980 peformance—IBM's possible reentry into processing services, the recession, and the lack of skilled people. The latter two, however, are paradoxical.

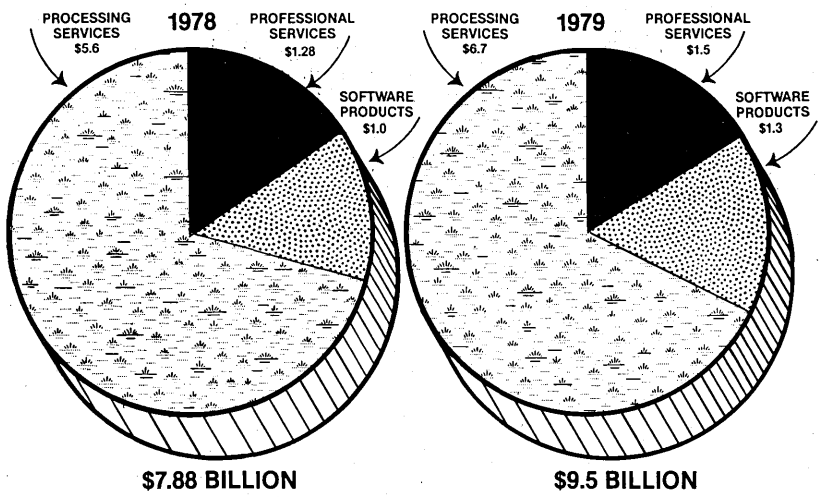
"It isn't often you ask an industry what will be the impact of a recession on its business and find 60% saying it will be positive," remarked Cunningham. As is often true during an economic downturn, many

1979 COMPUTER SERVICES INDUSTRY PERFORMANCE



COMPUTER SERVICES INDUSTRY PERFORMANCE BY TYPE OF COMPANY

REVENUES ($ BILLIONS)



companies clamor for additional dp power to help streamline their costs and operations. And they often find that's the time to seek out services companies for that assist. Corporate belt tightening on capital expenditures often goes hand in hand with a loosening of the purse strings for professional and processing services from the outside.

"The last chapter isn't written yet on the impact of the recession," Comshare's Crandall commented. "Some companies will experience bigger declines and others bigger growth spurts due to the recession. But the performance impact won't be felt in '80 anyway; it will be at least 1981 before we know what the recesson really means to us."

The people shortage in the industry actually creates business for the professional services companies.

As for the shortage of skilled dp personnel, that too has its pros and cons for services companies. According to Input's Cunningham, the people shortage in the industry actually creates business for the professional services companies. "As was true during the people crunch of the '60s, we're once again seeing people leaving companies only to turn around and sell themselves back to those very same companies as consultants. Their experience is too valuable for the companies not to hire them back, even at higher rates."

And what few people there are, claims Input's Cunningham, get gobbled up by the computer services industry. "If you're a programmer weighing employment at two firms, one a services firm that specializes in what it is you do best and the other a conglomerate whose dp activity is incidental to the main line of business, you'll choose the former where your skills will be readily recognized and rewarded rather than the latter where you may be but a small cog in a big machine." With in-house dp organizations suffering more than the services companies when it comes to attracting and retaining qualified dp people, Crandall claims, the services companies gain an even greater edge.

Another fascinating factor about the computer services industry is the sudden high degree of acquisition and merger activity. Analyzing a study of this activity by Broadview Associates, a financial consulting firm, partner Bernard Goldstein noted that the dp services industry represented 10% of the total merger activity in the U.S. last year.

Broadview tracked and identified 107 mergers and acquisitions valued at a total of $671 million in the industry during 1979. The 10 largest transactions accounted for $487 million, 73% of the dollar volume paid although they represented but 9% of

the number of transactions.

In contrast, the merger and acquisition activity across all industries hit an all-time high in 1969 with 6,107 transactions valued at a total of $23.7 billion. But by last year, that volume had dropped by one-third. Yet, in the five-year period from 1975, the number of acquisitions of computer services companies has shown 168% increase, making it currently the leading acquisition-prone industry.

As a result of the pace of this activity, ADAPSO has contracted with Broadview to provide a semiannual index of such activity in the computer services industry, one which will summarize and report on acquisition trends and changes.

At least for now, there's a great deal of interest in and optimism from the computer services industry. But then, this group is known for its optimistic outlooks. "You know, I listen to their forecasts every year and then I go back and do my own leveling of their optimism," remarked Harry Edelson, computer analyst for Drexel Burnham Lambert. "But this year, my gut feeling is that they're right on the money."

—Becky Barna

THE PCMS

MAGNUSON TO GO PUBLIC

For a latecomer to the PCM ranks, Magnuson appears to be holding its own.

Despite anything that detractors might say, another IBM software-compatible mainframe supplier has turned the corner and operated profitably for two consecutive quarters. And to make doubters into believers, Magnuson Computer Systems Inc. is about to go public. All this occurs after a disastrous year for the PCMs and for IBM, following the latter's introduction of its 4300 series computers.

"You know, our product was designed to compete against the 4300s, not the 370s," says Magnuson president Joseph L. Hitt in explaining why the long-awaited announcement of the E Series machines had some positive effects on the young company. It put Itel Corp. out of the PCM business, had a traumatic effect on Amdahl Corp., and even affected the earnings of IBM. But in 1979, says Hitt, "we sold everything we could make."

Computers don't exactly roll off a fast-moving assembly line in San Jose, Calif., at Magnuson, which was profitable in the final quarter of '79 and the first quarter of '80. Because the company has filed with the Securities and Exchange Commission to become a public corporation, it is restricted for the time being in the things it can say publicly. But through the end of March '80 the company had shipped 72 systems to 39 different customers; the number of systems will probably exceed 100 by the time this issue appears on the newsstands. And that's not bad for a latecomer to the PCM ranks doing battle in the trenches with IBM.

In that position, as a PCM that must be able to respond quickly to the maneuverings of IBM in the marketplace, Magnuson will have to prove itself to the legion of critics who will have you believe it can't be done. But Magnuson has already successfully run a model 32 under DOS/VSE in the native mode with 3370 and 3330 disk drives and the 3880 controller.

"Running the M80/32 in DOS/VSE mode improved total processor utilization in a batch workload by an average of 8.1% over running DOS/VSE in 370 mode," says Carl Amdahl, Magnuson's executive vp for technology. "Some job streams showed up to 13% improvement on both systems."

The company will also have to prove its ability to survive through a recession, which will be upon us one of these days. It is preparing to do so not by tightening its belt but by moving into an enlarged manufacturing facility, part of a $6 million expansion program involving three adjacent buildings.

Magnuson last month announced a new computer that it claims has 20% more power that the IBM 4331 Model Group 2 at a 20% lower price. The so-called M80/31, which can accommodate up to 8 megabytes of main memory, is the sixth computer to be introduced by the three-year-old company. Its first two machines, announced May 1978, were the M80/3 and 4, designed to compete with the 370/138 and 148 in the pre-4300 days. In March of '79, post-4300, it announced the model 32, which falls between the 4331 and the 4341, and the models 42 and 43, both a bit more powerful than the 4341.

JOSEPH L. HITT: "In 1979, we sold everything we could make."

But a look at the prices of the six machines that now make up the product line shows that the first two processors have been obsoleted by the IBM 4300s' new price/performance curve. With the models 3 and 4 removed from the picture, the two remaining mainframes at the lower end clearly become alternatives to the new 4331-2, while the models 42 and 43 can do battle with the larger 4341. And one can presume that there's a model 44 or 45 on the drawing board, awaiting IBM's announcement of a 4341 Model Group 2.

Magnuson claims its new computer has 20% more power than the IBM 4331 Model Group 2 at a 20% lower price.

But this is mere speculation, for the company is in registration and must remain mum. A preliminary prospectus prepared in conjunction with the filing, however, shows the company had losses of $6.8 million during its first three years of operation,

MAGNUSON'S MACHINES

	M80/3	M80/4	M80/31	M80/32	M80/42	M80/43
Power (MIPS)	.30	.54	.43	.54	.90	1.10
Power (Comparison)	1.5 × 138	1.3 × 148	1.2 × 4331-2	1.5 × 4331	1.10 × 4341	1.30 × 4341
Memory (Min-Max), MB	1-8	2-8	1-8	1-8	2-16	2-16
Price per Megabyte	$30K	$30K	$15.7K	$15.7K	$15.7K	$15.7K
Number Channels (Min-Max)	3-6	5-6	3-6	3-6	3-16	3-16
Price/ Configuration	$180K 1 MB 3 channels	$295K 2 MB 5 channels	$135K 1 MB 3 channels	$185K 1 MB 3 channels	$210K 2 MB 3 channels	$270K 2 MB 3 channels

became profitable in August '79, and has been profitable since that time. Last year, its first full year of product shipments, the company had revenues of almost $10.7 million, and in the first quarter of this year had sales of $5.6 million.

The company, like Amdahl Corp., provides the ability to field-upgrade its machines. In fact, the 3370/3880 benchmark tests were performed on a model 32 upgraded at a customer site from a model 4. The upgrade reportedly was accomplished in two hours. But as a result of this upgradability, customers will tend to acquire a smaller machine initially, and that affects revenues. According to Hitt, 60% of the company's shipments are leased, 40% purchased.

—Edward K. Yasaki

JOINT VENTURES

SYNERGY SPARKS SOLUTION

The Intel/Xerox/DEC networking plan required a lot of time for developing "joint specs on which we all could agree."

"I guess it can best be termed a collaboration," said David Liddle, vice president—systems development at the Office Products Div. of Xerox Corp., of his company's project with Intel Corp. and Digital Equipment Corp.

The three companies are developing specifications for a local area communications network which they expect to publish in the third quarter of this year.

Roots of the project are in Xerox' Ethernet system announced last December. Ethernet operates on a wideband coaxial cable which is essentially a pipeline with store and forward facilities that allows non-homogeneous devices to communicate.

Experimental Ethernet networks of several hundred stations have been used over a period of five years in several Xerox sites. Currently there are 1,200 work stations at seven sites on 45 Ethernets, Liddle said. There are some 10 to 15 workstations tied to Ethernets outside Xerox.

Although Ethernet was only announced last December, its concepts have been covered in technical publications and widely discussed for several years. Liddle said many vendors had questioned him as to how they could use the techniques long before the announcement.

He said DEC and Intel had independently queried him in the spring of '79. DEC's interest was in tying the Ethernet concepts to its own DECnet working architecture and Intel's in tying in microprocessors. "I realized they represented opposite ends of a big spectrum, that we could not only go all the way down to micros. Also they both represented the biggest volumes in their fields, and when volumes get big, components get cheap," said Liddle.

Armed with the idea for the "collaboration," Liddle first had to seek approval of his own top management. "I thought I'd have to work at selling the concept. I was amazed at how readily they went along and told me to go ahead," he recalled.

It was equally easy to win over DEC and Intel. "All three firms had been working like hell on local area networking for some time," Liddle said. And all three agreed that proprietary networks tend to lock out users who want to select the equipment they prefer. They hope to specify a network that can be used by virtually anybody and with any kind of equipment.

The network will have no switching logic and no control by a central computer. "DEC is thinking the transceiver part, working toward very low cost," said Liddle. Intel is providing expertise in microprocessors for communications functions and is

expected to produce controller hardware that could be marketed to other manufacturers wanting to make their existing equipment Ethernet-compatible.

"We all three have a general and a special role," said Liddle. The three companies held numerous meetings for more than a year before the announcement, which came when it did (just prior to the NCC) "because we felt we were sufficiently close to publishing the specs. Only a few things still need testing, a few things we propose that we think will work," said Liddle. Testing is done on installed Ethernet networks.

"All three firms had been working like hell on local area networking for some time."

"We moved the meetings around but most were held in California, with the largest share at Xerox Systems Development in Palo Alto." Meetings also were held at Intel's Santa Clara headquarters and at DEC's facility in Tewksbury, Mass.

Liddle said there regularly were "12 or so" people in each company working on the project, different people who were in and out. "All in all, it [the project] touched close to 40 people in each company."

He said they were working to get away from "technical Darwinism. Our approach is unlike that of the dp witch doctor who has a morbid fear of plug compatibility. Xerox makes a lot of peripherals. We feel we can thrive on the merits of a particular piece of iron and not on locking others out."

He said the three companies spent a lot of time "worrying about things mundane, about straight engineering. We wanted joint specs on which we all could agree."

Ethernet was modified as a result of the sessions. "We discussed how big addresses should be. Originally Xerox' Ethernet had an 8-bit address. We discussed 16 or 32 bits and larger, enough so users could make up unique ones." In the specified network, each system element has a unique 48-bit address.

The specs will call for a 10 megabytes/second bandwidth. Ethernet featured three megabytes/second three years ago. Intel will be working on developing a microprocessor to handle the higher data transfer speed.

Liddle said another reason for the timing of the announcement was the fact that "people already were talking about it. We got a lot of questions even before the announcement about what we have to license." He said, "The specs we're going to publish will be sufficient for anybody to implement and use Ethernet technology. Licenses will be very reasonable. We don't want to put up a huge barrier."

The three firms have invited cooperation from any standards organizations having an interest in adopting the specifications.

DEC's transceiver equipment and Intel's controllers will be marketed to other manufacturers interested in making existing equipment Ethernet-compatible. Manufacturers who want to build Ethernet-compatible equipment themselves will be able to do this by getting a license from Xerox.

Liddle sees the specs leading to a "whole new kind of business" among people who will help other people to take existing equipment to Ethernet.

The specified network consists of a coaxial cable, made up of one or more segments, each of which can be up to 500 meters in length, and a communications transceiver for each device attached. Each of these devices contains a control element for its own transceiver.

The network will connect system elements within a building or in a complex of closely grouped buildings. Other transceivers with associated processors could be implemented as gateways, to connect multiple networks to each other and to outside communications facilities for long distance transmission.

Information is transferred in packets which include the data to be sent, the address of the unit that will receive it, and the address of the unit sending it. Each transceiver monitors the cable before transmission to be sure it is clear and during transmission to detect interference. If there is interference from a transmission by another element, the packet is sent again when the cable is clear.

"Our approach is unlike that of the dp witch doctor who has a morbid fear of plug compatibility."

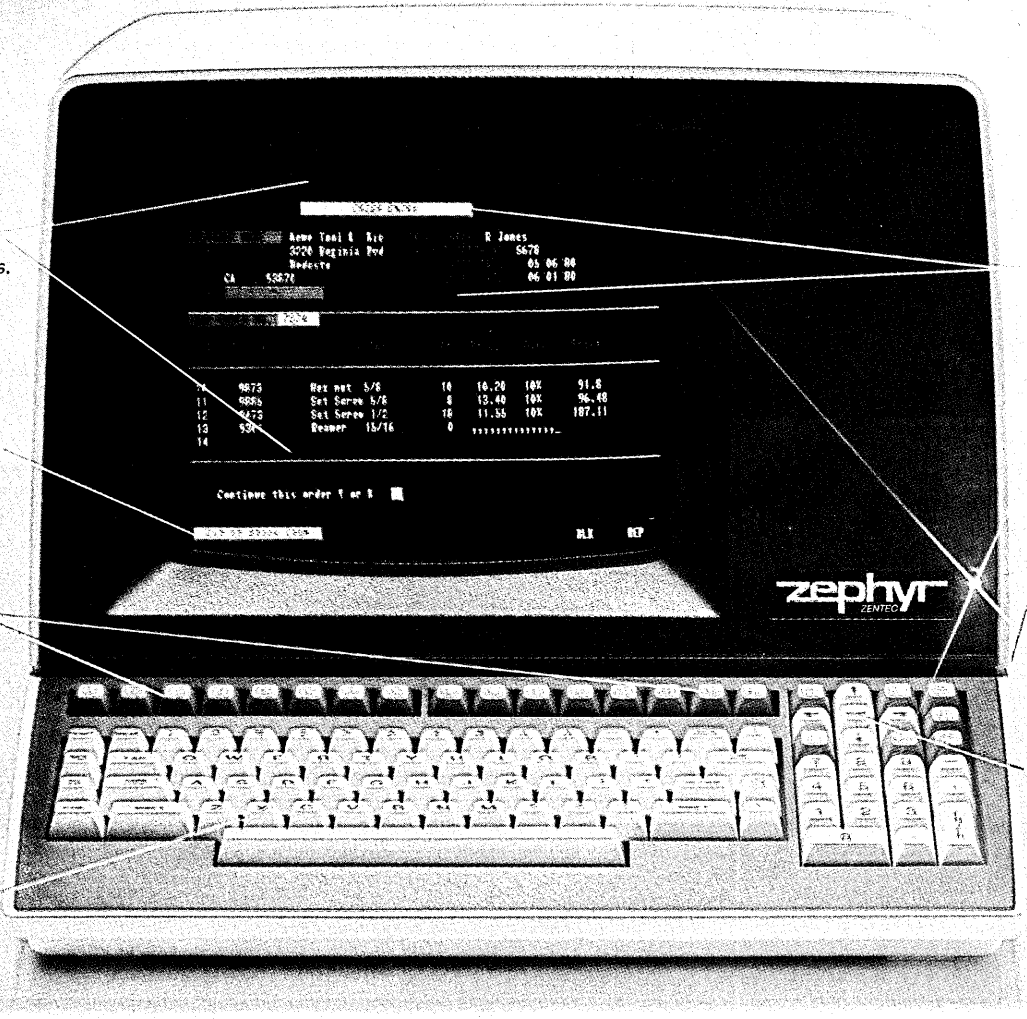
To receive data, each element recognizes its own address, accepting messages with that address and ignoring the others. At appropriate intervals, the receiving station sends a message of acknowledgement to the sending station.

Each local network itself has a unique address. Once a packet has passed from one network to another, it is identical to one sent locally and is handled in the same way. The 48-bit address field will permit the flexible assignment of addresses and the operation of equipment of different manufacturers on the same network without the possibility of address duplication.

Liddle said the response after the announcement was overwhelming. "We had a large number of calls from big users, sophisticated users, those with office of the future committees." As for the calls from vendors, he found it interesting that "Intel got the calls from business machine companies, the mini people called Xerox, and the semiconductor firms called DEC or me."

—Edith Myers

FINALLY, A SMART TERMINAL THAT DOESN'T SACRIFICE FORM FOR FUNCTION.



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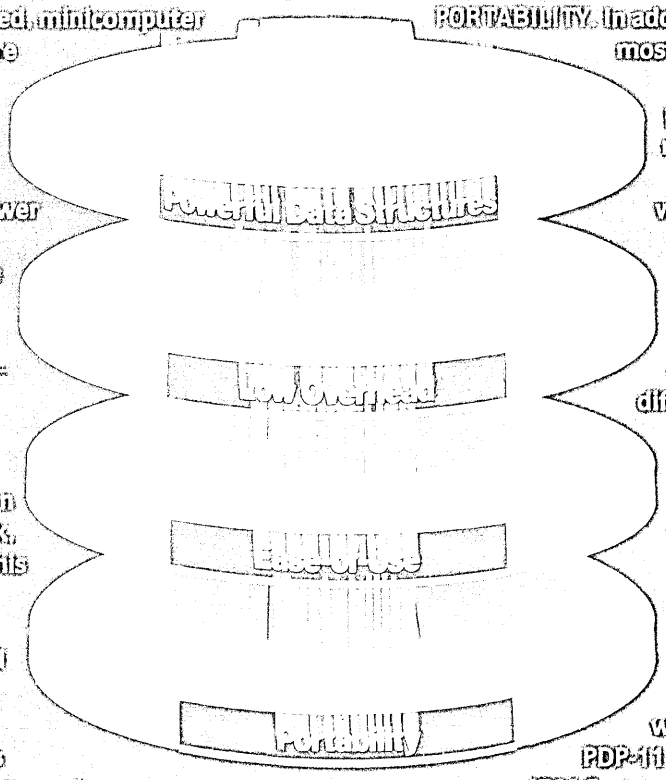

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FUJITSU, TRW PLAN STRATEGY

Initially the new TRW-Fujitsu Co. expects to sell retail and financial systems.

Another vendor of small business systems from Japan is appearing on the scene. But this one has plans to expand also into medium-scale mainframes that just happen to have operating systems comparable to IBM's DOS/VS and MVS. "We're looking primarily at the operating system that's comparable to the DOS/VS market," says Garrett Fitzgibbons, vice president and general manager of the new TRW-Fujitsu Co. in Los Angeles. "We are not looking to enter this market in any way, shape, or form as a PCM," he explains.

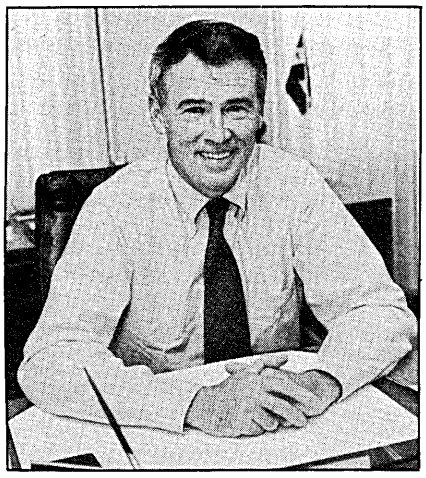
The joint venture, initiated almost three years ago by the American partner, brings together Japan's largest mainframe maker and largest shareholder in Amdahl Corp. with a huge American conglomerate. But the component from TRW that becomes the nucleus of the new venture is the Communications Systems & Services Div., which has been manufacturing systems for the retail industry in a Los Angeles suburb and for the financial industry in Orlando, Fla. The manufacturing plants remain with TRW, but moving over are the marketing, software, and administrative groups. In addition, the TRW Customer Service Div. will be the service company for the new venture while continuing also as the third-party service company for such manufacturers as Hazeltine and Docutel.

Small business systems based on Fujitsu's V Series computers may be introduced in 1981 with first shipments planned for late that year.

Initially TRW-Fujitsu expects to be selling retail and financial systems, adding small business systems based on Fujitsu's V Series computers. Fitzgibbons, who was marketing vice president at Memorex Corp. when that company tried to enter the systems business with a line of IBM-compatible mainframes, says these small systems might be introduced in 1981, with first shipments planned for late that year. Priced in the $25,000 to $150,000 range, he explains, they compare with the IBM System/34 and System/38 and the Univac System/80.

A fourth product category for the new company is the M Series mainframes with the F suffix from Fujitsu, that company's response to the IBM 4300s. These will likely be offered to TRW's customer base in the retail and financial industries as local processors that can be connected to a host over communications lines. These machines have a power range from approximately 0.30 MIPS to some 0.65 MIPS, considerably below anything being offered by Amdahl Corp. and therefore not in violation of the letter or spirit of Fujitsu's agreement with Amdahl.

—**Edward K. Yasaki**



GARRETT FITZGIBBONS: "We are not looking to enter this market in any way, shape, or form as a PCM."

COMMUNICATIONS

READYING BNA FOR USER NETS

The first implementations of Burroughs Network Architecture will be for host-to-host applications.

Burroughs Network Architecture (BNA) is alive and well at the vendor's Detroit headquarters and it soon will be ready for implementation in user networks. That's the word from Robert F. Lakin, product program manager at Burroughs, who described BNA features during a recent interview.

While BNA may sound and look similar to other vendor architectures, there are differences that make it apply specifically to Burroughs users, Lakin pointed out.

First announced in October 1978, BNA is really a technical plan. "We aren't selling the architecture and nobody's going to go out and buy a copy of BNA," he explained. Instead, Burroughs will have individual products that implement the

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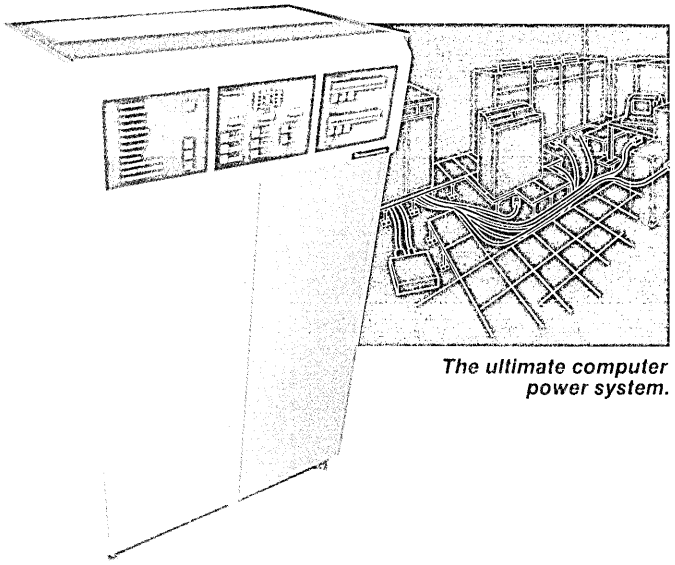

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architecture for specific cpu networks.

Actually the first BNA implementations will be for host-to-host applications, even though terminal-to-host applications might be more common. Lakin listed several reasons why the cpu usage is emphasized. Since the mid-1960s, Burroughs has developed a terminal-oriented architecture based on Network Definition Language (NDL) and Message Control Systems (MCS). This architecture included high level language implementations for switching terminals from one application to another, and insulating programs from having to know about terminal characteristics. Both NDL and MCS were software implementations that were effective for use in traditional hierarchical nets, Lakin said, but neither addressed the issue of peer-coupled networks such as those found in distributed dp applications.

For these reasons, Burroughs decided to concentrate on host-to-host implementations in the initial BNA products. And while there may be a common approach to the architecture, the implementations for the major cpu lines are being developed by the product groups that have responsibility for each series.

Although it contains many similarities to the seven-layer CCITT architecture which incorporates X.25, BNA is not identical. Actually, the Burroughs architecture has three major layers and two tiers, while the international standard has seven layers. The three levels of BNA are called the Station Level, the Host-Router Level, and the Port and Signal Level. These three levels are called Network Services Functions within BNA. The Station Level supports the physical interconnection between hosts and

The first BNA product will be for the B 6000 series cpus and is scheduled for implementation this September.

corresponds to the Physical Layer and Link Level Layer within the CCITT structure. The Host-Router Level deals with the logical interconnection among hosts and it corresponds to the Network Control Layer in the CCITT structure. The Port and Signal Level handles the transmission of messages, and it corresponds to the Transport Layer and Session Layer within CCITT. Burroughs Data Link Control (BDLC) is part of the Station Level and it is a "superset" of HDLC, which is used by the CCITT.

There is really a "second tier" of levels within BNA which is known as the Host Services Level. The Host Services corresponds to the Presentation and Application Layers within CCITT and it provides the functions associated with distributed processing and user applications.

The first BNA product will be for the B 6000 series cpus and is scheduled for implementation in September 1980. The

ROBERT F. LAKIN: "We aren't selling the architecture and nobody's going to go out and buy a copy of BNA."

next implementation will incorporate BNA into the smaller B 1000 machines and it is scheduled for the first quarter of 1981. The B 7000 series will gain BNA capability in the third quarter of 1981, and the medium scale B 2000, B 3000, and B 4000 series are slated for BNA in the first quarter of 1982, Lakin revealed.

Each implementation will require the user to purchase Network Services software modifications along with data communications hardware interfaces that will be installed within network front-end processors. Total costs for the BNA products are not yet set, but Lakin was able to provide the projected prices for the Network Services software. The B 1000 BNA software will cost $6,000; the B 2000, B 3000, and B 4000 software will be priced at $12,750; and the B 6000 and B 7000 large systems will get BNA software for $21,000. These prices are for a one-time initial fee and there will be follow-on annual payments for program support, Lakin said.

At this point, BNA will support only Burroughs equipment, but provisions will be made for supporting public data networks within BNA networks. An X.25 public network can be used as a transport mechanism only between Burroughs hosts. Current plans call for compatibility with the Canadian Datapac network and the Transpac net in France, he divulged. Support for other public data nets will follow, depending on user demand, and this includes X.25 networks operating in the U.S. Presumably, users will be able to combine private and public network facilities within BNA host-to-host distributed networks.

The SNA interconnection capability falls into what Burroughs classifies as Gateway features. "We certainly are looking at that and hope to add it to our list of capabilities in future announcements," Lakin said.

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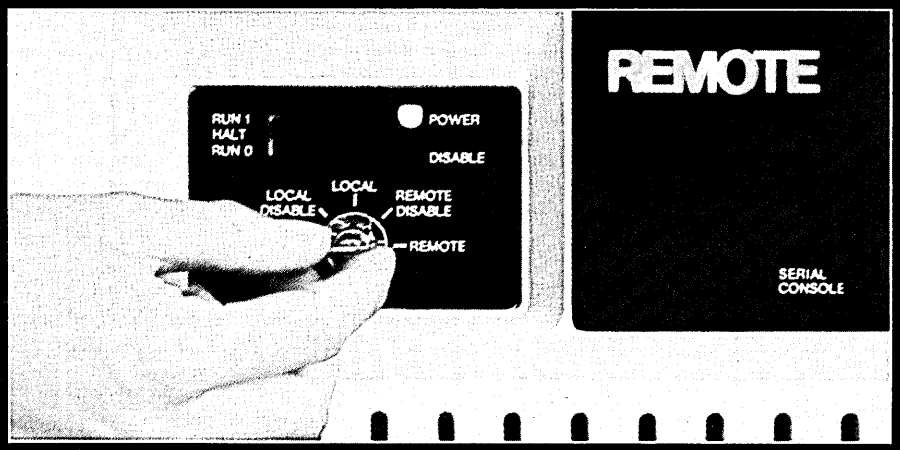

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Another future BNA addition will be terminal-to-host implementations within the new architecture.

Lakin stressed that existing Burroughs networks will be able to merge into the BNA environment with a minimum of upgrade effort. Existing NDL and MCS terminal-to-host applications will operate on BNA nets. Instead of the network recognizing an inquiry from a terminal, the network will deal with the host to which that terminal interacts. But such BNA details will not exclude compatibility for those networks now operating under NDL and MCS, and user transparency between the two network approaches is a continuing design goal, Lakin concluded.

—Ronald A. Frank

COMPANIES

IMMERSED IN INFO SERVICES

In 10 short years, XCS has found the information services market a good business to be in.

Ten years later, Xerox Corp. is totally immersed in the information services market.

The copier giant dipped its big toe into the market in May 1970 (DATAMATION, Nov. 1, 1970, p. 91), vowing to wade in gradually. It's done just that, growing steadily to a point where it now has 1,100 employees, 20 branches in the U.S. and two abroad, and a data base of 70 billion bytes.

Xerox Computer Services recently celebrated its 10th anniversary with parties

XCS, which achieved profitability in 1976, is growing at the rate of 35% to 40% per year.

in all its 20 domestic branches. Each party featured a cake that looked like a computer terminal. Design for the cake came out of XCS' Los Angeles headquarters. Each branch turned a sketch over to a local bakery. XSC president Haig M. Bazoian attended four of the 20 branch parties and judged the L.A. cake the best.

He noted the San Francisco branch's baker had a problem. Below the keyboard on the terminal in the sketch was written "your branch." And that's exactly how it came out on the cake in San Francisco.

Bazoian has been president of XCS since October 1977, when he took over from James Campbell, who moved up the Xerox corporate ladder to become president of Xerox Business Systems. With the organization almost from the start, Bazoian was its first Los Angeles marketing manager. He became director of national operations in 1972 and moved up to vice president, national operations in 1975. In 1976 he was promoted to vice president, marketing.

XCS today has six production centers. It aims its on-line services specifically at three industries: manufacturing, distribution, and public service. "We aim all our software development, marketing, and programming at those three application areas, but we build broadly and can sell to any business that does accounting," said Bazoian.

The company services more than 700 customers in more than 100 cities throughout 36 states via more than 3,000 on-line terminals. The XCS network consists of 90,000 miles of telephone lines—40,000 miles interstate and 50,000 miles intrastate.

In 1973, the company got into the hardware business with the 1340 terminal produced to XCS specifications by another Xerox subsidiary, Diablo Systems Inc., Hayward, Calif. This year XCS is adding a new crt terminal, the 1330, to be produced on an oem basis by Lear Siegler Corp. And it has another intelligent terminal, the 1350, produced by the Office Products Div. of Xerox in Dallas.

HAIG M. BAZOIAN: "We're still selling solutions."

Bazoian said XCS is talking to Office Products about other hardware: a little computer, floppy disks, memory, a high speed printer. The firm also is into software development for outside sale. And it may go a step further, said Bazoian, into package turnkey systems.

"But," he said, "we're still selling solutions. We go to a customer and say tell me your problem and we'll give you the best solution." This could be on-line services,

where everything is done by XCS, or a combination of on-line services and on-site computing.

Bazoian said XCS, which achieved profitability in 1976, is growing at the rate of 35% to 40% per year and he sees this continuing. He also sees XCS well positioned to weather a recession, as it can provide services needed by firms who don't want to make major capital investments in a time of tight money.

The XCS president is particularly proud of the fact that the firm's first customer, National Sanitary Supply, a distributor of janitorial supplies, is still with them. "We've grown together," he said.

—Edith Myers

MEETINGS

ICA SHIFTS GEARS

The once conservative communications organization is starting to take off in new directions.

When the International Communications Association (ICA) convened in Detroit in May for its annual conference, it soon became apparent that the organization was moving away from its earlier conservative posture. In such areas as the education of telecommunications managers and the monitoring of and participation in regulatory affairs, the ICA has begun to make its presence felt.

ICA is probably the most important and influential user organization in telecommunications. Its 440 member corporations are a select group from the largest firms in the country. To qualify for membership, a corporation must have a phone bill of at least $1 million per year in common carrier charges. Its members operate some of the country's largest telecommunications networks, many of which carry voice and data transmissions linking corporate dp centers with remote sites.

As a customer group, the ICA represents a major revenue source for both IBM and AT&T, and those companies regularly send their top researchers and management spokesmen to address the organization's annual conference.

According to Lloyd R. Isaacs, newly elected ICA president and the man who heads up telecommunications at the Bank of America, "What we're trying to do is educate our membership in the management of information. We don't separate voice and data; ultimately as managers our members have to systematize the flow of information so that it really doesn't matter whether it's voice or data. I think a communications manager can affect the productivity in his company in ways that are not yet fully realized."

Isaacs went on to say that the telecommunications manager will eventually be overseeing integrated corporate networks employing many technologies, "because it's all telecommunications."

"Education is a big thing," Isaacs explains. "The exchange of information among members is the key area, but we also need to have formal educational experiences for the young people coming into the profession because there aren't many places for them to get that kind of training." ICA is also looking at the regulatory environments, transborder data flow regulations, the state and federal privacy acts—all the areas that are impacting multinational corporations and the way they do business, Isaacs says.

As a user organization, ICA attaches high priority to the monitoring of regulatory issues, comments Robert E. Bennis, director of telecommunications management at Westinghouse and chairman of the ICA regulatory committee. For the past year ICA has enlisted the services of one of the top law firms in Washington, Peabody Rivlin Lambert and Myers, to act as a "listening post" to inform ICA of the potential impact of pending proposals. The law firm also assists ICA whenever the organization delivers a position statement before the FCC or a legislative committee working on

ICA attaches high priority to monitoring regulatory issues.

communications-related bills. Recent efforts have focused on providing the users' viewpoints to legislators in the House and Senate who have been working to update the Communications Act of 1934.

Do the lawmakers listen when the voice of the user is heard? "The committees are very anxious to hear what users have to say," Bennis claims. "We've had extremely good reception, and often we are asked why users haven't spoken out long ago on these issues." Before any position statements are delivered by the ICA regulatory committee, the membership is polled. Statements generally reflect the opinion held by the majority of members, he explains.

Although versions of the Communications Act rewrite have been changed many times, Bennis feels comfortable that the basic concerns expressed by ICA have been addressed. He hastens to add that this kind of effort must of necessity be a compromise among all parties involved, but the ICA is convinced that its interests are now being represented on an equal basis along with views of the carriers and vendors.

—Ronald A. Frank

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NEWS IN PERSPECTIVE

BENCHMARKS

ARRIVEDERCI BELLISARIO: Marisa Bellisario, former president and chief executive officer of Olivetti America, has been replaced by Albert L. Winegar, former group vice president for field operations. Bellisario has returned to Italy to handle Olivetti's technical relations with the French company, Cii-Honeywell Bull, within the framework of the Olivetti and St Gobain Pont-à-Mousson arrangements recently established. Winegar joined Olivetti in 1979 after working 23 years for IBM in various capacities. No explanations are being given for the switch.

MEETING OF THE MINDS: Expressing fears that proposed Congressional amendments to the Communications Act of 1934 will have "a significant negative impact on our industry," a group of top executives from dp and communications companies met to debate the subject during NCC. Led by Harold E. O'Kelley, ceo and president of Datapoint Corp., the group explained its concerns relating to the fast changing legislative efforts to pass a new bill. "This legislation will result in irreparable damage to our market," O'Kelley stated, adding that an industry study group had been formally organized to examine and monitor the pending legislation.

Citing rapid changes in the language of the proposed bills over the past several months, the Datapoint chief said it was difficult to know exactly what stipulations were included in the current versions. He called for full public hearings on the bills now pending in both the House and Senate so that companies directly affected could voice their concerns.

Contacted in Washington, Chip Shooshan, chief counsel of the House subcommittee on communications, expressed bewilderment about the group's charges. "It is very perplexing why the industry is not seeking passage of this legislation. Any suggestion that current proposals don't embody many of the suggestions that we have had from the computer industry, particularly the smaller companies, misses the entire point of the process we have been going through," Shooshan said.

SBS, AMI READY FOR EM: Under contract to Satellite Business Systems, AM International developed a prototype, high-speed communicating copier system that was demonstrated recently at an SBS facility in Reston, Va. The AMI equipment can send copies to dispersed locations as fast as 4,200 pages per hour, over 100 times faster than conventional facsimile methods. And, its laser scanners can read a page every two seconds. This electronic mail system has an address sheet that precedes each document, and it is geared toward sending multiple-recipient documents (one document destined for 12 recipients will be copied, marked, and routed automatically). SBS has no proprietary rights on the design of this system, leaving AMI free to market as it chooses. Information concerning pricing and availability of the system is being kept under tight wraps.

ANOTHER RECORD YEAR: Value Line, the investment advisory service, predicts another record year of growth rates for the computer industry. Progress in 1980 may be somewhat "dampened" by the recession, but high order rates and backlogs indicate that computer companies as a group will "post an earnings gain of about 12% this year." Industry earnings for this year should hit about $5.35 billion, up from approximately $4.75 billion last year. Industry sales for '80 are estimated at $52 billion compared to about $45.5 billion in '79.

The prediction for the industry within the next three to five years is that industry earnings will peak at $8.2 billion. Value Line points out that dollars in the leasing business "tend to keep flowing during hard times as well as prosperity," and that computer services companies have "little to fear from recession." ❋

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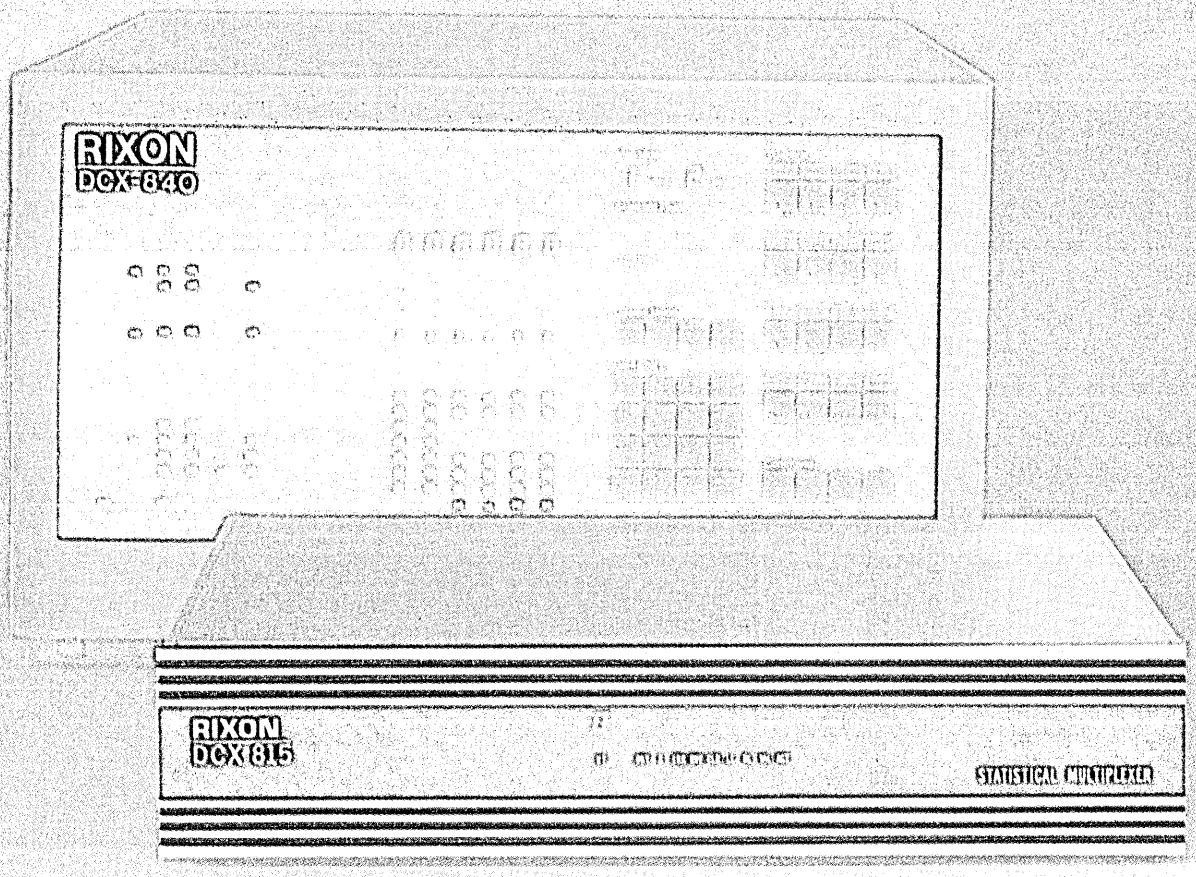

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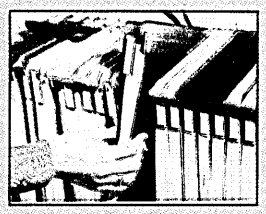

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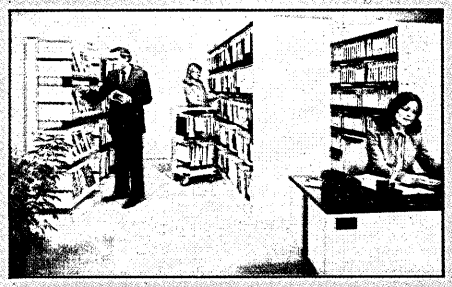

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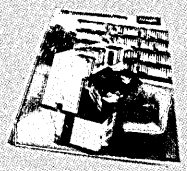

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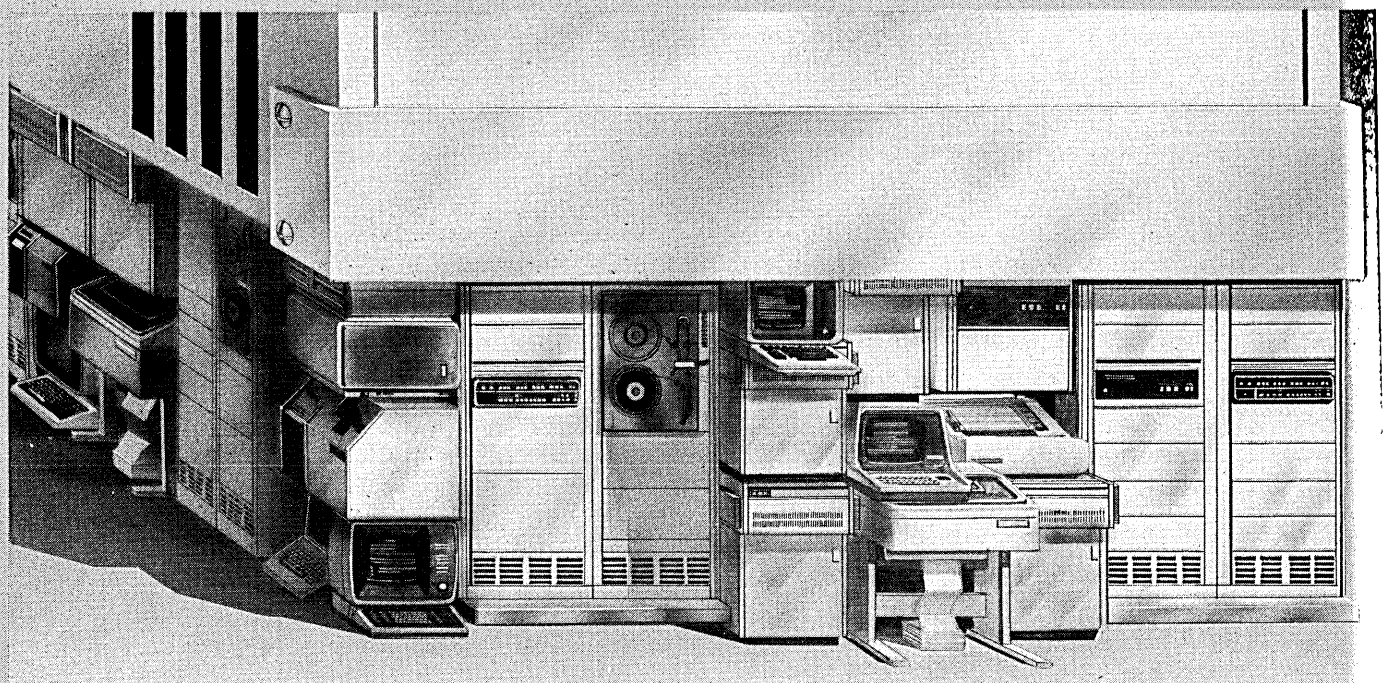

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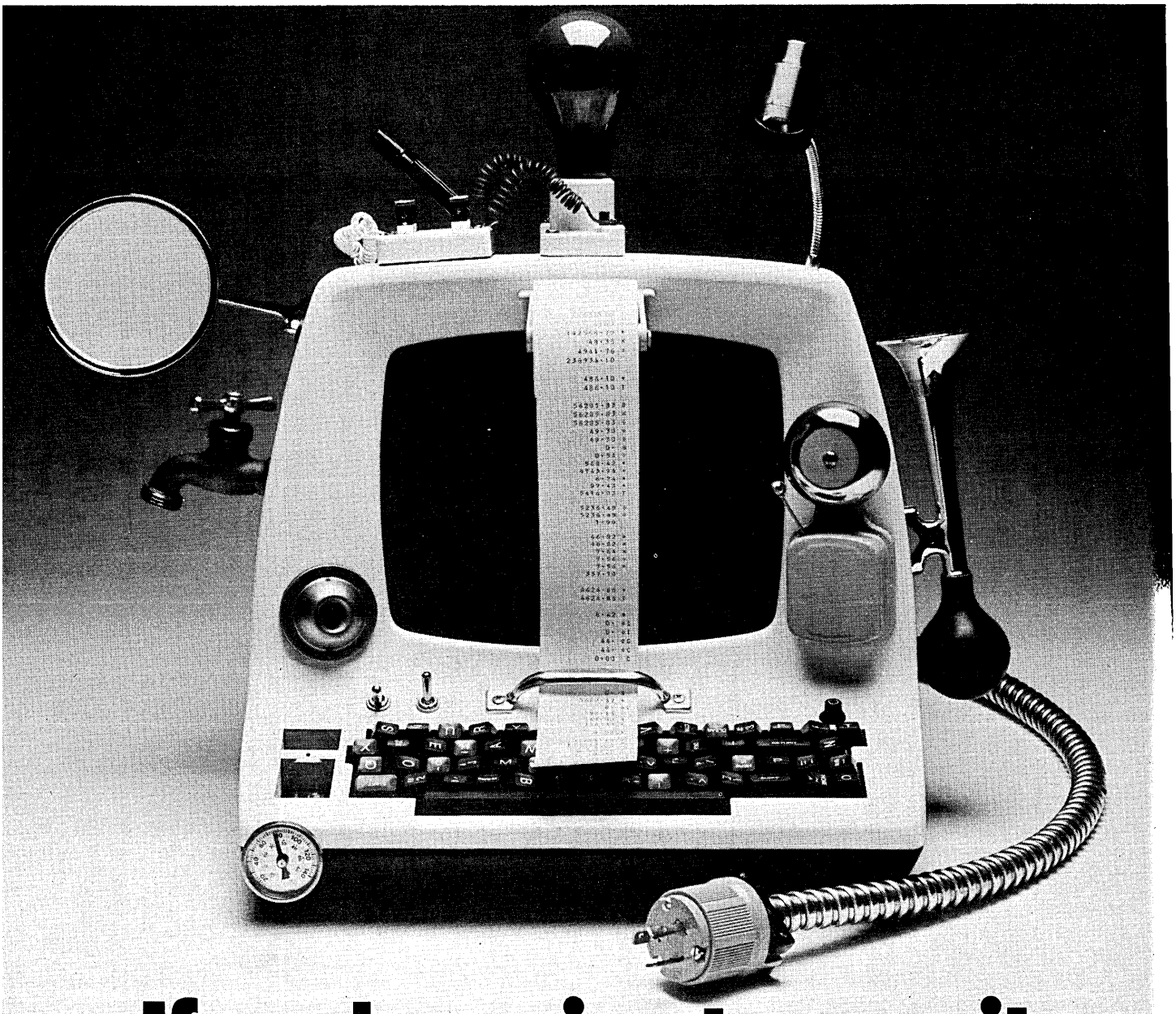

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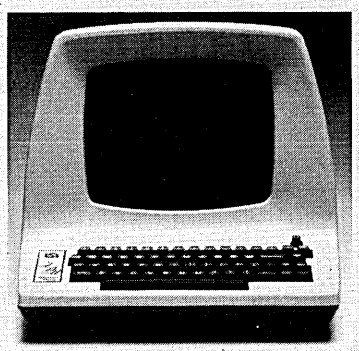

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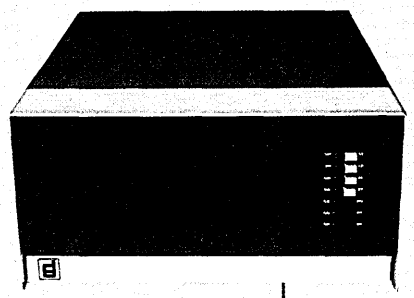

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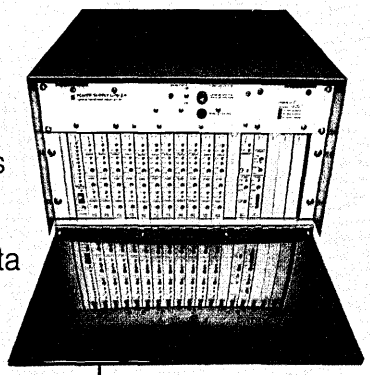

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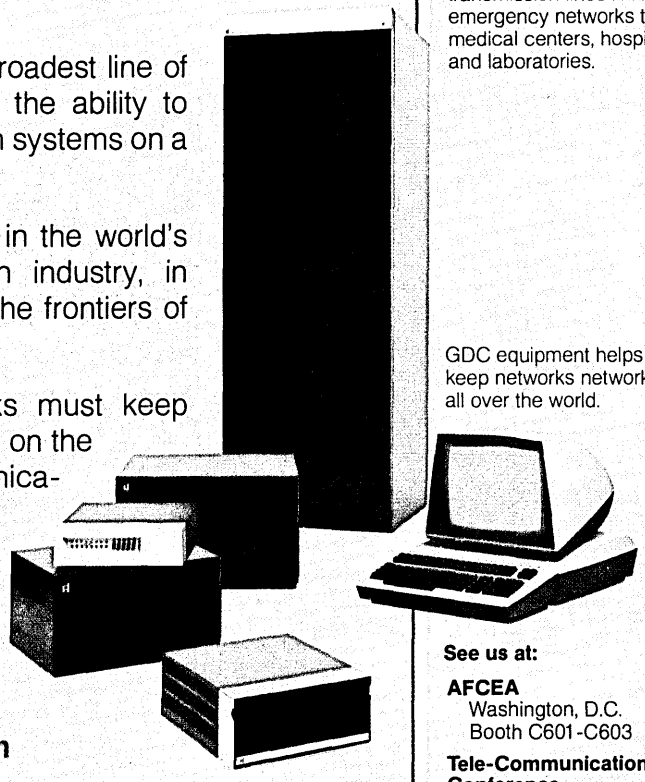

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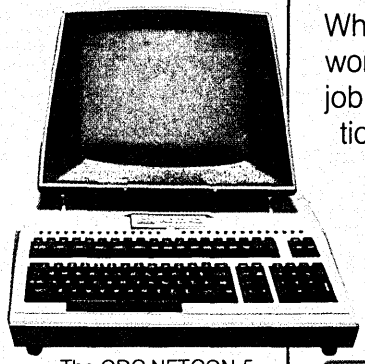

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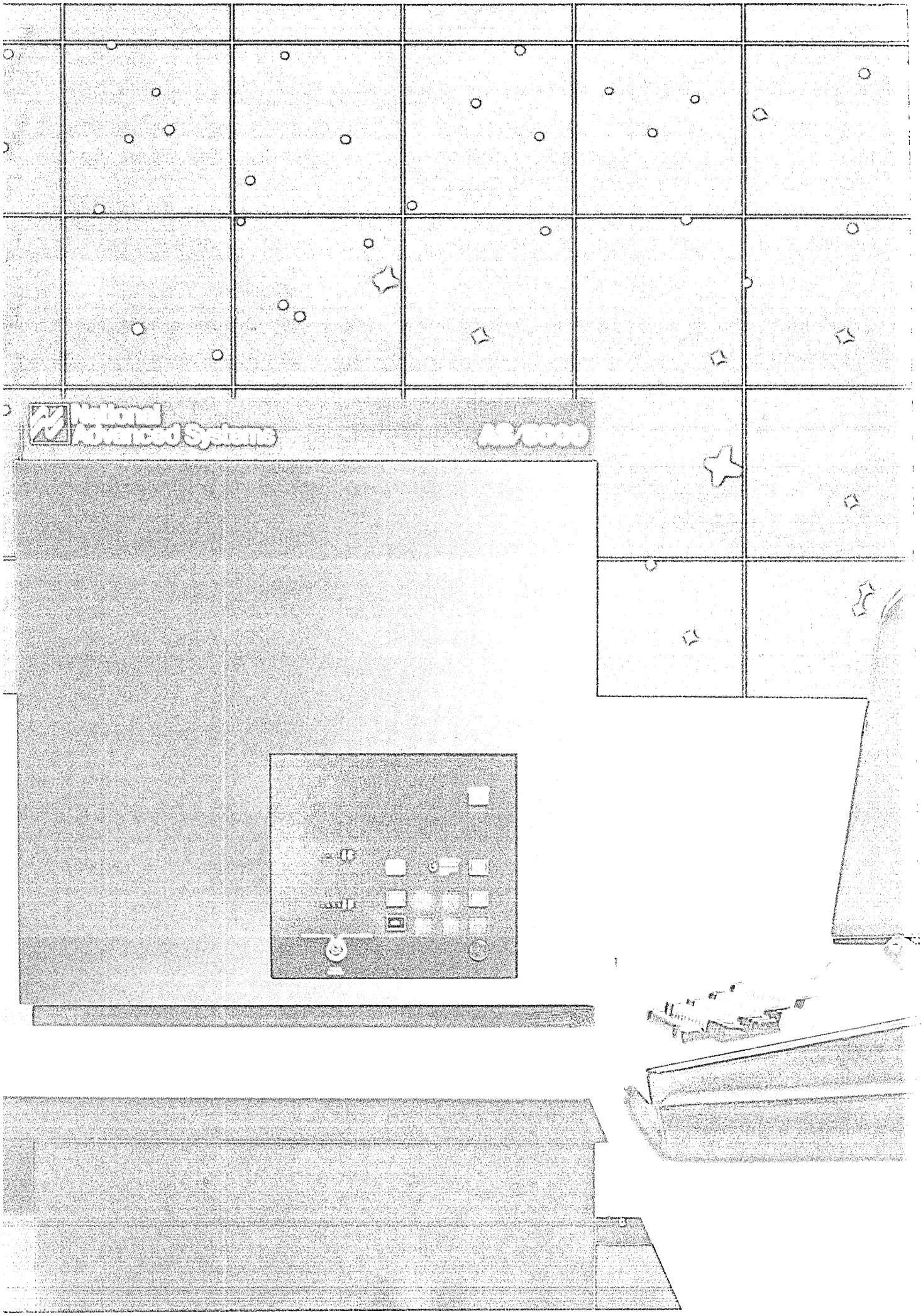

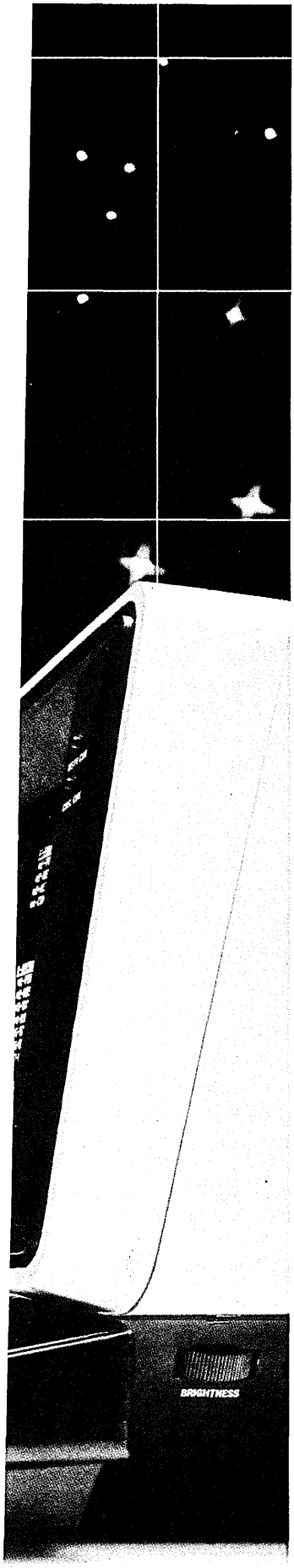

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The AS/5000 is a two-megabyte, six-channel system, optionally expandable to eight megabytes. Through the use of advanced integrated circuit technology, the number of components, pins, and connections is substantially less than used by IBM – resulting in unsurpassed reliability. The AS/5000 is lighter, takes up less floor space, requires 50% less power, and generates about half as much heat as comparable IBM systems.

A truly flexible system, with tailored support.

The AS/5000 supports all IBM System/370 and 303X operating systems, including their extensions. The AS/5000 runs complete VM-ECPS, including EVMA, more than is offered on the IBM 3031.

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More computer for your money. Now.

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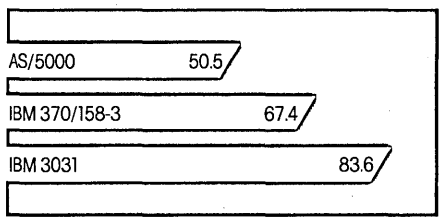

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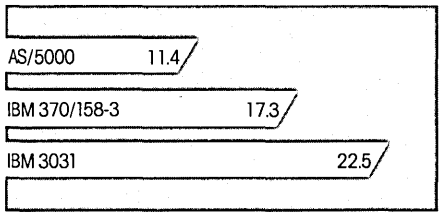

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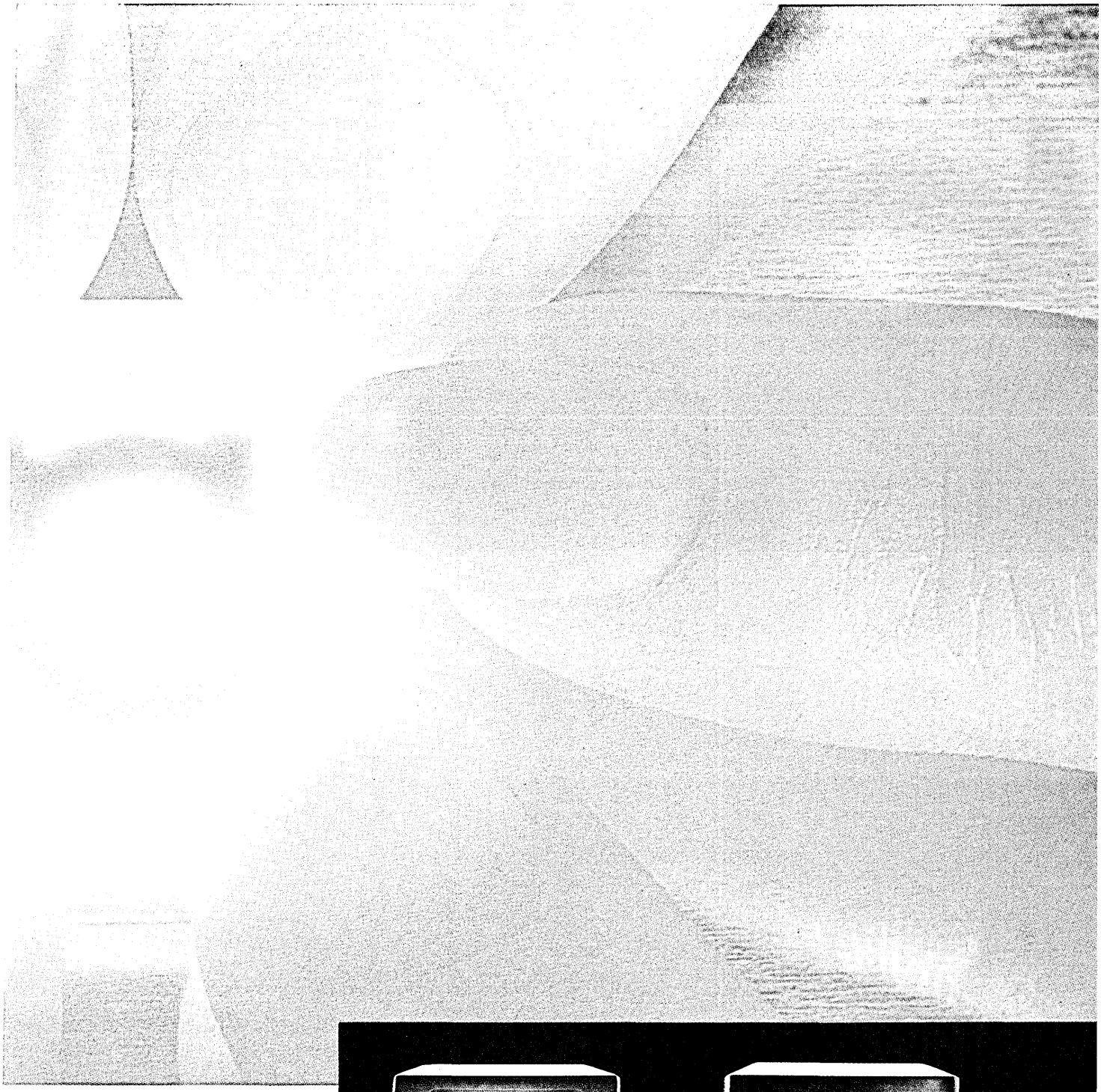
GTC is versatile in its thinking, too. We're willing to spend a little more, to experiment and innovate a little more, to bring



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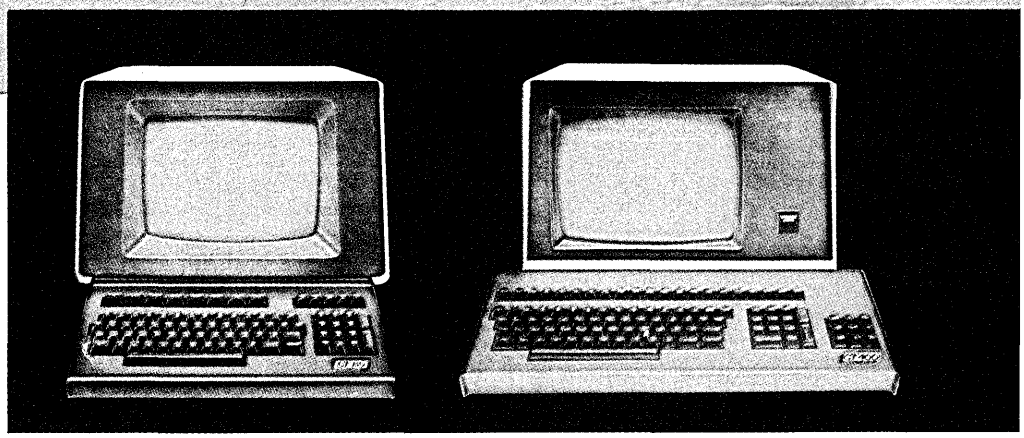

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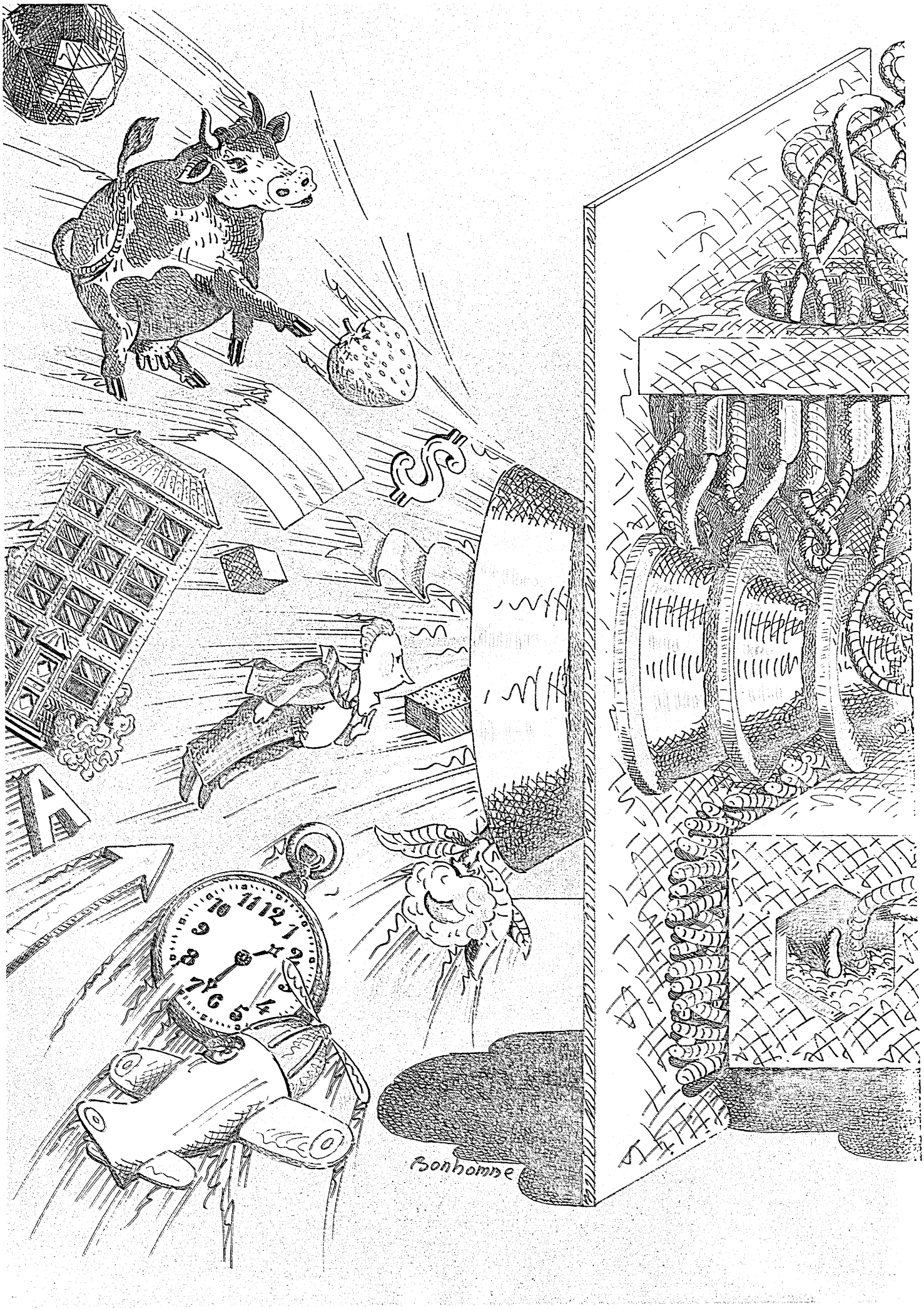
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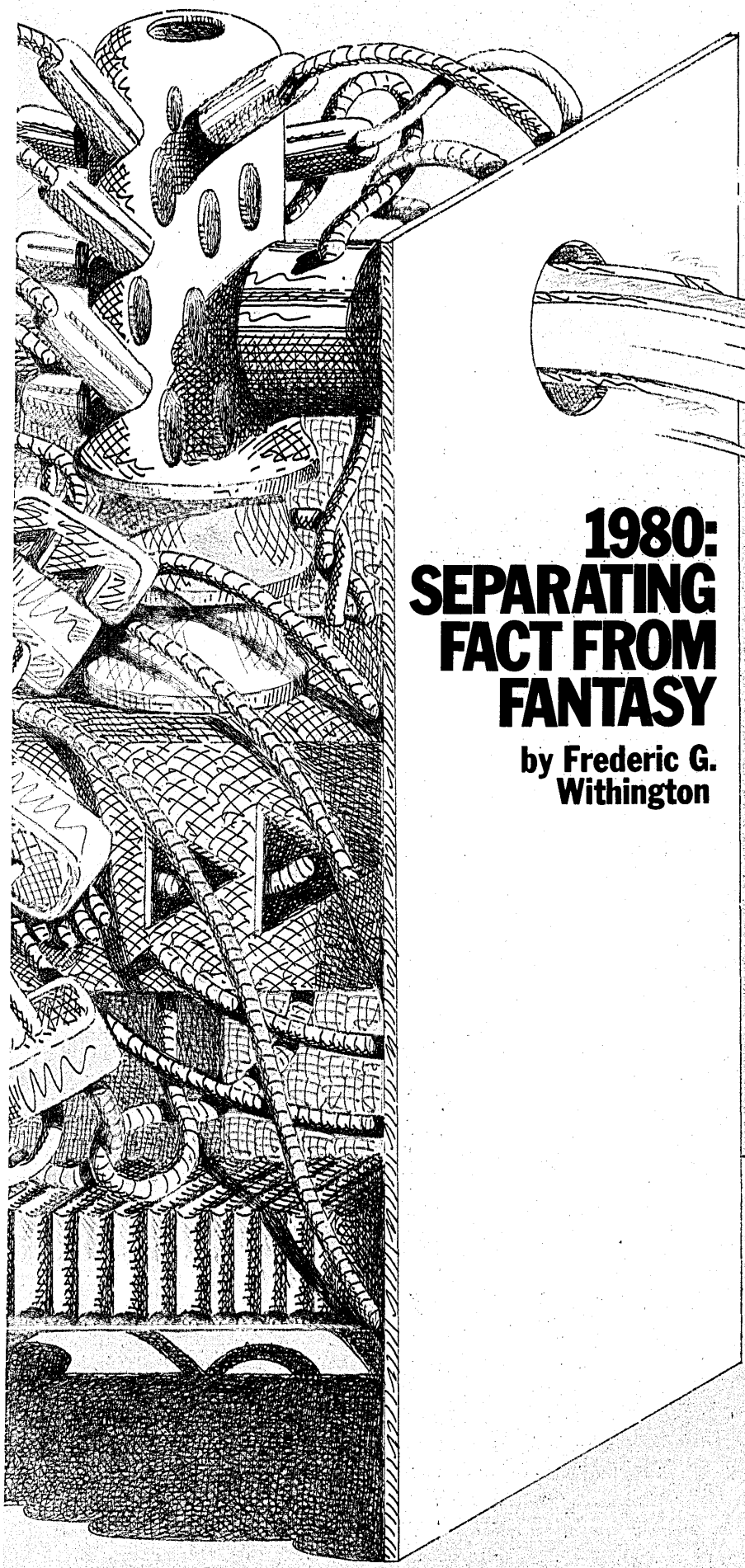

Dp vendors are facing a shaky beginning in the new decade, and it could be a while before profits pick up substantially.

1980: SEPARATING FACT FROM FANTASY

by Frederic G. Withington

"1970 was a miserable and confusing year, but by the end there were some reasons to think the worst was over."

DATAMATION, Jan. 15, 1971, p. 72

Does the data processing industry have to start each decade with a stumble? Let's hope not—but there are nervous portents for 1980. It may not be "miserable," but conditions may be tough enough to separate the business facts from the fantasies of enthusiastic forecasters.

Growth has already slowed. The revenues of DATAMATION's top 50 were up 15.7% in 1979, vs. 22% in 1978 and 18.1% in 1977. Profits are spotty. IBM's earnings turned down in 1979 for the first time since 1951. Most of its larger competitors showed profit increases, but most of them by less than the rate of inflation, and some have weakened further in 1980. Only a few showed dynamic growth in both revenues and profits.

Most of the primary causes of this decline in industry performance will continue to be around for a while.

Semiconductor costs have temporarily stopped dropping in the traditional manner, and the costs of some varieties have increased. Some reasons are the rising costs of materials, particularly precious metals, plus the effects of some shortages, and the effects of inflation on the semiconductor suppliers. Forecasters say that semiconductor price declines will resume with new designs and manufacturing processes, but not immediately. Other components (electromechanical assemblies, power supplies, crts, cabinets, etc.) contribute more to manufacturing costs than semiconductors do, and are generally vulnerable to inflationary forces.

People costs for software development, marketing, customer support, and maintenance are increasing faster than the average rate of salary inflation. (As the industry grows, competition for a slower-growing pool of trained people forces salaries up.) Since practically every product and service of the dp industry becomes steadily more software-intensive, the people-related compo-

ILLUSTRATION BY BERNARD BONHOMME

Large companies with strong financial resources have been moving into high growth areas of the industry.

nents of product cost increase relative to hardware cost. As a result, product costs become more tied to the rate of salary inflation.

As of this writing, the prime interest rate is 13½%. Manufacturers must have working capital, often borrowed, particularly if they have to finance equipment leased to customers—and customers have recently shown an increasing propensity to lease. Part of the reason is uncertainty about new products, but the cost of money is reason enough. Why not let the manufacturer finance your machine when your cash has become so valuable?

Manufacturers should be expected to pass these costs on to customers in the usual dispiriting inflationary cycle, and in part they have. However, competitive pressures have constrained the rate of price increase.

In 1977-1979, IBM, stung by manufacturers of plug-compatible equipment (particularly mainframes), responded by reducing prices on most of its product line directly or through new models. Manufacturers of noncompatible products are not immediately affected because their locked-in customers cannot switch readily, but sooner or later they must at least approximate IBM price-performance. IBM has recently raised some prices to compensate for inflation but not by much; the pressure remains.

TABLE 1

IBM CONTRACT MAINTENANCE PRICES FOR COMPARABLE IBM PROCESSOR COMPLEXES

Model	Year Announced	Power (MIPS)	Monthly Maintenance	Relative Cost ($K/MIPS)
360/65	1965	.65	$3351	5
370/155	1970	.7	$2776	4
370/158	1972	.9	$2570	3
370/3031	1977	.95	$2730	3
4341	1979	.8	$ 498	0.6

CONTRACT PRICE PRESSURE

A particularly severe form of IBM price pressure is being applied in the area of contract maintenance charges for purchased central processor complexes. Table I compares the current IBM maintenance prices for five computers of comparable configuration (2 MB) announced since 1964. The maintenance charge per MIPS (million instructions per second) of power declines slowly for the newer machines, then for the latest (4341) it drops by a factor of five. This reduced level of maintenance cost not only keeps pressure on the PCMs, but also applies it to the used computer industry. (Who will want a 370/155, for example, when the times comes that a 4341 that costs one-fifth as much to maintain is readily available?) Again, manufacturers of noncompatible computers must eventually establish comparability in the face of rising field engineer salaries.

Large companies with strong financial resources have been moving into high-growth areas of the industry directly or through subsidiaries (Exxon, Xerox, Siemens, Tandy, Northern Telecom). Anxious to establish strong market positions, they price their products aggressively.

If for any reason the price competition among existing competitors abates (if there is a general round of 25% price increases, for example), new competition waits on the sidelines to renew the battle. Hitachi offers its larger computers in the U.S. through NASCO, but does not offer its full line or compete under its own name. Fujitsu and TRW have announced the formation of a jointly owned U.S. subsidiary to sell Fujitsu products, but there has been no indication that it will offer the Fujitsu M series computers. Nippon Electric is well established in the U.S. selling semiconductors and peripherals under its own name, but not its computer systems. IBM is unlikely to willingly relax its price pressure much in the foreseeable future if the result will be to bring vigorous Japanese competition into the U.S.

Some semiconductor devices were in short supply during 1979, especially 16K RAM chips. Demand grew faster than supply; semiconductor manufacturers, remembering boom-and-bust cycles of the past and facing the high cost of money, have been cautious about adding capacity. Aggravating the shortage, IBM's new semiconductor plants apparently fell well short of meeting corporate needs. IBM was forced to buy outside to an unprecedented degree. Several companies (notably NCR and Data General) said their 1979 performance was directly affected by this shortage; they were unable to deliver products at the planned rate.

The semiconductor shortage will surely abate. IBM's plants will increase production, largely or entirely removing IBM from the market. The independent manufacturers will increase capacity, catching up with demand. It's too late to help 1980 end-product shipments much, though; semiconductor suppliers' 1980 production is already largely committed, and even if production increases, system manufacturers' lead times preclude much increase in 1980 end-product shipment volumes.

Availability of innovative software continues to be a problem. After all these years of experience, manufacturers still overcommit. IBM's System/38 and 8100 delivery schedules have been impacted by system program slippage, and the same thing has happened to other vendors of products and services (including AT&T with ACS). Nothing separates fact from fantasy in new product claims more certainly than the necessity of delivering robust software for the more novel products. 1980 will be a "put up or shut up" year for a lot of innovative products announced in 1978 and 1979.

Many of the new office and network products require high-performance communications services (e.g., teleconferencing, fast facsimile, some forms of data base distribution). Early hopes for availability of such services as ACS, XTEN, and SBS have been disappointed. (SBS has recently cleared a legal hurdle and hopes to be in business in 1981. Oriented to a small number of large customers, however, SBS alone cannot stimulate large volumes of terminal equipment sales for at least several more years.)

People and money were mentioned above under cost pressures, but there are also questions of availability at any (acceptable) price. Some people with specialized skills, such as those needed for implementing large users' integrated digital telecommunications systems, are essentially unavailable. A "credit crunch" on money availability also appears to be possible as the government tightens credit controls.

SOLVING MOST PROBLEMS

So far the picture appears pretty dismal, but there are at least partial solutions to most of these problems. Some of them are:

- *Separate pricing of software.* A separately priced software product offers the vendor potentially high profits if it becomes widely adopted, since software has no unit manufacturing cost. It's not easy to attain such profits, however; any separately priced software product must be attractive enough to induce users to abandon existing free software and to

The new Model 3500 intelligent terminal from Perkin-Elmer. Only $5,833.*

The Perkin-Elmer 3500 gives you an intelligent terminal with multitasking capabilities and sophisticated software at a price you can afford. 60 day delivery.

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The Perkin-Elmer 3500 handles multiple functions at the same time, maximizing operator productivity. The operator can enter data as the terminal verifies it, accesses the discs, communicates with your host computer, and drives your serial printer.

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The Model 3500's Screen Generator software makes developing transaction processing applications especially easy, from screen formatting right through to establishing, maintaining, and accessing the associated disc files and interfacing with the application tasks.

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The market potential for novel systems is vast, but it will apparently be some time before any large part can be converted to vendor revenue.

undergo the necessary conversion. Surveys show user expenditures for software products rising steadily but slowly; 1980 software revenues of the industry will surely be higher than those of 1979, but not by enough to be a primary factor.

• *More maintainable machines*. IBM's low maintenance price for the 4341 is not just a competitive ploy; it reflects a machine design oriented to low failure probability and rapid repair. Recent concentration on maintainable designs has produced encouraging results for all manufacturers. When the industry's installed base is largely made up of these more maintainable machines, the maintenance-cost pressure should be largely alleviated, but of course it will take a number of years to turn over a large part of the installed base.

• *Remote customer support*. Several manufacturers, following IBM's lead, are attempting to establish customer support centers both to diagnose equipment malfunctions and to solve software problems. Working by telephone instead of by in-person calls, support center technical staffs should be able to spend substantially less time per problem solved. Early reports of the success of remote customer support centers are encouraging, but it will take time to build smoothly functioning networks of them. Justified customer suspicion must be overcome. New procedures must be developed, and in some instances, hardware and software must be redesigned.

• *New system designs*. Microprocessors and related "intelligent chips" are increasingly being used as components in everything from toys to giant cpus. Their use decreases people-related costs in several ways. Design labor is reduced because engineers work with fewer, larger components and specify functions in microcode instead of circuit designs. Manufacturing labor is reduced because there are fewer components and less back-panel wiring. Software cost is reduced because existing monolithic system programs are being partly decomposed into microcoded pieces that intercommunicate via high-level messages. Finished microcoded pieces can then be incorporated into future systems programs as modular building blocks, without internal change. (This process, only begun, is likely to profoundly change the nature of the industry's products over time.) Finally, maintainability is enhanced because self-diagnostic capabilities can be incorporated in the intelligent chips and their microcode.

• *Increasing shipment volumes*. Many manufacturers' costs are largely fixed. As unit shipment volumes increase, a smaller portion of each unit's gross profit margin is needed to cover fixed costs, and more goes to the bottom line. The manufacturers with the biggest shipment and revenue increases in 1979, such as Digital Equipment, Wang, and Prime, also had the biggest profit increases. As the wave of new products announced by the industry in 1977-1979 enters volume shipment, then, profits should improve for all participants. This will only be true if market demand is great enough, however.

Vast potential markets exist for the new products of the data processing industry. Users' appetites for increased capacity are apparently insatiable. Interest in office automation is universal, as is interest in computer-aided design and manufacturing, in specialized computing of many kinds, and in improved communications in general. Enhanced productivity is the goal, reflected in user interest in everything from decision-support systems for general management to electronic typewriters. These optimistic views are not just articles of faith in the indus-

try; they are supported by surveys, vendor experience, and the observations of virtually everyone who deals with any number of user organizations. But *potential* market and *available* market are different things. Are the users ready for all this? Let us address some factors that are tending to slow down users.

WHAT USERS WANT

The customers would like products that are easier to use. Users' application development plans are constrained by the need for programmers and operators experienced in handling the complexities of today's systems (ranging from giant cpu complexes through word processors). They therefore buy fewer products than they might. The industry has been aware of this for years and has been working diligently, but progress has been painfully slow. No overall revolution in ease of use is in sight that will suddenly release pent-up demand—not in 1980, perhaps not in any single succeeding year.

The customers want completed products. Software should be bug-free. Communications management systems should fail soft, providing for recovery of messages, alternate routings, and unambiguous status information. File management systems should also provide for recovery, restart, audit trails, access controls, and the like. Word processors should provide the features users need, such as subscripts and superscripts, tables and graphs, and page composition. Office automation systems that go beyond word processing should provide for intermixed voice, text, data, and image media. They must also meet document file management needs that are apparently at least as complex as data base management needs, but more diverse. The customers are obviously not about to get products that fulfill all of these wishes, and experience shows that many users will put up with a degree of incompleteness. Nevertheless,there are many potential customers who would rather wait for more complete products.

The customers must have backward compatibility. They must preserve their investments in software, files, and personnel training at all levels. Conversion pain must be kept to a tolerable level. The vendors are therefore challenged to produce new products that are easier to use and complete, but which resemble past products that were hard to use and incomplete. This is impossible and everyone knows it, so customers accept compromises. But every compromise leaves someone dissatisfied, someone who decides to continue using the present product (or a plug-compatible version of it).

Even if all the new products were easy to use, complete, and backward compatible, would all the potential customers be ready to accept them? Apparently newer concepts such as distributed data processing, office automation, and design and manufacturing automation pose organizational challenges that slow up the rate of new product acceptance. Here are some major considerations:

- *Control must be maintained.* Assets must be safeguarded in a manner that satisfies auditors as well as government reporting and legal requirements. Ripoffs must be discouraged. For these reasons the organization's master files may not float around a network, manipulable by everyone with a terminal.

- *Expenditures should be justified.* Most managers agree that it's hard to forecast the value of productivity increases, so experiments with office or design automation projects are sometimes justified. This doesn't

The vendors that do best may be the most conservative.

mean management gives every enthusiast a blank check to buy any fool gadget, however. Better means of justifying novel types of systems are widely sought, and in the meantime many organizations keep the brakes on.

• *The employees must be ready*. Resistance to change and to automation is natural and nearly universal, especially if new skills will be required and old ones may become obsolete. Managers are usually aware of this, especially if unions are involved. Even after a new system is a proven winner, managers may justifiably require a phased implementation, which can take years.

• *The system management organization must change*. End users should be increasingly involved in system operation and application development, while the central dp organization should provide a suitable system environment for them. This system environment must usually include telecommunications and data base architecture as well as processing, and should be robust, forgiving, and defensive (i.e., able to protect both itself and the user against error or unacceptable usage). A new organizational principle is evolving, which for want of a better term I have called "distributed responsibility." Whatever principle is adopted, working out the best structure for a given organization takes time.

• *People must be available*. Creating a new system management organization is one thing; manning it is another. Given the current job market and the requirement that many of the people have intimate knowledge of the end-users' needs, many organizations have resigned themselves to postponing the acquisition of novel systems until they have had time to internally develop the key people to cope with them.

• *Economic pressures*. Finally, there is the recession of 1980 (if any). There is no sign yet that economic pressures on customers have caused any significant slowdown in information processing expenditures. (The desire to improve productivity becomes even stronger during hard times.) Some organizations have already been slowed down by the effects of interest rates, though. One thing at least is clear: the current climate of economic uncertainty discourages any wild spending.

The market potential for novel systems is vast, then, but it will apparently be some time before any large part of this potential can be converted to vendor revenue. Possible solutions to the vendors' profit problems exist, too, including changes in technology, pricing, and policy structures. These solutions may eventually lead to unprecedented prosperity—but not for a while. 1980 does indeed look like a "confusing" year, and it may prove a "miserable" one for some vendors. The vendors that do best may be the most conservative; the ones currently shipping large quantities of products that offer low-cost capacity increments for users' present information systems. If so, 1980 will truly have separated fact from fantasy. ✲

FREDERIC WITHINGTON

A 25-year veteran in the computer industry, Mr. Withington is a vice president of Arthur D. Little Inc. He has written four books and 25 articles and papers, and is a longtime contributing editor to DATAMATION.

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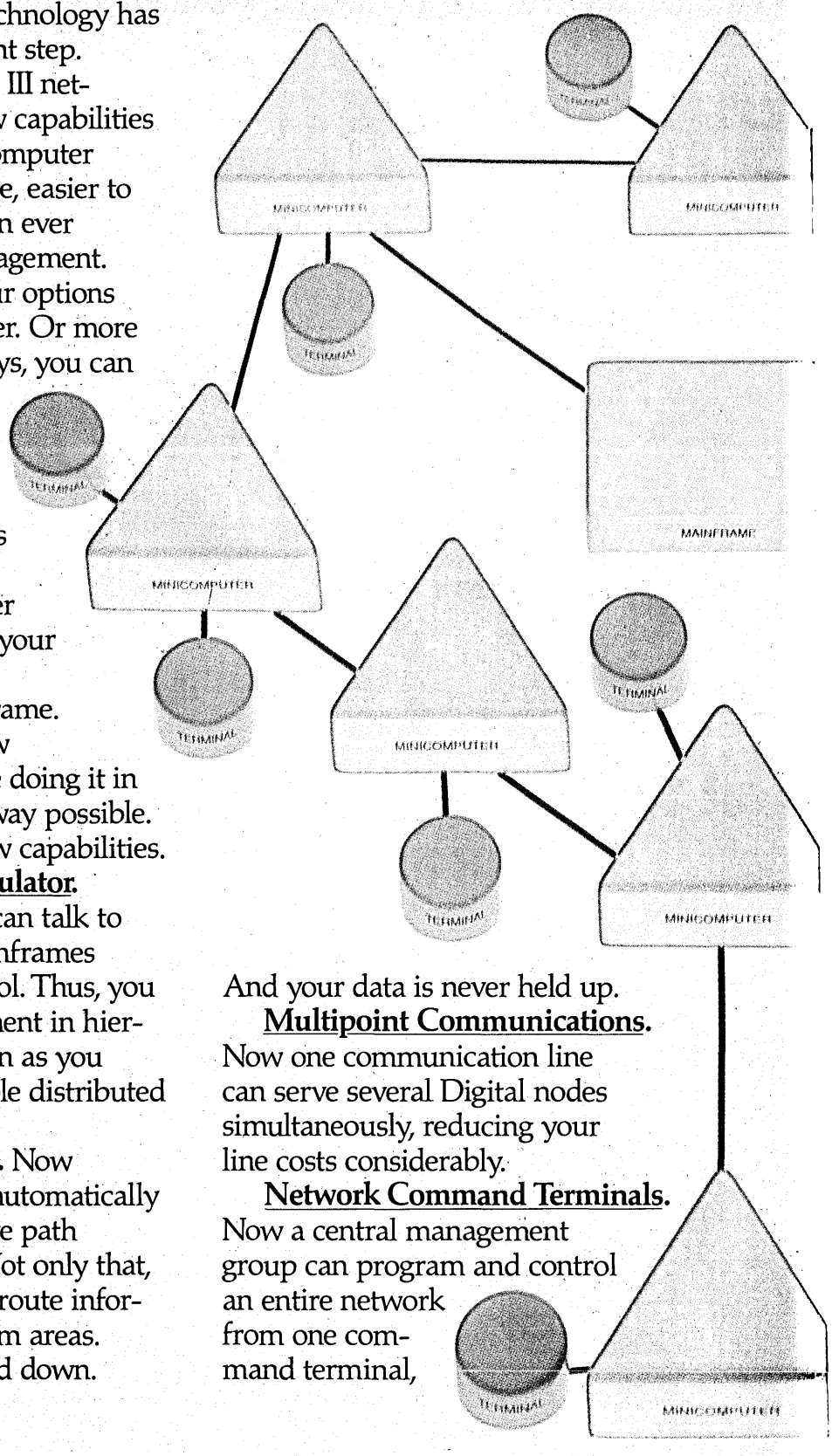

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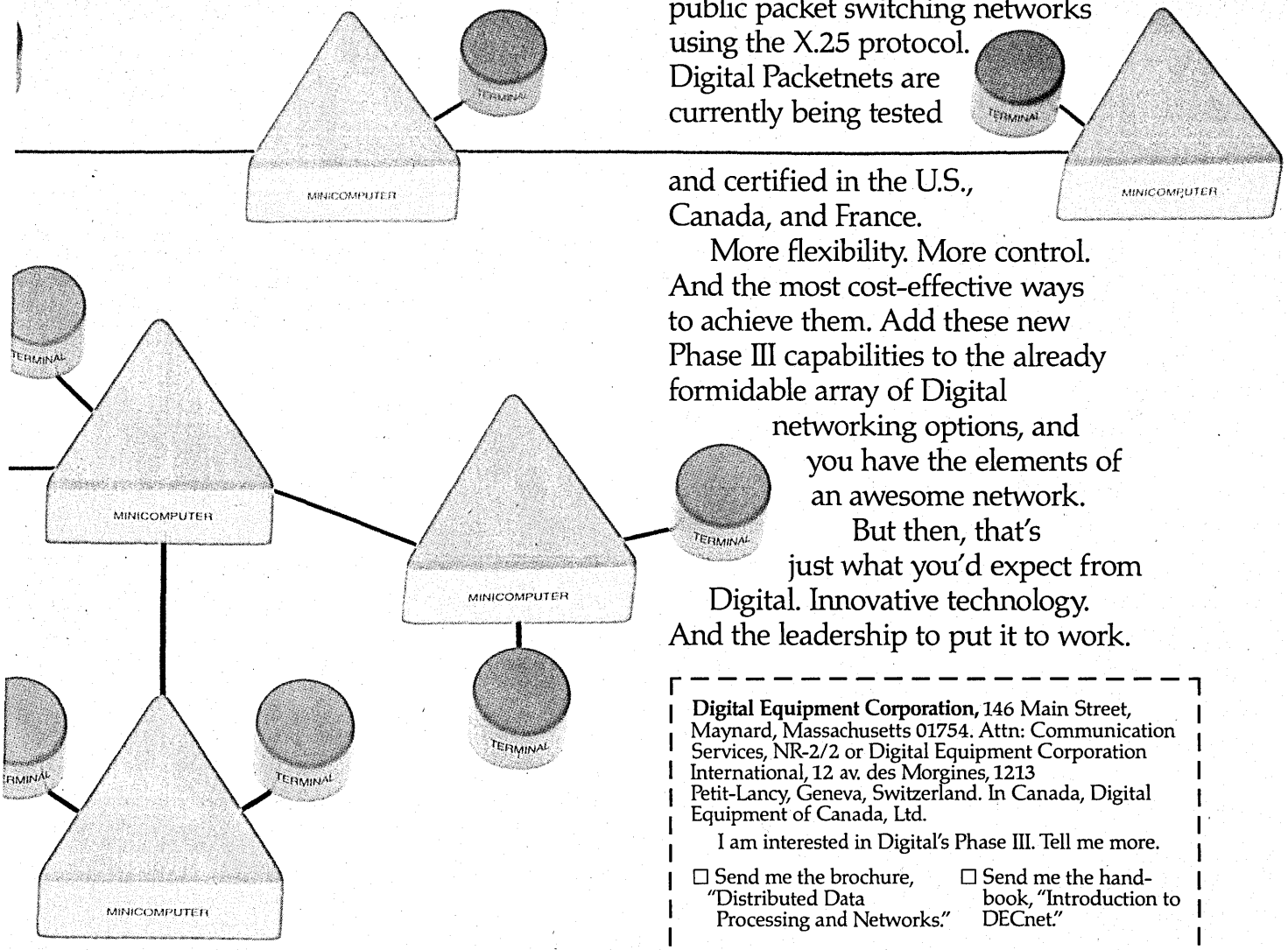

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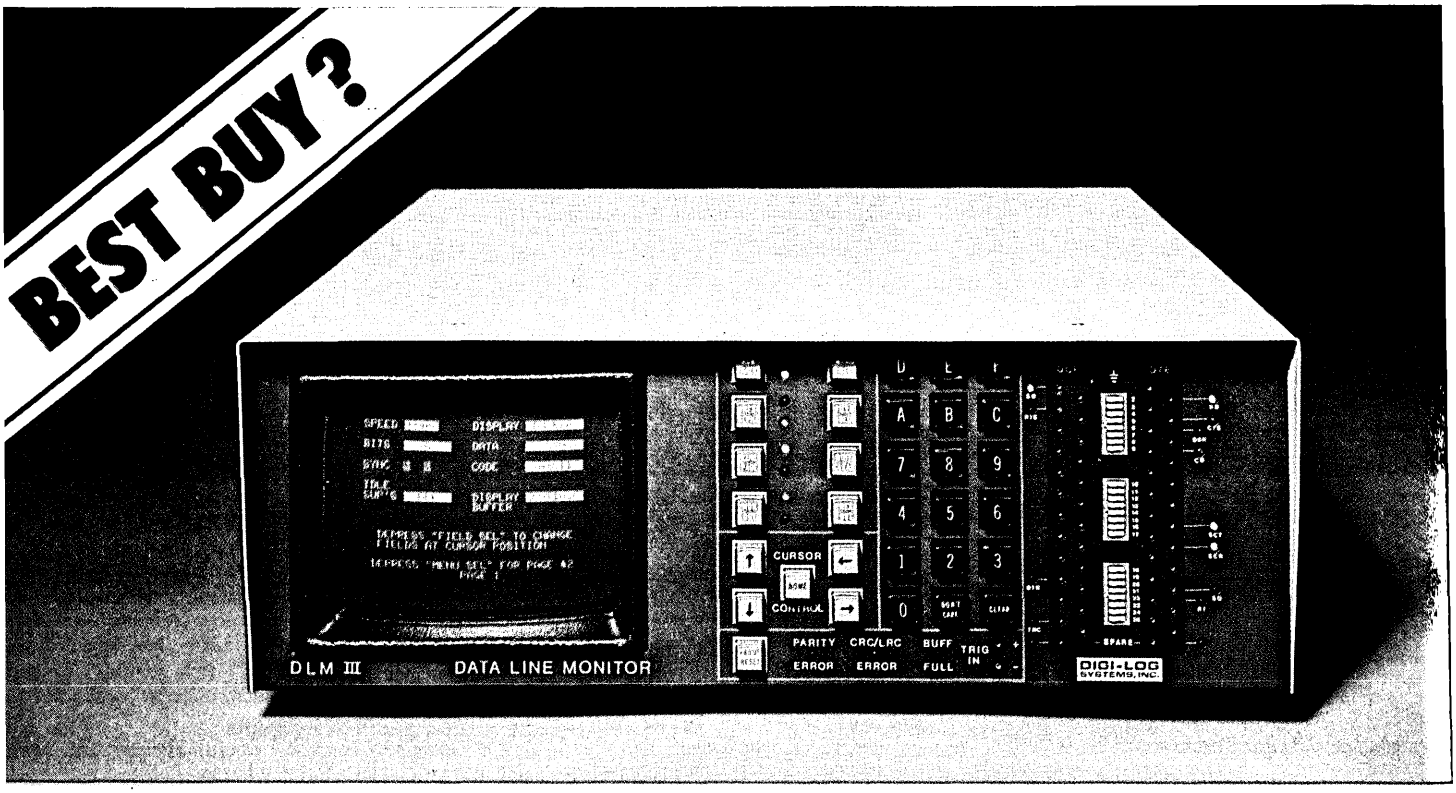

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THE DATAMATION 100

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

The growth of the dp industry in 1979, as measured by the worldwide dp revenue progress of the top 100 U.S. participants was a 15.7% increase over the 1978 figures. This growth, while appearing superficially strong, represents a weaker than expected performance. For example:

- Of the $45.6 billion in revenues generated in 1979, only 58%, or $26.7 billion, was generated in the U.S. And, while the overseas growth rate was a booming 25%, the U.S. growth rate was only 9.0%, well below last year's rate of inflation.
- The 15.7% growth rate for the top 100 companies was weighted toward the smaller firms; the top 10 companies grew by only 11%, and the top 50 by 14.6%. (Figures in 1978 and 1977 for the growth rate of the top 50 were 22% and 18%, respectively.)

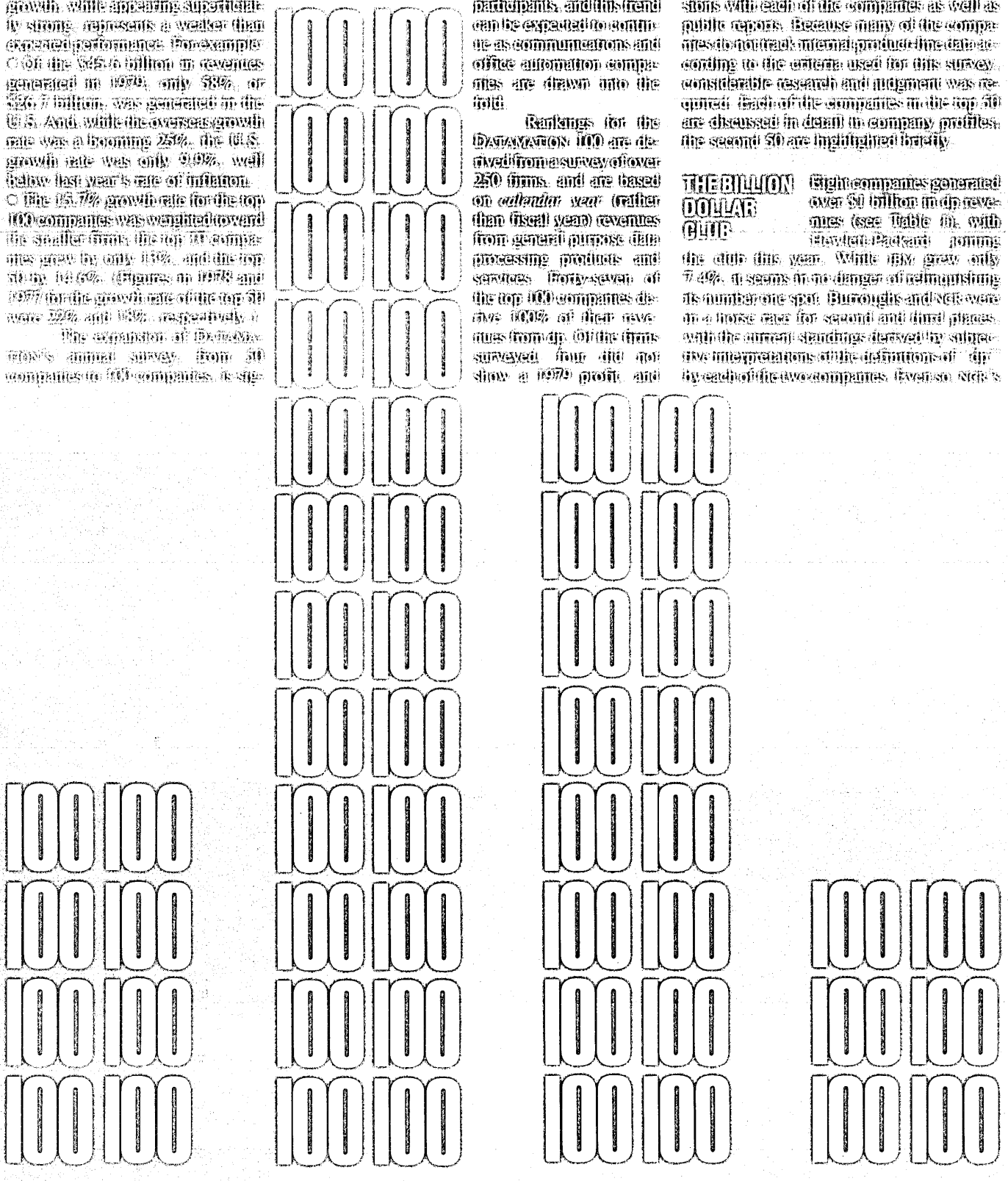
The expansion of Datamation's annual survey, from 50 companies to 100 companies, is significant and reflects the diversity and strength of the dp business. While there are the inevitable dropouts in the industry, there is a simultaneous rise of growth in substantive participants, and this trend can be expected to continue as communications and office automation companies are drawn into the field.

Rankings for the DATAMATION 100 are derived from a survey of over 250 firms, and are based on *calendar year* (rather than fiscal year) revenues from general purpose data processing products and services. Forty-seven of the top 100 companies derive 100% of their revenues from dp. Of the firms surveyed, four did not show a 1979 profit, and five experienced downturns in sales. IBM's market share, at 40%, was down three percentage points compared with 1978.

Estimates have been based on discussions with each of the companies as well as public reports. Because many of the companies do not track internal product-line data according to the criteria used for this survey, considerable research and judgment was required. Each of the companies in the top 50 are discussed in detail in company profiles; the second 50 are highlighted briefly.

THE BILLION DOLLAR CLUB

Eight companies generated over $1 billion in dp revenues (see Table II), with Hewlett-Packard joining the club this year. While IBM grew only 7.4%, it seems in no danger of relinquishing its number one spot. Burroughs and NCR were in a horse race for second and third places, with the current standings derived by subjective interpretations of the definitions of dp by each of the two companies. Even so, NCR's



dp growth rate of 24% versus Burroughs' 14% may indicate a trend. Control Data and Sperry were even closer competitors for fourth and fifth places; however, the growth rates differed markedly, with Control Data pulling ahead. Digital Equipment has sixth place locked up, but with a 27% growth rate, and only $400 million behind Burroughs, may soon challenge the others for number two position. Honeywell was not given credit for Honeywell-Bull revenues, and therefore lagged behind the top six.

It is interesting to track the *absolute* dp revenue gains of the top companies. IBM led with an increase of $1.264 billion, which was tantamount to creating, in one year, an incremental force the size of the Tandy Corp. Besides the top eight above, four others added $100 million or more during 1979. Most noteworthy were Storage Technology and Xerox, with increases of over $170 million each. Data General and Texas Instruments grew by over $100 million, while Wang, Memorex, and Computer Sciences just missed.

As expected, most firms maintained their rank between 1978 and 1979 within a few positions, but some dramatically improved their relative position, and some dramatically declined (see Table 2). Of those who gained, the three microcomputer firms, Apple, Commodore, and Tandy, were standouts. Obviously, these companies were at or near the top of the growth rate sweepstakes, with gains of 650%, 150%, and 131% respectively. The table shows those companies that either gained or lost 10 ranking positions or more.

TABLE 1

	1979 Dp Rev ($M)	1979 Growth %	1978 Ranking
IBM	$18,338	7.4	1
Burroughs	2,432	13.5	2
NCR	2,404	24.4	4
Control Data	2,273	21.7	5
Sperry Rand	2,270	15.5	3
DEC	2,032	26.9	6
Honeywell	1,453	12.3	7
Hewlett-Packard	1,030	41.1	8

TABLE 2

	# Positions Gained in Ranking	1979 Ranking	Dp Growth %
Apple	39	61	650
Commodore	19	75	150
Tandy	18	40	131
Tandem	14	70	116
AM International	14	66	99
Computervision	13	55	112
National CSS	13	50	83
Comshare	12	69	100
Cray Research	11	87	148
Prime	10	38	64
Inforex	18	74	(15)
Itel	16	26	*
Decision Data	15	89	1.5
Calcomp	13	52	(17)
EM&M	12	79	5
Olivetti	11	96	17
Grumman	11	97	17
Planning Research	10	48	(8)
Computer Research	10	67	4
Cincom	10	100	16

* Itel ranking based on nine months results for 1979, since full-year financial statements were not available by publication date.

TABLE 3

	1977 ($M)	1977 % total	1979 ($M)	1979 % total	% Change	Annualized % Change
Mainframes	7,387	24	7,185	16	(3)	(1)
Minicomputers	2,502	8	4,360	10	74	32
Peripherals & Terminals	13,766	44	20,507	45	49	22
Service & Software	5,685	18	11,828	25	108	44
Other (Media & Supplies)	1,771	6	1,807	4	2	1
Total	**31,111**	**100**	**45,687**	**100**	**47**	**21**

THE BROAD CLASSIFICATIONS

Even considering all the disclaimers which we can muster relative to the broad breakdown of each company's revenues into five categories, we would be negligent not to present the aggregated results. In Table 3, 1978 data were not available, and we were not able to restate, so we compared survey results with the reported statistics from the 1977 survey, grossing those up to account for the fact that only 50 companies were tracked then. Mainframes show an essentially flat performance measured on revenues, which may reflect even worse performance in terms of shipments when one notes a general secular shift towards more purchase activity over this two-year span. In regard to systems, a substantial portion of the peripherals and terminals category consists of local end-user peripherals, improving the picture somewhat. But even if both categories are summed, they would represent 61% of total industry revenues in 1979, down from 68% in 1977. The most impressive performance among these revenue classifications is the service and software category, with a 44% indicated annual growth.

The true measure of the health of an industry is its level of profitability. As a result of competitive and inflationary pressures as well as the increasing cost of money and a higher propensity of customers to lease instead of purchase, margins were adversely affected in 1979.

Only 50 companies were available for profit analysis. The other companies were either privately held and unwilling to divulge profits, or had too large a percentage of their business (in excess of 25%) in areas outside of data processing to estimate dp profits.

The total earnings for these 50 companies only increased 0.9% to $4.2 billion in 1979. This increase was negatively weighted by IBM's 3.2% decline in 1979; excluding IBM, profits increased 13% to $1.2 billion, barely exceeding inflation. After-tax margins for the 50 companies decreased to 11.1% in 1979 from 12.5% the prior year, and excluding IBM, margins suffered a 0.6% decline to 8.0%.

During 1979, only seven companies had after-tax margins in excess of 10%, down from 14 in 1978. In all, 20 companies experienced an increase in after-tax margins, and 30 companies experienced a decline. In spite of the average lower rate of profitability, increased demand for computer equipment and services resulted in 36 of the 50 firms showing greater *absolute* after-tax earnings during 1979. Of the 15 companies reporting lower earnings, eight were peripherals vendors,

Although most firms maintained their rank within a few positions, some dramatically improved their relative positions and others dramatically declined.

TABLE 4
MAINFRAME COMPANIES

Ranking by 1979 Dp Rev. Growth Rate		1979 Dp Revenue Growth Rate	1979 US Dp Revenue Growth Rate	1979 Dp Revenue	1979 % of Total Revenue	1979 After-Tax Margins	1978 After-Tax Margins	1979 Earnings Growth Rate
3	Cray Research	148.3	−2.1	42.7	100.0	18.3	15.1	200.0
51	NCR	24.4	24.4	2404.0	80.1	7.8	NA	NA
56	Control Data	21.7	23.8	2273.0	69.9	NA	NA	NA
75	Sperry Univac	15.5	11.4	2270.0	49.5	NA	NA	NA
78	Burroughs	13.5	11.2	2432.0	87.3	11.0	10.5	20.6
83	Honeywell	12.3	17.3	1453.0	34.5	NA	NA	NA
89	IBM	7.4	4.9	18338.0	80.2	13.2	14.8	−3.2
96	Amdahl	−6.6	−14.5	299.6	100.0	5.7	15.0	−64.5
100	Itel	−54.5	−54.5	221.3	48.1	NA	NA	NA

TABLE 5
MINICOMPUTER COMPANIES

Ranking by 1979 Dp Rev. Growth Rate		1979 Dp Revenue Growth Rate	1979 US Dp Revenue Growth Rate	1979 Dp Revenue	1979 % of Total Revenue	1979 After-Tax Margins	1978 After-Tax Margins	1979 Earnings Growth Rate
6	Tandem Computers	115.6	144.9	66.4	100.0	9.2	9.1	117.9
9	AM International	98.6	98.7	69.5	8.5	NA	NA	NA
15	Prime Computer	63.5	63.9	152.9	100.0	11.0	9.0	101.0
20	Wang Labs.	53.8	58.4	280.0	68.3	NA	NA	NA
28	Hewlett-Packard	41.1	38.5	1030.0	41.5	NA	NA	NA
35	Texas Instruments	32.8	34.6	425.0	13.2	NA	NA	NA
38	Data General	31.7	29.4	539.6	100.0	9.3	10.7	14.1
43	Management Assistance	28.0	17.4	283.4	100.0	6.0	8.1	−4.8
47	Digital Equipment	26.9	26.9	2031.6	100.0	10.2	9.6	35.3
48	Qantel	26.1	20.8	58.0	100.0	8.6	4.3	150.0
52	Nixdorf Computer	23.5	23.5	10000.0	100.0	NA	NA	NA
64	Pertec Computer	19.7	22.6	171.0	100.0	3.2	6.3	−38.9
70	Harris	16.7	15.4	210.0	20.0	NA	NA	NA
76	Systems Eng. Laboratories	15.3	15.7	71.0	100.0	5.8	5.5	20.6
79	Perkin-Elmer	13.4	15.5	172.5	22.0	NA	NA	NA
84	Modular Computer	11.3	9.4	71.8	100.0	6.5	6.8	6.8
85	General Automation	10.8	5.0	122.3	100.0	.1	6.4	−98.4
92	Computer Automation	3.6	1.8	69.4	100.0	−3.2	3.7	−188.0

three were minicomputer vendors, three were mainframe vendors, and one was a service company.

Of the top eight companies cited in the "Billion Dollar Club," we have grouped together the five plus traditional systems suppliers in the "mainframe" sector, and added Amdahl, Itel, and Cray Research. (During 1979, of course, Itel divested itself of all dp-related mainframe and service operations.) This sector in total generated 65% of all dp revenues. After-tax corporate margins for this sector, which is dominated by IBM, declined to 13% from 15% in 1978. But mainframe manufacturers still maintained the highest margins of all the sectors, ranging from a low of 5.7% for Amdahl (down from 15% in 1978), to 18.3% for Cray Research, the highest after-tax margin of all companies in the survey. IBM and Burroughs both had margins in excess of 10%, although IBM's profitability declined to 13.2% from 14.8% in 1978. The dp growth rate for this group was 9.7% worldwide, weighted down by IBM's lackluster 7.4%. NCR's growth in dp of 24.4% happened to be the median growth company of our entire 100-company population. Table 4 shows statistics for the mainframe firms, ranked by 1979 dp growth rates.

Perhaps small systems is the preferred descriptor for 19 vendors we placed in the Minicomputer category. Table 5 shows this group ranked by revenue growth rate. The group as a whole generated $6.1 billion in revenues, or 13% of total, led by DEC at $2 billion. The top three (DEC, Data General, and Hewlett-Packard), accounted for 60% of the sector's revenue. The percentage of dp revenues generated in the U.S. was 65%, a significantly higher percentage than the 51% generated by the mainframe companies. Of course, the mainframe companies are active in small systems, but were excluded from this portion of the analysis. Dp growth for the minicomputer group was 31%, outpacing expansion for the mainframe sector. The minicomputer share of total dp revenues rose from 11.5% to 13% against a 3.5% drop for mainframes. Twelve of the 19 companies had growth exceeding 20% as compared with only NCR, Control Data and Cray Research among the mainframers.

Of the 11 companies sampled for profitability in the minicomputer sector, five

TABLE 6
PERIPHERAL COMPANIES

Ranking by 1979 Dp Rev. Growth Rate		1979 Dp Revenue Growth Rate	1979 US Dp Revenue Growth Rate	1979 Dp Revenue	1979 % of Total Revenue	1979 After-Tax Margins	1978 After-Tax Margins	1979 Earnings Growth Rate
10	Printronix	91.8	79.7	32.8	100.0	8.8	9.4	81.3
14	Documation	66.1	66.4	84.9	100.0	2.8	11.5	−59.3
17	Storage Technology	59.6	53.0	479.5	100.0	8.3	8.9	48.1
18	Xerox	57.8	49.6	475.0	6.8	NA	NA	NA
31	Centronics	35.4	29.6	129.2	100.0	14.8	15.1	32.6
49	ITT	25.0	25.0	260.0	1.2	NA	NA	NA
57	General Instrument	21.6	17.2	141.0	21.1	NA	NA	NA
65	Telex	19.0	21.3	104.4	65.0	NA	NA	NA
66	TRW	18.9	27.8	440.0	9.6	NA	NA	NA
67	Ampex	17.7	11.4	156.3	35.4	NA	NA	NA
68	MSI Data	17.1	13.0	46.5	99.8	4.3	9.2	−45.9
73	Memorex	16.5	8.9	664.0	90.0	4.3	7.9	−37.3
80	Recognition Equip.	13.3	12.8	98.2	100.0	2.6	5.4	−44.7
82	Conrac	12.7	7.9	62.0	45.2	NA	NA	NA
86	3M	10.7	11.6	310.0	5.7	NA	NA	NA
88	Northern Telecom	9.1	9.1	300.0	100.0	NA	NA	NA
90	Dataproducts	6.6	1.6	149.5	86.6	5.6	10.0	−38.9
91	Electronic Memories	4.7	5.0	51.1	47.9	NA	NA	NA
94	Decision Data	1.5	−3.3	41.4	100.0	1.4	5.6	−73.9
98	Inforex	−14.6	−47.9	61.0	100.0	−13.1	4.9	−328.6
99	California Computer	−16.7	−25.9	107.4	10.0	−16.7	1.6	−995.0

TABLE 7
TERMINAL COMPANIES

Ranking by 1979 Dp Rev. Growth Rate		1979 Dp Revenue Growth Rate	1979 US Dp Revenue Growth Rate	1979 Dp Revenue	1979 % of Total Revenue	1979 After-Tax Margins	1978 After-Tax Margins	1979 Earnings Growth Rate
7	Computervision	11.5	130.6	103.0	78.3	9.9	NA	NA
13	Data Terminal Systems	80.6	74.6	36.3	37.7	NA	NA	NA
23	Lear Siegler	44.4	36.1	65.0	4.8	NA	NA	NA
27	Datapoint	41.1	45.9	252.3	100.0	10.9	10.0	54.5
29	Gerber Scientific	39.0	21.8	36.3	64.5	NA	NA	NA
33	Tektronix	33.9	32.4	195.0	22.2	NA	NA	NA
37	Four-Phase Systems	31.8	26.3	178.7	100.3	9.4	9.0	36.9
41	Raytheon	28.0	28.9	180.0	4.3	NA	NA	NA
59	Mohawk Data Sciences	21.1	26.2	198.2	100.0	6.2	4.4	69.4
61	Quotron Systems	20.3	20.3	47.4	100.0	14.8	11.4	55.6
63	Hazeltine	19.8	19.9	73.9	59.9	NA	NA	NA
69	Teletype	16.9	16.9	145.0	44.3	NA	NA	NA
71	Olivetti	16.7	16.7	35.0	20.6	NA	NA	NA
77	Bunker Ramo	14.5	10.9	135.9	31.9	NA	NA	NA
87	Applied Digital Data	10.7	10.7	51.9	100.0	5.6	14.1	−56.1

(Prime, DEC, Tandem, Qantel, and Systems), improved margins. The bottom six ranged from a loss to a 6.5% after-tax profit.

THE PERIPHERAL VENDORS We classified 20 companies as peripheral vendors (see Table 6). This $4 billion segment, 9% of total dp 100 revenues, was led by Memorex at $664 million. Unlike the mainframe and minicomputer sectors, the peripheral sector was less dominated by a few vendors, as the top five accounted for only 54% of the total. The explanation for the lesser market-share dominance by the top few vendors is based on the different types of expertise required for each type of peripheral —printers, disk drives, tape drives, and data entry equipment. In addition, peripheral manufacturers focus not only on a product line, but also on certain market segments. For example, printer manufacturers Dataproducts, Centronics, and Printronix make products for the minicomputer market and marketing is predominantly oem, while Documation focuses on the printer replacement market for mainframes, sold primarily to end users. The growth rate of this sector was 23%, slowed down by plug-compatible add-on memory manufacturers and to some extent the tape and disk drive manufacturers (particularly Memorex, Telex, and Calcomp, but not Storage Technology).

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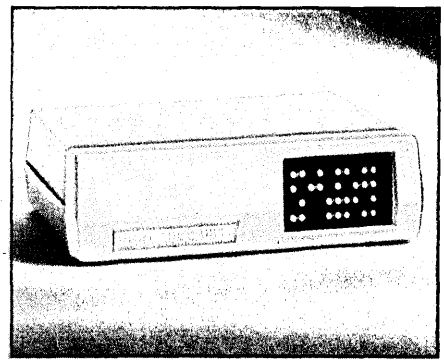

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- **Synchronous or Asynchronous input protocol**
- **X.25 Level 2 support**
- **Built-in diagnostics**
- **Optional High Speed backup lines**
- **No impact to existing terminals, computers, or software**
- **Many other standard and optional features**

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For further information contact the Data Communications Marketing Department.

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A MACOM Company
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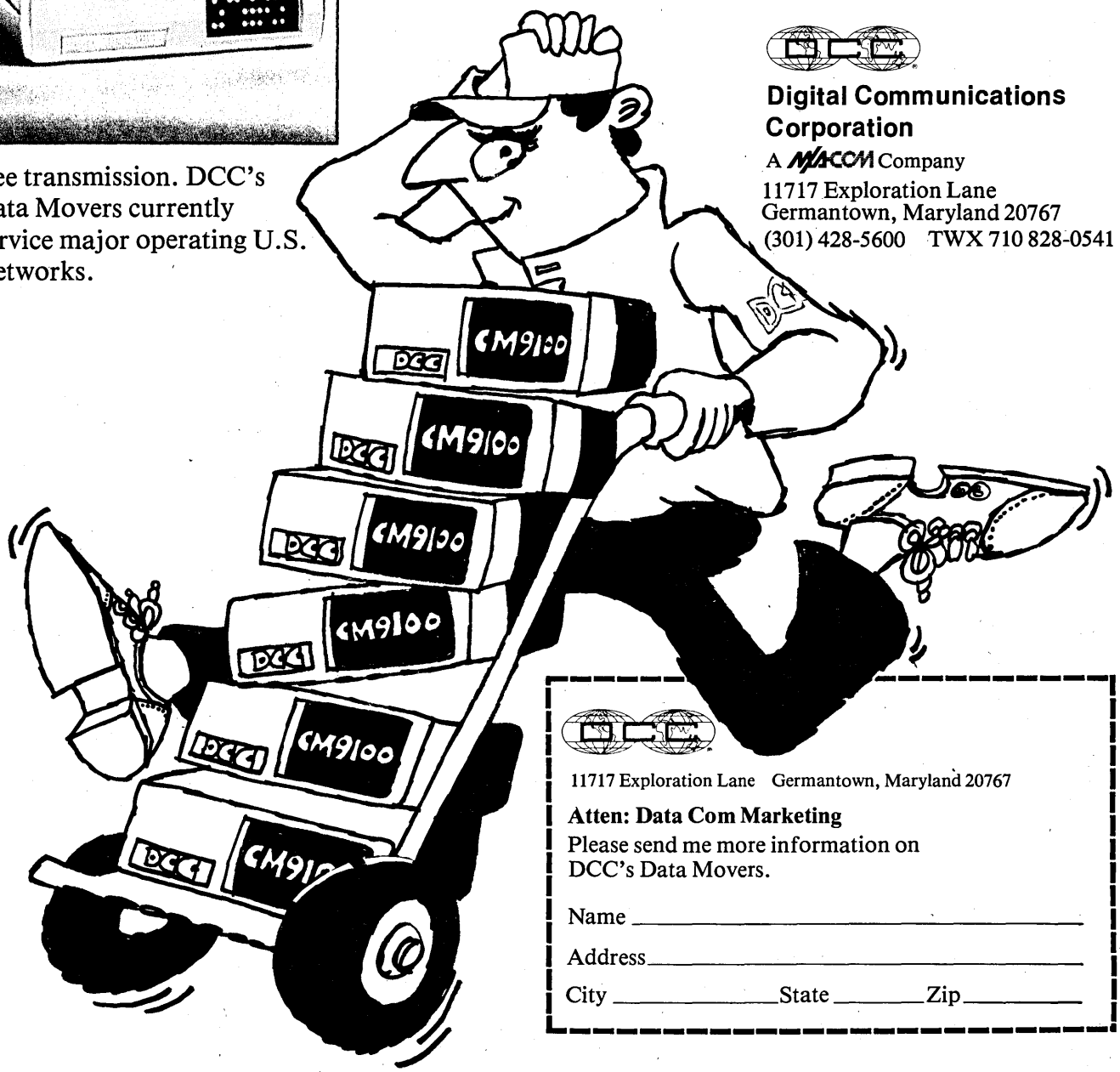

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CIRCLE 72 ON READER CARD

The overall revenue growth rate for the peripherals sector was 23%, but intense competition resulted in lower margins for all 11 companies reporting.

TABLE 8
SOFTWARE AND SERVICES COMPANIES

Ranking by 1979 Dp Rev. Growth Rate		1979 Dp Revenue Growth Rate	1979 US Dp Revenue Growth Rate	1979 Dp Revenue	1979 % of Total Revenue	1979 After-Tax Margins	1978 After-Tax Margins	1979 Earnings Growth Rate
8	Comshare	99.7	11.9	66.9	100.0	6.9	10.1	35.3
11	Anacomp	85.4	89.3	35.8	71.2	NA	NA	NA
12	Dun & Bradstreet	83.3	52.5	110.0	11.6	NA	NA	NA
21	American Mgmt Systems	51.3	51.1	48.1	100.0	3.5	4.4	21.4
22	Interactive Data	50.0	49.8	42.0	100.0	NA	NA	NA
24	Martin Marietta	43.1	42.9	67.1	3.3	NA	NA	NA
25	Reynolds & Reynolds	43.0	41.5	109.5	57.9	NA	NA	NA
26	Manufacturing Data	42.6	35.3	45.5	100.0	9.9	10.7	32.4
30	Mgmt Science America	36.7	22.2	35.0	100.0	4.6	3.9	60.0
34	United Telecom	33.8	34.4	138.4	7.7	NA	NA	NA
36	Electronic Data Systems	31.9	31.0	311.5	95.9	7.9	9.0	18.3
39	Shared Medical Systems	31.2	31.2	82.8	100.0	13.0	13.6	25.6
40	Computer Sciences	28.7	22.1	416.1	100.0	4.5	4.9	19.7
42	The Sun Company	28.0	28.0	64.0	.6	NA	NA	NA
44	Commerce Clearing House	27.7	27.7	49.3	23.3	NA	NA	NA
45	Tymshare	27.5	27.5	176.0	91.1	7.6	7.1	37.7
46	General Electric	27.3	14.6	350.0	1.5	NA	NA	NA
50	First Data Resources	25.0	25.0	50.0	100.0	NA	NA	NA
53	National Data	22.8	24.1	54.4	100.0	9.4	8.1	41.7
54	Automatic Data Processing	22.5	22.5	400.8	98.0	8.8	9.0	20.1
55	McDonnell Douglas	22.2	17.7	253.0	4.8	NA	NA	NA
58	Informatics	21.5	14.9	112.4	100.0	2.8	1.6	106.7
60	Optimum Systems	20.3	20.3	35.5	100.0	NA	NA	NA
62	Boeing	20.0	.0	96.0	1.2	NA	NA	NA
72	Grumman	16.7	16.7	35.0	2.3	NA	NA	NA
74	Cincom Systems	15.7	15.7	30.9	100.0	4.2	8.6	−43.5
81	Wyly	12.8	14.1	89.0	100.0	5.3	3.3	80.8
93	System Development	2.3	2.3	163.1	100.0	3.8	1.3	210.0
95	Bradford National	1.2	1.2	120.1	100.0	4.7	4.1	16.3
97	Planning Research	−8.6	15.8	119.6	48.1	NA	NA	NA

Except for Dataproducts, which was hampered by start-up problems with its new product lines, the printer manufacturers did well in 1979 with respect to growth rates. Printronix grew at 92%, Documation at 66% and Centronics at 35%.

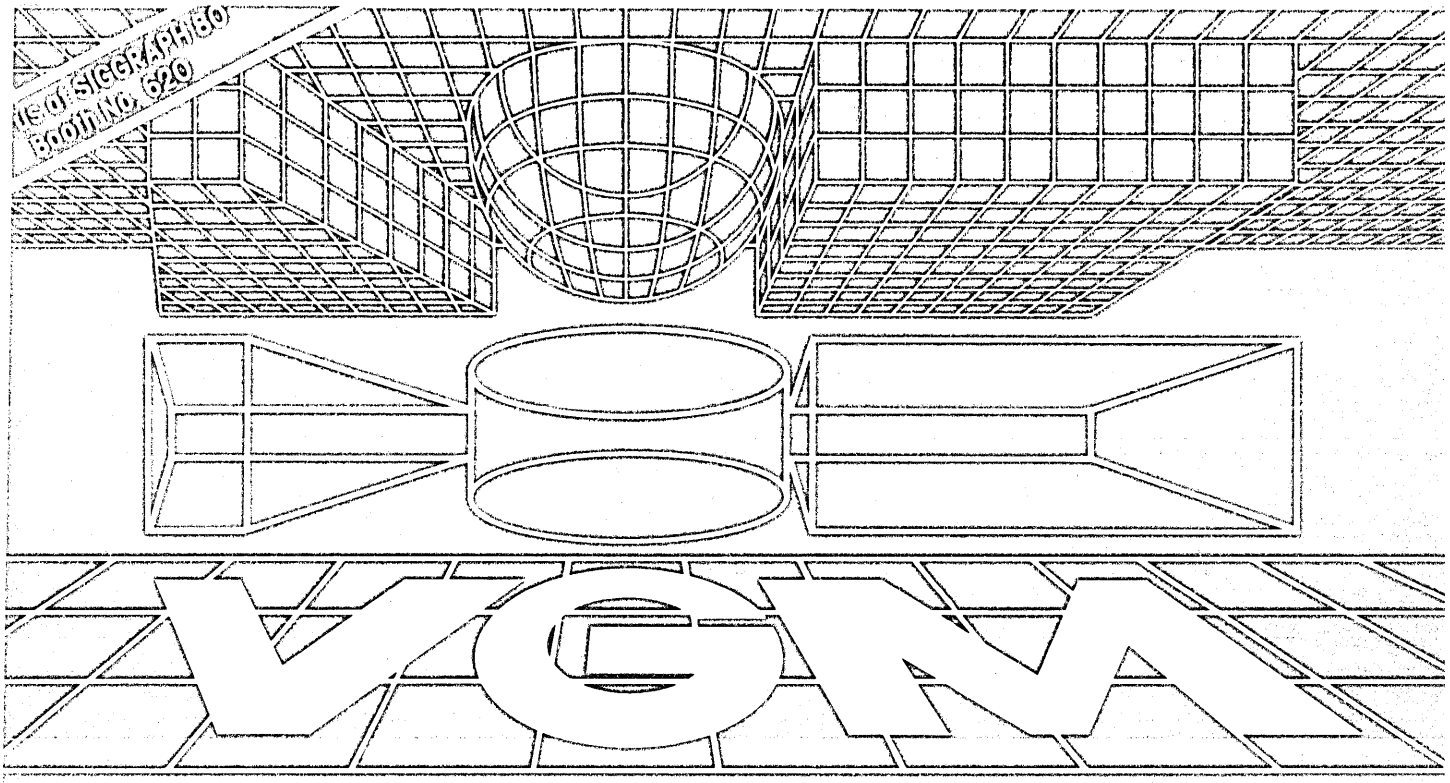
The overall revenue growth rate was 23% for the peripherals sector. However, intense competition resulted in lower margins for all 11 companies reporting. Even highly profitable Centronics, at 14.8%, showed an after-tax margin decline. Only four companies had margins in excess of 6%, and two, Inforex and Calcomp, experienced losses. In addition, five companies had margins pared in excess of 60%. The peripherals market has indeed become more hazardous.

The terminal and terminal-based subsystem segment, with $1.5 billion or 4% of total, included 15 vendors (see Table 7). Of these, the three largest (Datapoint, Mohawk Data, and Four-Phase) are basically distributed data processing vendors; four vendors manufacture crt displays; two vendors manufacture terminal-based systems for the finance industry; two vendors sell systems for computer-aided design/computer-aided manufacturing (CAD/CAM) and one vendor, Data Terminals, sells point of sale (POS) terminals to retail vendors.

Terminal vendors had an excellent year in 1979. Computervision (112%) and Gerber Scientific (40%) led the way in the CAD/CAM sector, and Datapoint (45%) and Four-Phase (32%) continue to register solid gains in distributed data processing. The lowest growth rates in this sector were experienced by crt manufacturers (with the exception of Lear Siegler) and suppliers of terminals to the financial industry.

In addition, the terminals group was the only one reporting higher margins on average. Only Applied Digital Data Systems incurred a lower margin. Quotron and Datapoint, with margins of 14.8% and 13.6%, ranked third and fourth of all companies reporting.

The largest sector in terms of *number* of companies making the list, was software and services, with 30 firms accounting for 8% of total revenues (see Table 8). This group



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CIRCLE 73 ON READER CARD

Software and service firms, collectively, grew 26% in 1979.

TABLE 9
PERSONAL COMPUTERS/COMPUTER MEDIA COMPANIES

Ranking by 1979 Dp Rev. Growth Rate		1979 Dp Revenue Growth Rate	1979 US Dp Revenue Growth Rate	1979 Dp Revenue	1979 % of Total Revenue	1979 After-Tax Margins	1978 After-Tax Margins	1979 Earnings Growth Rate
1	Apple Computer	650.7	650.7	75.0	100.0	NA	NA	NA
2	Commodore Int'l.	150.0	92.3	55.0	55.4	NA	NA	NA
4	Tandy	130.8	125.8	150.0	11.6	NA	NA	NA
5	Dysan	118.3	118.3	38.2	100.0	7.3	18.3	−12.5
16	Verbatim	63.0	55.0	45.0	100.0	4.4	8.0	−9.1
19	Nashua	56.1	69.1	39.5	6.5	NA	NA	NA
32	BASF Systems	35.0	35.0	54.0	NA	NA	NA	NA

provides a mixture of activities including remote computer services, time-sharing, access to data bases, operating system software, and applications programming. The top five vendors accounted for 47% of the group's $3.7 billion in revenues. This segment had the highest percentage of dp revenues generated in the United States (86%). We attribute this to the faster development and acceptance of the service business in the U.S. as compared to Europe, and to regional differences due to language and custom, which are more pronounced in services than in hardware.

The software and service firms, collectively, grew at 26% in 1979. The top three performers (83% to 100% growth), Comshare, Anacomp, and National CSS, grew mostly through acquisitions; of the remaining 27 firms only four had growth under 15%.

These firms had mixed financial results as seven of the sample of 15, which we tracked on profits, increased profitability. Unlike other sectors where the rich got richer, most of the increases were seen by the less profitable companies with the exception of National Data which increased margin by 1.3% to 9.4%. The last two sectors which we defined (see Table 9), disk/tape media (four companies) and personal computers (three companies), only account for 1% of total revenues. Tandy Corp. is the only vendor within these groups to make the top 50. But the personal computer manufacturers were clearly the star performers of 1979. Apple Computer, Commodore International, and Tandy Corp. ranked 1, 2, and 4 in dp growth rate, with Tandy lagging with "only" 131% growth in 1979. The media manufacturers, all of whom increased plant capacity, also had accelerated growth ranging from 35% for BASF to 118% for Dysan.

METHODOLOGY

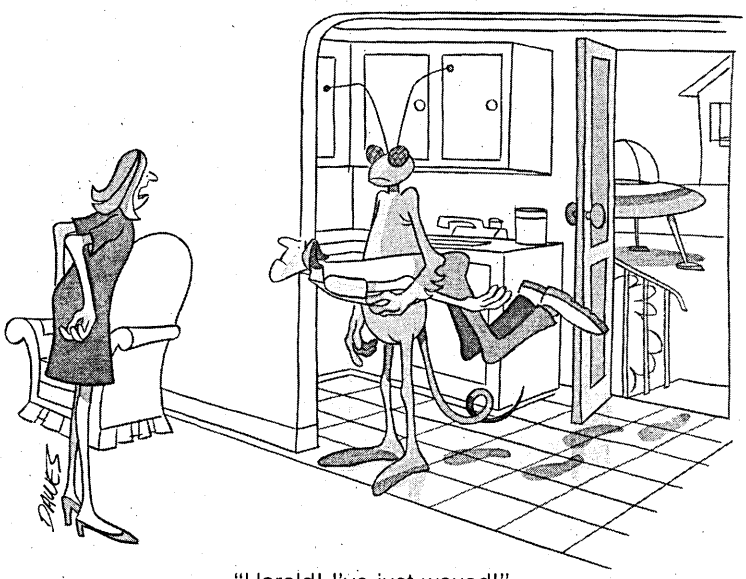
We have defined *data processing revenues* as general purpose data processing products and services during calendar 1979. Explicitly excluded are: communications devices such as modems, multiplexors, PABXs; regulated communication services; standalone equipment without functional connections to dp systems, such as general office equipment, electronic and mag card typewriters, and electronic cash registers; instrumentation; and dp supplies with the exception of magnetic media for disk and tape drives. Standalone equipment to be included must be programmable and all peripherals that attach to a dp system are included.

Prior year results were restated where possible to reflect improved data and to maximize consistency.

It was difficult to obtain data from privately held companies, dp divisions of large multinationals, and foreign-held companies. Much of our data are best estimates and have not been blessed by company sources; however, we did offer the surveyed companies every chance to respond to our estimates.

Earnings were only obtained from public companies, and only those companies which had high percentages of dp revenues were meaningful in understanding the profitability of the computer business. We defined earnings as after-tax, but before extraordinary gains and losses (for example, before gains/losses from discontinued operations).

Capital expenditures are easily obtained from the use of funds in the sources/uses of working capital statement, but this variable has different meanings. For example, hardware companies build manufacturing facilities and capitalize the expenditures; however, service companies may increase productive capacity by renting computers without capital expenditures. Too, capital expenditures for brick and mortar purposes are much different from capital expenditures which represent investments in rental equipment.*



"Harold! I've just waxed!"

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The Top 100 report was prepared for DATAMATION by the Gartner Group, a consulting organization in Greenwich, Conn.

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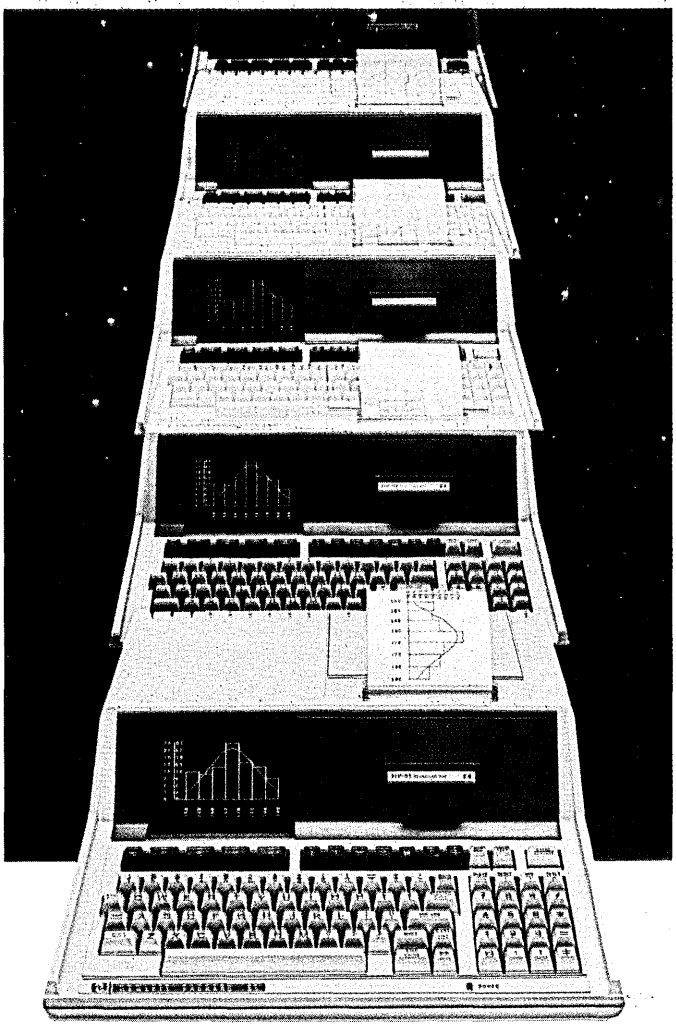

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CIRCLE 74 ON READER CARD

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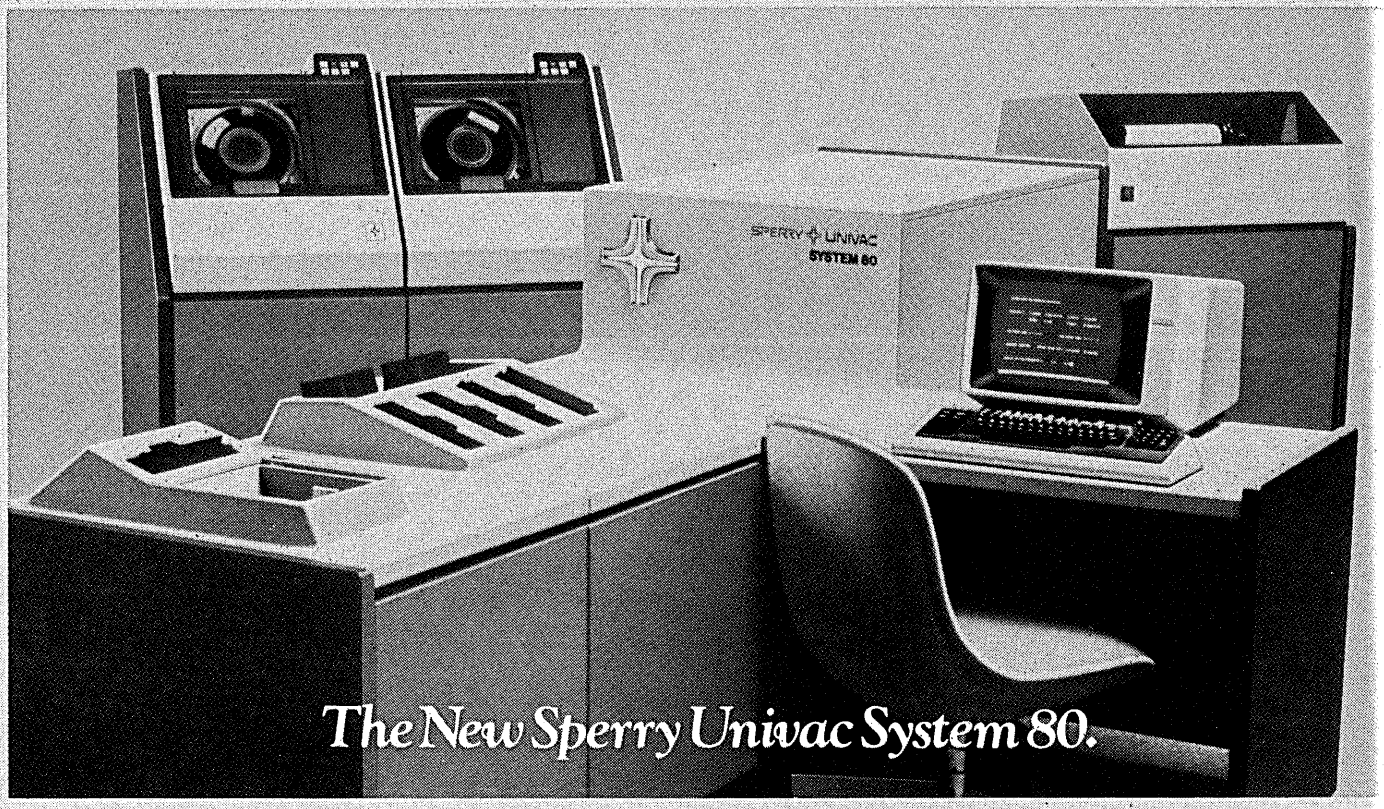

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The computer people who listen.

CIRCLE 75 ON READER CARD

THE DATAMATION 100

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

1979 RANK	COMPANY	1978 RANK*	ESTIMATED CALENDAR 1979 1979 DP REVENUES $M	% CHANGE 1978-1979	U.S. DP REVENUES %	1979 TOTAL REVENUES
1	IBM	1	18338	7	46	22863
2	Burroughs	2	2432	14	59	2786
3	NCR	4	2404	24	46	3003
4	Control Data	5	2273	22	68	3250
5	Sperry Rand	3	2270	16	55	4586
6	DEC	6	2032	27	62	2032
7	Honeywell	7	1453	12	67	4210
8	Hewlett-Packard	8	1030	41	52	2480
9	Memorex	9	664	16	51	738
10	Data General	11	540	32	73	540
11	Storage Technology	18	480	60	88	480
12	Xerox	17	475	58	85	7027
13	TRW	12	440	19	77	4560
14	Texas Instruments	16	425	33	82	3224
15	Computer Sciences	14	415	29	88	416
16	ADP	13	401	22	92	409
17	GE	20	350	27	79	22980
18	Electronic Data Systems	22	312	32	96	325
19	3M	19	310	11	81	5440
20	Northern Telecom Systems	21	300	9	65	300
21	Amdahl	15	300	−7	67	300
22	MAI	23	283	28	55	283
23	Wang	26	280	54	57	410
24	ITT	24	260	25	60	21996
25	McDonnell Douglas	25	253	22	84	5279
26	Datapoint	28	252	41	78	252
27	ITEL	10	221	−55	70	461
28	Harris	27	210	17	71	1049
29	Mohawk	29	198	21	40	198
30	Tektronix	32	195	34	62	878
31	Four-Phase Systems	36	179	32	80	178
32	Tymshare	35	176	28	95	193
33	Perkin-Elmer	31	173	13	75	785
34	Pertec Computer	33	171	20	74	171
35	System Development	30	163	2	100	163
36	Raytheon	40	160	28	78	3728
37	Ampex	37	156	18	53	442
38	Prime Computer	48	153	63	67	153
39	Tandy	58	150	131	93	1296
40	Dataproducts	34	150	7	79	173
41	Teletype	41	145	17	100	327
42	General Instrument	44	141	22	96	667
43	United Telecommunications	46	138	34	76	1792
44	Bunker Ramo	42	136	14	82	426
45	Centronics	47	129	35	67	129
46	General Automation	45	122	11	67	122
47	Bradford National	43	120	1	100	120
48	Planning Research	38	120	−8	92	260
49	Informatics	49	112	22	86	112
50	National CSS	63	110	83	82	952

*For 51-100, the rank is based only on this population. For 1-50, the calendar rankings for 1978 may vary from prior surveys due to restatements and other changes.

% CHANGE 1978-1979	1979 NET INCOME $M	% CHANGE 1978-1979	TOTAL EMPLOYEES	REPORTED FISCAL 1979 1979 TOTAL REVENUES $M	1979 NET INCOME $M	YEAR ENDING
8	3011.0	−3	337,119	22863	3011.0	Dec
15	305.5	21	56,509	2786	305.5	Dec
15	234.6	21	67,000	3002	234.6	Dec
19	124.0	39	57,000	3250	124.0	Dec
13	259.2	21	90,000	4179	224.0	Mar
27	207.5	35	49,000	1804	178.4	Jun
19	240.0	32	94,620	1453	240.0	Dec
36	212.0	32	52,000	2361	203.0	Oct
17	31.5	−37	12,264	738	31.5	Dec
32	50.0	14	13,710	508	49.8	Sep
60	39.7	48	7,351	480	39.7	Dec
16	563.1	18	115,705	7027	563.1	Dec
20	194.6	12	97,935	3787	174.2	Dec
26	172.8	23	85,779	3227	172.9	Dec
29	18.8	19	13,200	343	14.2	Mar
22	35.9	20	10,900	371	33.2	Jun
14	1409.0	15	409,000	22980	1409.0	Dec
34	25.8	18	10,646	274	23.7	Jun
17	655.0	16	NA	5440	655.0	Dec
9	NA	NA	6,100	300	NA	Dec
−7	17.1	−65	3,638	300	17.1	Dec
28	17.0	−5	5,000	272	17.0	Sep
67	36.9	83	9,177	322	29.0	Jun
13	380.7	−42	NA	NA	NA	Dec
28	199.1	24	82,700	5279	199.1	Dec
41	27.5	54	5,300	232	25.2	Jul
−33	−217.0	−560	NA	487	42.2	Dec
13	68.0	19	20,100	982	63.0	Jun
21	12.2	69	4,000	178	9.6	Apr
30	84.5	32	22,224	787	77.2	May
31	16.7	37	3,422	179	16.7	Dec
29	14.6	38	3,132	193	14.6	Dec
27	55.5	40	14,166	733	50.3	Jul
20	5.5	−39	3,348	148	8.3	Mar
2	6.2	210	3,900	166	3.7	Jun
15	197.0	31	67,200	3728	197.0	Dec
23	36.6	54	12,000	380	27.4	Apr
63	16.9	101	2,562	153	16.9	Dec
12	92.7	22	20,700	1216	83.2	Jun
10	9.6	−39	4,400	164	14.2	Mar
NA	NA	NA	NA	NA	NA	Dec
28	45.7	50	24,000	551	34.1	Feb
25	182.9	9	29,601	1792	182.9	Dec
11	23.3	24	9,800	426	23.3	Dec
35	19.1	33	2,700	122	18.4	Jun
11	0.1	−98	2,400	116	2.5	Jul
1	5.7	16	3,800	120	5.7	Dec
3	5.0	−9	6,500	262	5.0	Jun
22	3.1	107	2,700	112	3.1	Dec
25	88.8	26	24,000	952	88.8	Dec

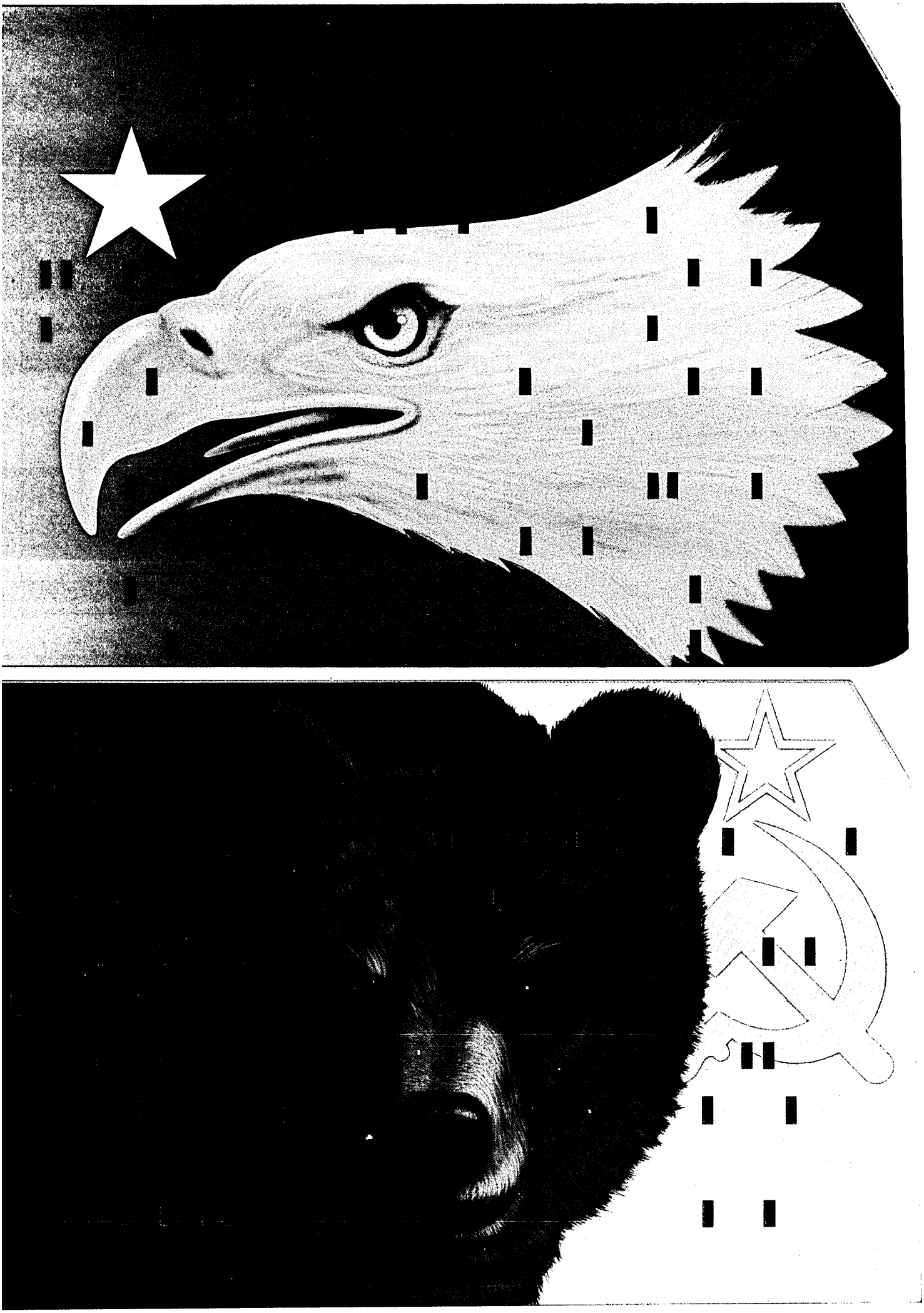
THE DATAMATION 100

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

1979 RANK	COMPANY	1978 RANK*	ESTIMATED CALENDAR 1979 1979 DP REVENUES $M	% CHANGE 1978-1979	U.S. DP REVENUES %	1979 TOTAL REVENUES
51	Reynolds & Reynolds	55	110	43	91	190
52	California Computer	39	107	−17	66	107
53	Telex	50	104	19	100	161
54	Computervision	68	103	111	61	132
55	Nixdorf Computer	52	100	23	100	100
56	REI	51	98	13	68	98
57	Boeing	53	96	20	NA	8131
58	Wyly	54	89	13	47	89
59	Documation	65	85	66	85	85
60	Shared Medical Systems	60	83	31	100	83
61	Apple Computer	100	75	650	75	75
62	Hazeltine	61	74	20	84	123
63	Modular Computer Systems	59	72	11	89	72
64	SEL	62	71	15	75	71
65	AM International	80	70	99	90	819
66	Computer Automation	57	69	4	72	69
67	Martin Marietta	69	67	43	75	2061
68	Comshare	81	67	100	56	67
69	Tandem Computers	84	66	116	90	66
70	Lear Siegler	72	65	44	80	1368
71	Sun Company	66	64	28	100	10880
72	Conrac	64	62	13	66	137
73	Inforex	56	61	−15	42	61
74	Qantel	71	58	26	70	58
75	Commodore International	94	55	150	50	99
76	National Data	73	54	23	96	54
77	BASF Systems	75	54	35	100	NA
78	ADDS	70	52	11	86	52
79	EMM	67	51	5	90	107
80	First Data Resources	76	50	25	98	50
81	Commerce Clearing House	79	49	28	100	212
82	Amer. Management Systems	83	48	51	99	48
83	Quotron Systems	78	47	20	100	47
84	MSI Data	77	47	17	84	47
85	Manufacturing Data Systems	82	46	43	85	46
86	Verbatim	89	45	63	60	45
87	Cray Research	98	43	148	33	43
88	Interactive Data	88	42	50	96	42
89	Decision Data	74	41	1	84	41
90	Nashua	93	40	56	65	608
91	Dysan	97	38	118	100	38
92	Gerber Scientific	91	36	40	60	56
93	Data Terminal Systems	95	36	81	85	96
94	Anacomp	96	36	85	94	50
95	Optimum Systems	87	36	20	100	36
96	Olivetti	85	35	17	100	170
97	Grumman	86	35	17	100	1493
98	Management Science America	92	35	37	85	35
99	Printronix	99	33	92	78	33
100	Cincom Systems	90	31	16	100	31

NA=Not available

% CHANGE 1978-1979	1979 NET INCOME $M	% CHANGE 1978-1979	TOTAL EMPLOYEES	REPORTED FISCAL 1979 1979 TOTAL REVENUES $M	1979 NET INCOME $M	YEAR ENDING
28	15.1	21	3,292	181	14.8	Sep
−17	−17.9	−995	2,141	134	−7.8	Jun
17	1.3	−82	4,181	148	5.4	Mar
84	13.0	150	2,350	132	5.2	Dec
23	NA	NA	1,607	100	NA	Dec
13	2.6	−54	2,100	98	2.6	Oct
49	505.4	57	102,000	8131	505.4	Dec
13	4.7	81	1,620	89	4.7	Dec
66	2.4	−59	2,400	59	6.4	Jan
31	10.8	26	1,019	83	10.8	Dec
650	NA	NA	NA	75	56.3	Dec
16	5.4	23	NA	123	5.4	Dec
11	4.7	7	1,302	72	4.7	Dec
15	4.1	21	1,296	65	3.8	Jun
16	.3	−99	20,000	755	11.6	Jul
4	−2.2	−188	1,400	64	−4.2	Jun
17	178.0	31	30,200	2061	178.0	Dec
100	4.6	35	400	53	4.7	Jun
116	6.1	118	949	56	4.9	Sep
10	66.5	22	NA	1327	63.3	Jun
43	699.9	69	40,065	10800	699.9	Dec
16	4.8	41	2,956	137	4.8	Dec
−15	−8.0	−329	1,060	61	−8.0	Dec
26	5.0	150	750	58	5.0	Dec
80	9.7	120	NA	71	6.0	Jun
23	5.1	42	1,895	49	4.3	May
NA	NA	NA	NA	NA	NA	Dec
11	2.9	−56	NA	52	4.8	Dec
15	3.3	14	NA	107	3.3	Dec
25	NA	NA	1,800	50	NA	Dec
17	19.6	18	4,701	212	19.6	Dec
51	1.7	21	1,000	48	1.7	Dec
20	7.0	56	675	47	7.0	Dec
16	2.0	−46	820	43	3.8	Mar
43	4.5	32	579	42	4.3	Aug
63	2.0	−9	1,543	36	2.3	Jun
148	7.8	200	524	43	7.8	Dec
50	NA	NA	725	42	NA	Dec
1	.6	−74	746	41	.6	Dec
20	267	18	7,800	608	26.7	Dec
118	2.8	−13	1,146	34	3.0	Oct
56	4.4	57	1,500	45	3.9	Apr
54	15.3	19	NA	69	14.0	Jan
82	3.3	74	1,300	38	2.7	Jun
20	NA	NA	1,098	31	NA	Jul
6	NA	NA	2,000	170	NA	Dec
2	19.6	−2	28,000	1493	19.6	Dec
37	1.6	60	630	35	1.6	Dec
92	2.9	81	762	21	1.8	Mar
16	1.3	−43	574	30	1.2	Sep



Can our computers beat their computers?

Russia has more frigates than we do. More heavy cruisers. More atomic submarines. More long range ballistic missiles. They also have more tactical aircraft and far more tanks and men in uniform.

Against that imbalance of power, is the superiority of our data processing systems. Computer technology will be the deciding factor in a major conflict because most large scale military actions cannot be successfully conducted without it. Today, the security of our country is as much in the hands of computer scientists as it once was in the hands of minutemen.

As the world's largest information services company, Computer Sciences Corporation is deeply involved in developing the defense systems of the free world. Like the National Military Command Center that allows the President and Joint Chiefs of Staff to assess military situations and make strategic decisions based on real time displays. Or the AEGIS program: Multi-purpose ships capable of rapidly identifying, and destroying many hostile aircraft and missiles simultaneously.

By integrating the technologies of software, communications and hardware, CSC is continuously advancing the techniques of problem solving. This work requires unprecedented levels of fail proof design.

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The only limitations are the ones you bring with you.

CSC

COMPUTER SCIENCES CORPORATION

Corporate Offices: 650 N. Sepulveda, El Segundo, CA 90245

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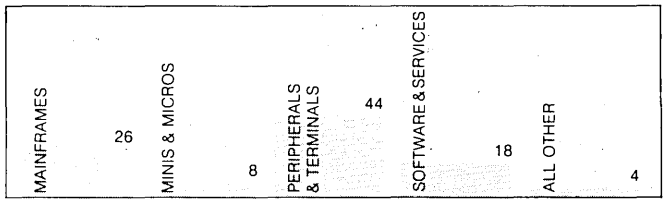

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$18338 (M)	7	80	$8527 (M)	5	46	$22863 (M)	8	$3011.0 (M)	−3

INTERNATIONAL BUSINESS MACHINES CORPORATION

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

Any major move by IBM creates shock waves that are felt throughout the information processing industry. The degree of impact is not always immediately clear, however, as was true with the aggressively priced 4300 series announced in 1979. The jury is still out, although some industry casualties, such as Itel Corp., may partially be attributed to the 4300.

The mere expectation of IBM moves, such as the Newport (announced as the 3033N in November) and the H series (not yet announced at writing), had a heavy impact. Users could easily extrapolate the 4300 price/performance characteristics to upcoming systems. Hence, they opted to lease rather than purchase while they waited. This caused revenue and earnings problems for IBM and adversely affected the plug-compatible manufacturers.

Despite record shipments, IBM earnings declined 3% in 1979, the first such down year since 1951. Revenues grew only 8.5% to $22.8 billion, versus 16.2% in 1978. A poorer showing was headed off by price reductions and the 3033N announcement. IBM did have star performers in its maintenance and software products activities, which increased by $500 million or 31%. Office Products Division sales moved up by 13.5%, and overseas operations, affected by currency fluctuations, increased 10.9% to 53% of the corporate total.

If 1979 was not a vintage IBM year, the firm said it "laid the foundation for the 1980s." This was through: technological innovation and increased research and development; declining hardware prices and a "box for box" competitive strategy; new software strategies involving programming support centers and priced on-site maintenance; and massive plant expansion. IBM moved to raise the capital needed for these and leasing activities through lines of credit, sale of notes, and a Saudia Arabian loan totaling almost $3 billion—and it says it will need more.

New products for new markets in 1979 signaled IBM intentions. Telegraphing IBM moves into AT&T's domain were the 3101 Teletype-compatible terminal, with quantity discounts, and the 1750 PABX, announced abroad but expected in the U.S. A joint venture with MCA Inc. in Discovision, a video disk maker, indicated potential entry into the home market, as well as industrial and education sectors. Finally, IBM has indicated intentions to be a major force in office information systems; while the plan does not seem fully formulated, all divisions have committed development funding.

Finally, 1979 saw the true end of an era at IBM when Thomas Watson, Jr. resigned from the board of directors to become ambassador to the U.S.S.R.

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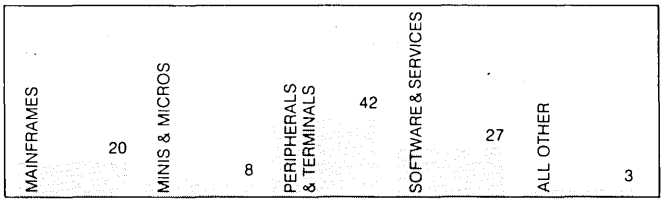

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$2432 (M)	14	87	$1429 (M)	11	59	$2786 (M)	15	$305.5 (M)	21

BURROUGHS CORPORATION

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

In an uncharacteristic move, Burroughs went outside the company and industry in choosing W. Michael Blumenthal as vice chairman, designating him to succeed Paul S. Mirabito in January, 1981 as chairman. Blumenthal was formerly U.S. Secretary of the Treasury and chairman of the board of Bendix Corporation. DuRay Stromback assumes the position of president and chief operating officer.

From Burroughs' established position and record of sustained growth over the past 16 years, management will be confronting a new set of challenges in the next decade, particularly in view of accelerating product innovation throughout the industry. Burroughs' objective to outpace the growth of the industry through increased share of the mainframe market, and through expansion in related areas, faces intensifying competition from IBM and rival minicomputer manufacturers.

Operating revenues rose 15% for Burroughs to $2,785.5 million in 1979, with data processing activities contributing an estimated $2,432 million. Corporate net earnings for 1979 were $305.5 million, representing an increase of 21%. While Burroughs closed the year with a drop in pretax margins in the fourth quarter to 23.5% from 25.9% the prior year, with a sharply lower tax rate offsetting the impact on reported earnings, Burroughs' pretax margins remain the second highest in the industry. A continually increasing order flow, up 15½% for the year, resulted in the largest year-end backlogs in the company's history.

In very-large-scale systems, Burroughs set records in sales and, after delays, began deliveries of B 7800 processors. In the medium range, the February 1979 introduction of the B 2900 and B 3900 computers, accompanied with price adjustments on the current products, appeared to follow the dramatic price-cutting pattern established with IBM's 4300 series. The October introduction of the B 1900 series, however, followed more traditional patterns—30% additional performance with a 10% effective price increase.

A new, low-end B 90, with purchase prices starting at less than $18,000, positioned these systems well within the minicomputer range. A dual-drive, six megabyte "Super Mini-Disk II" with the B 90 improves capacity and access times. A new family of modular terminals, the BMT series, boosted order levels for terminal products into the 30% growth range.

As the year drew to a close, Burroughs was preparing for the January introduction of a new series of communications processors for network operations, and the B 6900 series of medium-to-large-scale systems featuring 30% higher performance at roughly 20% greater price, and a new I/O and data communications subsystem.

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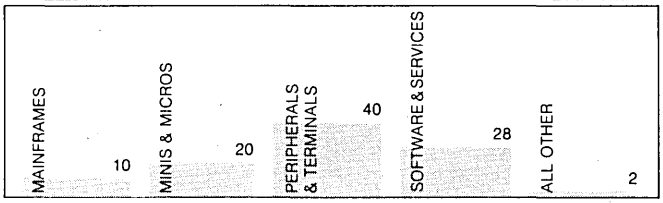

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$2404 (M)	24	80	$1106 (M)	24	46	$3003 (M)	15	$234.6 (M)	21

NCR CORPORATION

Dayton, OH 45479
(513) 449-2000

NCR just missed taking over the number two spot in the industry from Burroughs in 1979. It posted a 24% increase to $2.4 billion in dp revenues, and considering the definitional arguments over what constitutes dp, it's a toss-up as to who is in second place. NCR also continued its healthy upward earnings trend in 1979, reaffirming the effectiveness of the 1970s streamlining of operations. (First quarter 1980 earnings were off, but it is unclear if this is a trend.)

Dp revenues now account for 80% of the NCR total, and exclude electronic cash registers, non-dp financial equipment, and related services. Last year, computer systems sales grew 21% to $838.3 million. Other dp revenues relating to terminals sales and services are not broken out, but NCR lists totals for each terminals sector which should indicate growth trends: retail terminals grew 19% to $533.7 million; financial grew 14.5% to $329.1 million; and general purpose terminals grew 22% to $97.2 million. Services were listed at $835.4 million, a 14% increase, and represent data center income, as well as maintenance and other services. Computer systems sales were helped last year through an important acquisition—Comten Inc., an innovative communications processor manufacturer. We estimate Comten added about $45 million (for six months of 1979) to systems revenues, which, without Comten, actually grew about 15%.

NCR was very active in the systems front last year, announcing nine new models ranging from the 500KB V-8455 to the 12MB V-8585MP multiprocessing system. The firm notes greater activity in "larger systems" and a trend toward more rentals in its revenue mix as a result; the dampening effect on short-term gross may be somewhat offset by NCR's increased software unbundling and a new laborsaving software support structure similar to IBM's. Five centers are being established to provide software maintenance remotely at no extra charge, while on-site support is offered on a fee basis.

According to NCR, terminal revenues could have been better, but, as happened throughout the industry, the component shortage slowed production and deliveries. The company does not expect the shortage to be as severe in 1980, and it is bringing on-stream a third microelectronics plant this year to step up its internal capabilities.

In small systems and terminals, NCR last year announced a new I-8140 tabletop satellite dp system; 2950 microprocessor-based terminal; 7900 interactive crt, the first in a new family; and, in special purpose terminals, the 2152 (POS), 2251 (hotel), 2160 (restaurant), 2261 and 2170 teller terminals, and 2820 (industrial data collection).

NCR spent 58% of its $171 million R&D on software last year and announced a myriad of operating system enhancements, transaction processing packages, and applications software for its many markets (both for end users and for its data centers).

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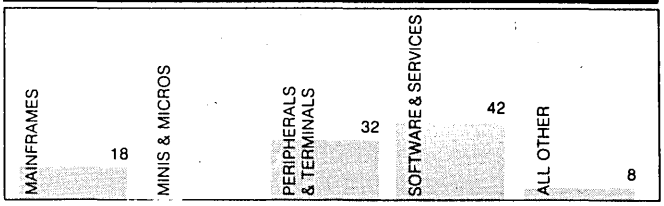

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$2273 (M)	22	70	$1544 (M)	24	68	$3250 (M)	19	$124.0 (M)	39

CONTROL DATA CORPORATION

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

With its computer business at $2.3 billion in 1979, up 22%, CDC jumped into fourth place by a whisker and continued to lay claim to being the biggest independent peripheral supplier, the biggest data services company, and the biggest large-scale scientific computer supplier. It also had a very high dp net income increase: 79%. (The Commercial Credit financial subsidiary lagged with 11% growth in revenue and 10.6% growth in earnings.)

These figures tell the story:

	Revenues ($M)	% Change	% of Revenues
Peripherals	$725	37	32
Business products (disk packs)	184	31	8
Data services	474	16	21
Engineering services (maint.)	278	16	12
Consulting and education	126	30	6
Dp systems (including software)	486	7	21

CDC's peripheral products business clearly led in growth. Minicomputer peripheral sales are primarily credited for the 30% increase in this sector in the last three years, and the company believes that its many oem contracts with the rapidly growing mini manufacturers will make this business less vulnerable to recession than its previous mainframe oem concentration. The competition here is becoming aggressive, including such products as IBM's 8-inch rigid disk systems for the 4300; CDC plans to announce its own line of 8-inch disks this year. Also, more than 3,000 of the 625MB disk drives were delivered in the last 18 months.

CDC is investing heavily to become a major factor in non-impact printers within five years. Planned are ink-jet printers for the office and higher speed nonimpact devices in the 5K-20K lpm range.

Data services represented high growth and improving profitability. Cybernet and SBC services are in this sector, as are related sales of minicomputers. Growth now is in interactive applications on its 14-center network, which services five continents. In the 1980s, major emphasis will be on increased integration of minis into CDC services.

Computer systems saw less growth than other sectors last year, but improved over the 1978 experience. It was dampened a bit by a drop in government sales and an increase in rentals vs. purchase. The firm, however, announced its first new supercomputer in many years—the $10 million CYBER 203. CDC admits it is playing catch-up, but hopes its maintenance and support resources will provide momentum.

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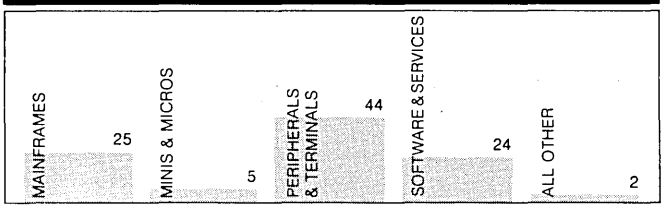

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$2270 (M)	16	49	$1259 (M)	11	55	$4586 (M)	13	$259.2 (M)	21

SPERRY RAND CORPORATION

1290 Avenue of the Americas
New York, N.Y. 10019
(212) 956-3273

Sperry Univac, with increasing concentration on the high and low ends of the computer systems market, moved its revenues to record heights in 1979—$2.27 billion, up 15.5%. Also, with this performance, the Univac Division came close to contributing half of Sperry Rand's total income.

By computer product line, Univac's major activity in 1979 was in minicomputers and the large-scale 1100 series. New Univac president, Richard Gehring, credits "our concentration of resources to develop the minicomputer market" as one major reason for the increases in revenues and shipments (up 20%). Investment in production was sharply increased, production facilities were enlarged, and the minicomputer sales force was doubled. The result: a 50% increase in bookings.

Univac also posted similar increases for the UTS-100, 200 and 400 independent terminals, with $125 million in bookings.

In the 1100 series, Univac announced the entry level 1100/60 and within five months sold 100 systems worth $70 million. The 60 is labeled "the first large-scale . . . computer to implement LSI with a multiprocessor-based architecture." Just as significant is the more-performance-for-equal-price strategy Univac has followed in its competition with IBM.

Other announcements included a top-end addition to bolster the BC/7 small business computers, which to date have not been the financial success hoped for. Univac also enhanced its printer offerings with new 21,000 and 1,200 lpm systems, and it announced new large tape and disk subsystems for the 1100 and Series 90.

What Univac didn't do in products was also important, as the firm announced no major moves with its byte-oriented, medium-scale Series 90. The industry is waiting for a decision from Univac on the future of the 90 in view of the stiff competition from IBM's 4300. It is estimated that about 6,000 Series 90 systems are installed, and the question is when will the next generation appear?

By market, Univac felt it made great strides in its target industries in 1979: manufacturing, the public sector, energy, and airlines. Univac's manufacturing industry sales have grown at 27% compounded annually in the last three years, and the number of customers doubled in the last year. In energy, Univac secured a giant order from British Petroleum which should bring between $21 million and $36 million in the next three years. Longstanding airlines customers ordered new systems last year to increase Univac's new business by 50% in this sector.

Geographically, Univac's foreign operations were the star performers in 1979, posting a 21% increase in sales vs. 11% in the U.S. (As with most companies with a large foreign business, currency fluctuations significantly impact this reporting, however.)

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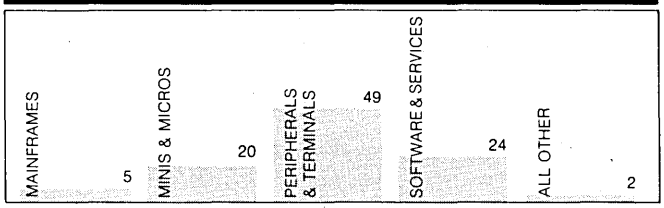

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$2032 (M)	27	100	$1260 (M)	27	62	$2032 (M)	27	$207.5 (M)	35

DIGITAL EQUIPMENT CORPORATION

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

The rampant growth of the minicomputer subsector continues to challenge the leader, Digital Equipment Corporation (DEC). At 22 years of age, DEC has passed into adulthood with just over $2 billion in revenues.

The 37% annual growth rate since 1973 hasn't always been smooth in the face of roller coaster economic and demand trends. The upturn of 1975-1977 witnessed a heady doubling in employment to 38,000 and a ballooning in capital spending from $6 million to $10 million quarterly to $47 million-$53 million. The aggressive internal expansion program subsequently foundered on the discovery that the earlier surge in orders had been artificially boosted by delivery stretchouts and double-ordering. Employment and production rates leveled off, and capital spending fell back to a $19 million-$23 million quarterly rate through late 1978.

In the face of recessionary economic assumption, and conservative internal production schedules, incoming business for DEC outstripped the company's ability to deliver throughout the latest year. By December 1979, however, sharply higher production rates broke the logjams. The production work force rose 32% to 21,000 for the year, with inventories and capital spending also climbing to support higher volumes. Prospects for improved delivery lead-times by mid-1980 began to firm. Unit production of video terminals more than doubled, with even larger increases planned for the current year.

In March, DEC introduced the LSI-11/23, costing less than $1,800 in quantity, which joined the entry-level LSI-11/2. With processor speeds approaching those of a mid-range minicomputer, plus the ability to run the PDP-11's multiuser RSX-11M operating system, the LSI-11/23 brings a new level of functionality to the microcomputer market. A new PDP-11/44 mid-range minicomputer, announced in November, provides many of the features of the top-of-the-line PDP-11/70, and twice the performance, with a 20% higher price, of the PDP-11/34.

As 1979 drew to a close, DEC prepared a new announcement of DECnet Phase III for February 1980, covering enhanced DECnet software for networks among Digital Equipment computers, a new communications interface giving PDP-11 systems interactive access to IBM Systems Network Architecture (SNA) host machines, and a commitment to support of X.25 public packet-switching network technology. Currently there are more than 500 DEC networks in the field, supporting well over 2,000 nodes. Although the DECnet software is not being used in AT&T's ACS packet network, DEC should gain valuable experience in its contract to provide VAX systems for ACS.

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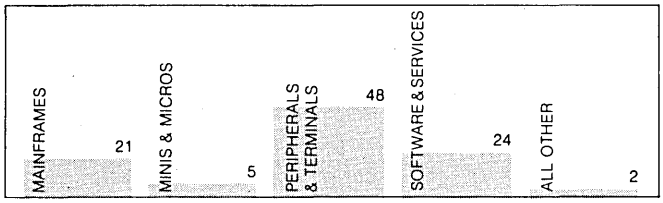

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$1453 (M)	12	35	$975 (M)	17	67	$4210 (M)	19	$240.0 (M)	32

HONEYWELL INC.

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

Honeywell Information Systems (HIS) registered a rousing 44% gain in operating profit on a 12% increase in revenues to $1,453 million. Cii Honeywell Bull (Cii HB), 47% owned by HIS, added momentum to its earnings turnaround with a 42% gain in equity contribution to HIS on a 23% revenue rise. Even so, there is substantial room for additional improvement for HIS and Cii HB to match the industry profit norms; combined net margins are estimated at 5% after absorbing corporate overhead.

Including the results of Cii HB, computer revenues totaled $2,519 million in 1979, vs. $2,131 million in 1978. Excluding Cii HB, computer revenues were $1,453 million, 35% of the corporate total, and up 12% from last year's $1,294 million. HIS also benefits from its part ownership in Magnetic Peripherals Inc., and minority ownership of GE's Information Services Company.

In small business computers (Level 62), Honeywell continues to concentrate on bringing new customers into the base at the low end, with roughly two-thirds of the business representing new accounts. The 1,000th installation in the U.S. was accomplished in the second quarter for the Level 62, which is designed and manufactured by HIS-ITALIA.

In medium-scale systems, Level 64/DPS provides upgrade ability for users of Honeywell 100, 200, and 2000 computers. Level 66/DPS provides increased power, and the CP-6 Operating System defines a transition and growth path for Xerox users. Honeywell now has over 2,000 large-scale system sites with installed equipment valued at more than $4 billion.

In the third quarter, Honeywell staged itself for the large-computer marketplace of the 1980s with the announcement of DPS 8 systems. The top-of-the-line processor, DPS 8/70, offers almost twice the power of the model 66/80. The lower end DPS 8/20 has approximately 75% more power than Honeywell's smallest Level 66 computer. Prices range from $400,000 for a basic DPS 8/20 system to about $5 million for a fully configured four-processor DPS 8/70.

In minicomputers and terminals, orders were received from Metropolitan Life Insurance Co. for 70 Level 6 systems worth approximately $10 million; Xerox for 110 Level 6 systems in a $23 million contract; and United Airlines for 10,000 Incoterm terminals. Honeywell's U.K. subsidiary and Cii HB have established production of Level 6 minicomputers.

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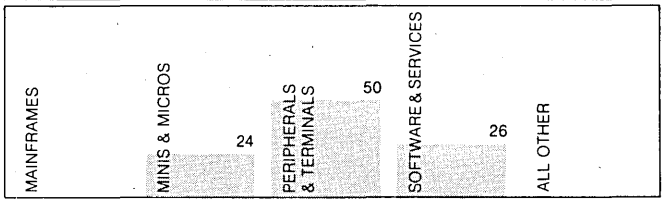

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$1030 (M)	41	42	$540 (M)	38	52	$2480 (M)	36	$212.0 (M)	32

HEWLETT-PACKARD COMPANY

1501 Page Mill Road
Palo Alto, CA 94304
(415) 857-1501

Hewlett-Packard will be shooting for a 30% growth rate in the future, sharply less than the historical average annual 50% rate it has enjoyed in data processing, because of two factors: a slowdown in minicomputer market demand and the constraints of size. Certainly, at HP's $1 billion level in dp sales, spectacular growth becomes more difficult and less desirable from a management standpoint. In 1979 alone, HP increased its dp forces from 20,000 to 25,000 and increased capital expenditures 27% to handle the sales and orders.

Excluding calculator sales (about 10% of stated dp revenues), HP's computer revenues stood at about $1.03 billion by year end, up 41%; the firm said operating income jumped more than that. Dp orders ran slightly ahead of "comfort," in HP's reckoning, at $1,115 million.

Hewlett-Packard marked its 40th year, 1979, by improving its position in business computer sales. Since 1975, when HP began aggressively marketing the 3000 series in business markets, sales have increased rapidly, reaching $400 million in 1979. In Europe last year, HP more than doubled its sales for commercial applications in almost every country. This contributed to the increase in international revenues from $376 million in 1978 to $546 million in 1979.

HP continued to refine its organization last year, putting the R&D and manufacturing of all scientific and technical systems —the HP 1000 and desktop computers—under a single Scientific and Technical Computer Group. The sales force for these two lines were also combined, operating under the central marketing and support organization established in 1977.

This reorganization is particularly important to HP's growing emphasis on a target industry: manufacturing. HP believes that whereas in the 1970s distributed processing was geographic, the '80s will see distributed processing in the plant—a broad variety of functionally oriented systems and terminals. By integrating its instrumentation-related control products, business systems, and communications capabilities, the firm feels it can offer a "total solution." Most R&D monies for the business division, General Systems, are for manufacturing applications.

Hewlett-Packard vice president Paul Ely assesses IBM's "increasingly more competitive stance in the small computer market" as lending "credibility" to it, although IBM's rising product shipments will have "a major impact on companies that are poorly positioned to withstand it." Ely feels HP is in a good position as a result of its long-term effort to become well entrenched in on-line interactive distributed and network systems.

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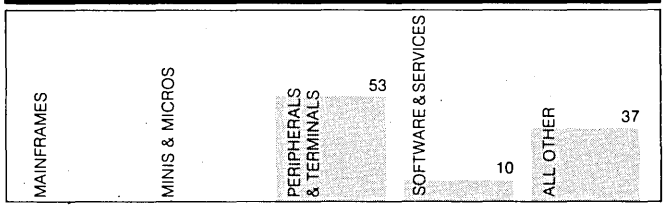

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$664 (M)	16	90	$341 (M)	9	51	$738 (M)	17	$31.5 (M)	−37

MEMOREX CORPORATION

San Tomas at Central Expressway
Santa Clara, CA 95052
(408) 987-1000

In the midst of the competitive and economic storms of 1979, Memorex Corporation was courted by two other plug-compatible equipment suppliers, Storage Technology and Amdahl. While a merger with either would have created a billion-dollar computer power, financial disagreements ended both discussions. Shortly after, Memorex surprised the industry by hiring Clarence W. Spangle, president of Honeywell Information Systems, to take over the same post at Memorex from Richard Wilson.

Statements to stockholders from Wilson, chairman of the board, indicate both Memorex and Spangle have their work cut out for them in 1980. In 1979, Memorex revenues, while up 17% to $738 million, were below projections and net income dropped 37% to $31.5 million. Wilson spelled out the reasons: economic uncertainties and the competitive price reductions affecting most of Memorex's dp product lines. Inflation, interest rates, parts shortages, and employee turnover also adversely affected operating costs. Some increased expenditures were for the future, such as R&D (up 17% to $28 million), facilities (up 18% to almost $38 million), and marketing support.

The outlook for 1980 is "mixed," according to Wilson. While IBM's price reductions early in 1979 impacted many Memorex products, he felt that IBM's price increases late in the year eased the problem somewhat. Worldwide demand is high, he said, and despite economic worries, Memorex is encouraged by the recession resistance of the computer industry and the fact that it is an election year, when "historically the government tries to maintain a strong economy."

Data processing revenues—including tape and disk drives, communications processors, cpus, terminals, and magnetic media—reached $664 million last year, up 16.5%. As with many companies, the strong showing was from international operations, which account for nearly half of Memorex's dp revenues and were up by 26% (vs. 9% in the U.S.). Some of Memorex's strong international growth in the last few years has resulted from purchase and expansion of Telex's European operations. Memorex now has 4,000 overseas employees, a 30% increase over 1978.

Among major new products announced in 1979 were the double-density 3652 disk subsystem, and the first in a family of 8-inch rigid disk drive products, the 101, with 11.7MB of storage capacity. Memorex also enhanced the 3670 double-density drive by increasing capacity from 100 to 200MB per spindle and adding an intelligent dual interface to allow two control units to access two spindles simultaneously.

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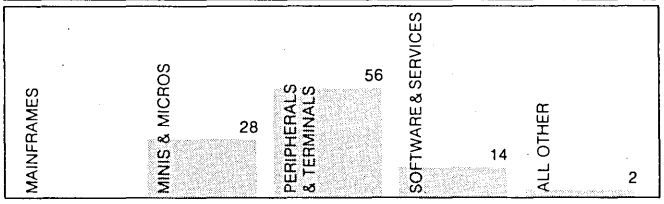


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$540 (M)	32	100	$394 (M)	29	73	$540 (M)	32	$50.0 (M)	14

DATA GENERAL CORPORATION

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

Just over 10 years old, Data General cracked the half-billion-dollar barrier with $539.6 million in calendar revenues—up 32%. Earnings of $50.0 million, up only 14%, were disappointing, with operating margins for the September quarter plunging to 14% of revenues from 20.5% for the prior year period. Front-end expenses associated with field-service expansion from 1,130 personnel to 1,435 at year-end, production startup expenses and lower initial margins on new products, price cuts on older products, and component shortages all combined to drive down profitability.

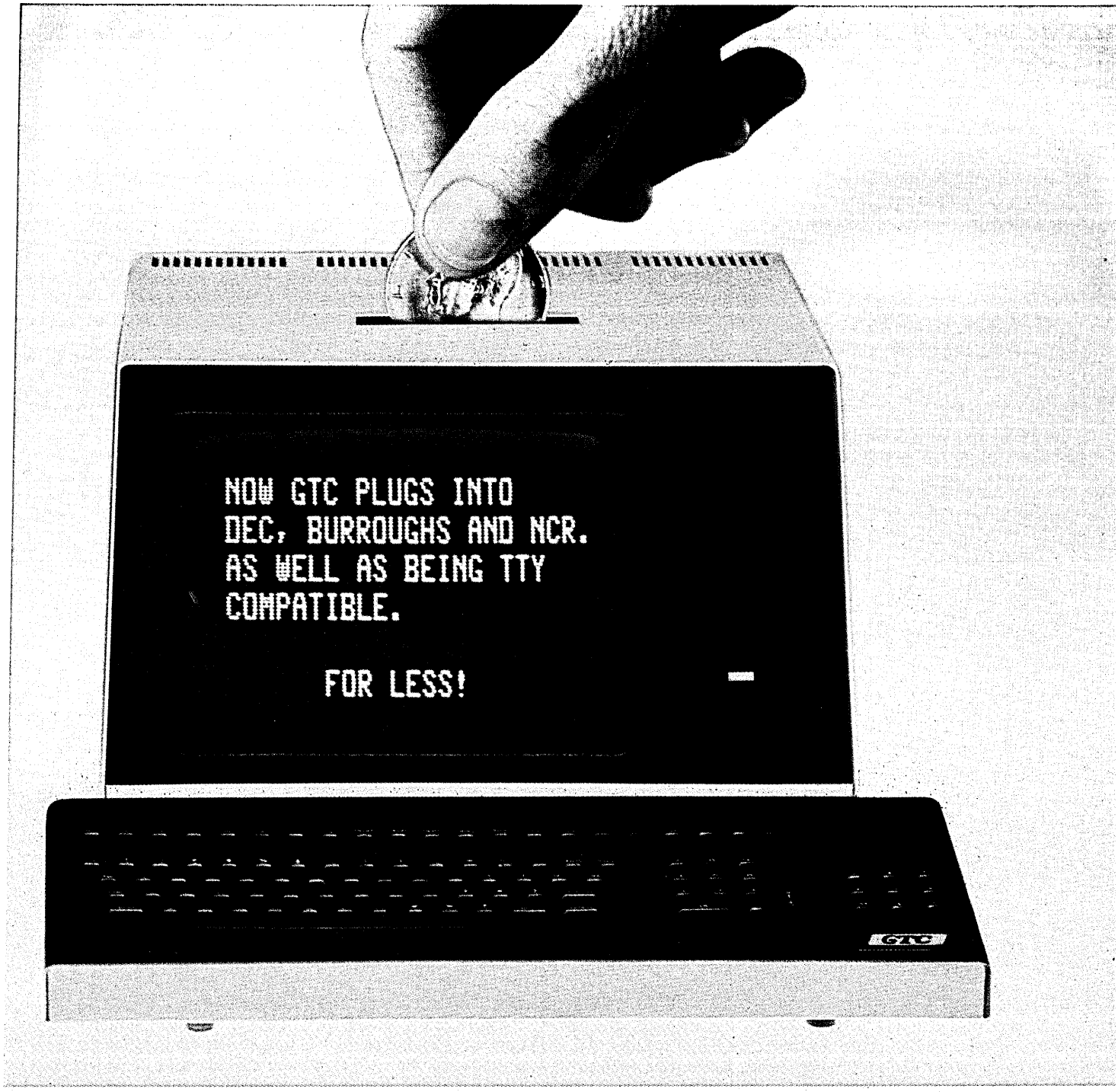
Moderate margin relief was recorded in the December quarter with additional steady gains anticipated in 1980. For the first time in the history of the company, prices on established products (the Nova/3) were raised by 5% in October 1979 with software fees adjusted upward in November. The moves represent a sharp reversal of the traditional 20%-25% rate of decline in costs for equivalent performance over the last 10 years.

Also, three officers left the company in 1979—Jake Diaz, treasurer; Carl Carmen, vp of engineering; and William Foster, vp of software development. The management turnover and margin pressures reflect the intense internal pressures of the high growth technology sector.

A fivefold revenue expansion and a fourfold increase in employment since 1975 have severely burdened management resources—requiring on average 44% more line managers each year. Data General appears to be going through the same readjustment cycle of high growth that afflicted rival DEC in 1977-1978, and rippled through Hewlett-Packard's technical group in 1979.

Slightly under 50% of development expenditures now go to software, with the balance split between peripherals and processors. Although the company has introduced four new computer families in the last five years, it has maintained software compatibility. For example, screen handling extensions added to AOS COBOL in 1979 allow users to move programs from the CS small business systems to larger Eclipse data systems.

Speculation in the trade continued throughout 1979 on the timing and details of Data General's next generation computer family, the Eagle, with expanded addressing capability to match the VAX 11/780 from DEC. Having coded substantial existing software in a higher level language, internal challenges of software incompatibility may not prove severe. However, the magnitude of the customer's software conversion remains uncertain as of the date of this review.



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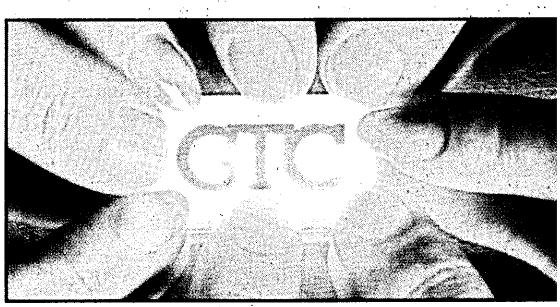

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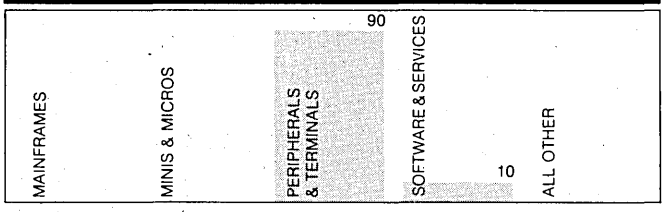

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$480 (M)	60	100	$423 (M)	53	88	$480 (M)	60	$39.7 (M)	48

STORAGE TECHNOLOGY CORPORATION

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

After a phenomenal growth in 1978 (85% increase in revenues and 135% increase in net income), Storage Technology (STC) had a tough act to follow in 1979. But follow they did with a 60% increase in revenues to $479.5 million and a net income increase of 48% to $39.7 million.

At deadline time, STC had signed a letter of intent to merge with Amdahl Corporation, major large-scale plug-compatible mainframe manufacturer (subject to approval of the boards and shareholders of both firms). While the financial and market ramifications are not clear at this writing, STC and Amdahl would in combination create one of the biggest companies in the industry and a powerful systems competitor for IBM.

Storage Technology itself remains the unchallenged leader among the independents in the high-performance tape drive market. The company has also captured a majority of the plug-compatible market for the IBM 3350-type disk drives and is now shipping a dual density version of its 8350, called the 8650, into the IBM end user marketplace. While the disk drive market is the fastest growing of the two markets, tape drives—the foundation products of the company—still account for the majority of revenues, just under 70%.

Tape drives are sold to both the mainframe oem and end user markets, and during the last two years the company has been marketing a version of its high-density (6250 bpi) drive for minicomputers. In 1979, this minicomputer tape drive accounted for the largest single oem contract, approximately $50 million over five years, from Honeywell Information Systems. New disk drives have also been announced for the oem mini market.

Storage Technology also has a solid-state version of IBM's 2350 in its product arsenal: the 4305. This disk drive, using charge-coupled device (CCD) technology, received very high customer acceptance and amassed a backlog of orders valued at approximately $40 million. Delivery against this backlog was only a small factor in 1979 revenues, however, since shipments were impaired by the lack of CCD components. CCDs have been replaced by 16K RAM technology.

Knowing the necessity of maintaining technological leadership, STC increased its research/development funds by 75% to $33 million last year and began a vertical integration into semiconductor manufacturing by starting a new facility and buying Microtechnology Corp., an integrated circuit designer.

Very important to STC's future is a small communications subsidiary formed in 1978. With its digital voice multiplexor and line concentrator, COM2, this subsidiary contributed $2 million to 1979 revenues, but with growth and new products is expected to reach $10 million in 1980.

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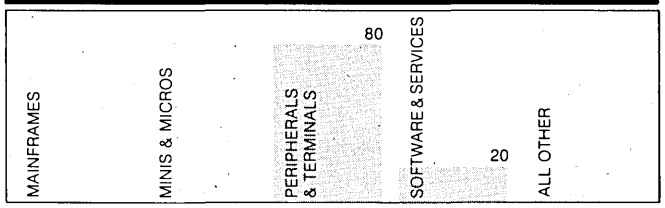

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$475 (M)	58	7	$404 (M)	50	85	$7027 (M)	16	$563.1 (M)	18

XEROX CORPORATION

800 Long Ridge Road
Stamford, CT 06904
(203) 329-8711

In 1979, Xerox once again set financial records. Revenues topped $7 billion, up 16.5% over 1978, and net income increased 18% to $563.1 million. Xerox groups dp revenues with those of word processing, facsimile, communications systems, supplies and publishing for education. In 1979, these revenues totalled $1,773 million, compared to $1,416 million in 1978.

Our dp revenues estimate is $475 million, up 58%. This includes Xerox Computer Services, Versatec, Diablo, Shugart, Xerox Memory Systems, Century Data, and Autex (bought from Itel in September). During 1979, Xerox became involved in several businesses which are directly or indirectly related to its dp activities.

Century Data Systems is a 1979 acquisition from California Computer Products, and provides capability in large-capacity disk drives. In August, Xerox began efforts to enter the network business by proposing the establishment of the Xerox Telecommunications Network (XTEN) to the Federal Communications Commission. Within XTEN, data transmitted long distance by satellites would be distributed locally on a radio band. In November, Xerox went into international telecommunications by buying carrier WUI Inc.

Xerox' primary posture in information products is in rotating storage, printers, and services. In storage products, Shugart Associates is the largest supplier of floppy disks. With Century, 1979 revenues in this sector totaled over $160 million. In printers, Diablo primarily builds daisywheel printers, and Versatec is one of the largest electrostatic printer producers; together their sales were over $220 million. Finally, Xerox garnered over $50 million in services revenues from Xerox Computer Services, which has about 800 customers in the U.S.

In office products, a particularly notable new product in 1979 was the Xerox 860 information processing system for word processing, record processing, and computing. Through a cable system, Ethernet, the 860 and other kinds of office equipment can be linked within a building, and multiple Ethernets can be linked to one another and outside facilities.

At the annual meeting in 1979, chairman Peter McColough said that reprographics "will provide the bulk of our revenue and profit for as far into the future as we can reasonably predict." But, he added that current Xerox experimental office systems "demonstrate to us that we are on the verge of a new adventure that will take us into some markets that are barely identified now." This means that although Xerox has withdrawn from the mainframe business, it has embraced the microprocessor in all its reprographic products and has adopted a strategy of producing a variety of dp products and services—all of which may be combined into advanced office systems of the future.

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That's why we provide total capability in information management. Computers, word processing systems, facsimile communications, system software, application programs, customer training, maintenance, plus business forms and supplies. We call it Total System Support. And it's there to help you improve your productivity.

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Burroughs

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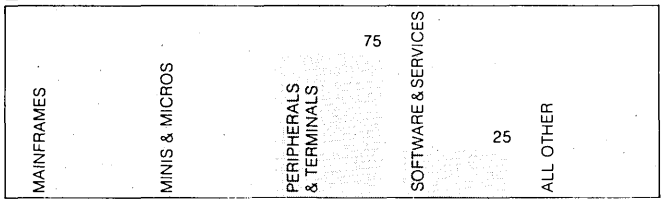

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$440 (M)	19	10	$340 (M)	28	77	$4560 (M)	20	$194.6 (M)	12

TRW INC.

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

A diversified multinational, TRW manufactures a wide range of products from components for cars and trucks to defense electronics and space systems. Although the company provides limited data to support an analysis of the company's dp activities, these areas account for 10% or less of total corporate revenues and an even smaller share of corporate net income.

One of the fastest growing TRW dp operations is TRW DataCom, which acts as an international marketing and service organization for Datapoint terminals (to end in 1982), Azurdata portable data collection equipment, Centronics printers, computer entry systems, ocr equipment, NBI word processing equipment, and financial and retail terminal systems from TRW itself. DataCom works with distributors overseas, the majority of which are independent. Although margins remain low on pass-through business, a significant equity position among the distributors enables TRW to participate in the end user marketplace. Distributors in Canada, Brazil, Austria, West Germany, and Switzerland are owned; TRW has joint ventures in Australia, France, Spain, and the United Kingdom.

Most of TRW's 2,500 service personnel are in the U.S., providing complete service capability for domestic companies, including ADDS, Pitney Bowes and Wiltek.

The Information Services Division (consumer and business credit reporting) contributes an estimated $60 million-$80 million in revenues. Part of ISD, TRW Credit Data is the largest automated consumer credit reporting company; its one-third market share has remained relatively stable for the past several years. Prospects for 10% annual growth appear reasonable, although it remains sensitive to the fluctuations in outstanding consumer credit.

TRW Business Credit has been challenging Dun and Bradstreet (D & B) on credit reporting for the business community. Using a fully automated system, TRW basically analyzes paying habits at a substantially lower price than the D&B service—which includes significant additional analysis. Recently, Business Credit added financial statistics and pertinent business information from Standard and Poor.

ISD is currently instituting a nationwide communications network utilizing packet-switching under a multi-million dollar contract with Tymshare. Within a year and a half, TRW plans to complete the network with up to 30 nodes supporting 2,000 ports, which in turn will service 12,000-15,000 terminals.

Sales of TRW's POS equipment slowed during the year with incoming orders running below expectations. Competitive pressures are rising from IBM in the general merchandise retail sector. Customer response remains strong to TRW's computerized product line, including a new family of automated teller terminals announced in 1979. These areas in combination were unprofitable, however.

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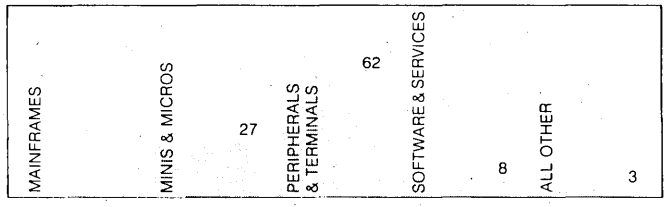


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$425 (M)	33	13	$350 (M)	35	82	$3224 (M)	26	$172.8 (M)	23

TEXAS INSTRUMENTS INCORPORATED

Post Office Box 225474
Dallas, TX 75265
(214) 995-2011

A growing factor in the minicomputer and terminal markets, Texas Instruments, we estimate, registered a 33% gain in dp-related products in 1979. While TI does not provide dp breakouts, trade sources estimate that dp revenues were about $425 million, up from $320 million in 1978.

Texas Instruments publicly breaks down its $3.2 billion 1979 trade revenues as follows: Components, at $1,413 million; Digital Products, at $843 million; Government Electronics, $345 million; Metallurgical Materials, $145 million; and Services, $267 million.

Almost half of the Digital Products group revenues are from dp products (minis, terminals, and home computers), with the other 50%-plus from consumer electronics products such as digital watches and calculators. This total group registered a 21% increase, attributed to growth in dp products; after-tax margins, however, declined to 6% last year from 10.1% in 1978—attributed to cost and competitive problems in digital watches, home computer development costs, and a reduction in terminal prices. The watch business, over one-fourth of this group's total, was reportedly flat in 1979, while calculator sales suffered from delivery problems owing to component shortages.

TI, which sold an estimated $210 million in minicomputers, is becoming known more and more as a small business system supplier. It enhanced this image in 1979 by announcing four new models in the DS990 commercial computer family and promising bigger models downstream.

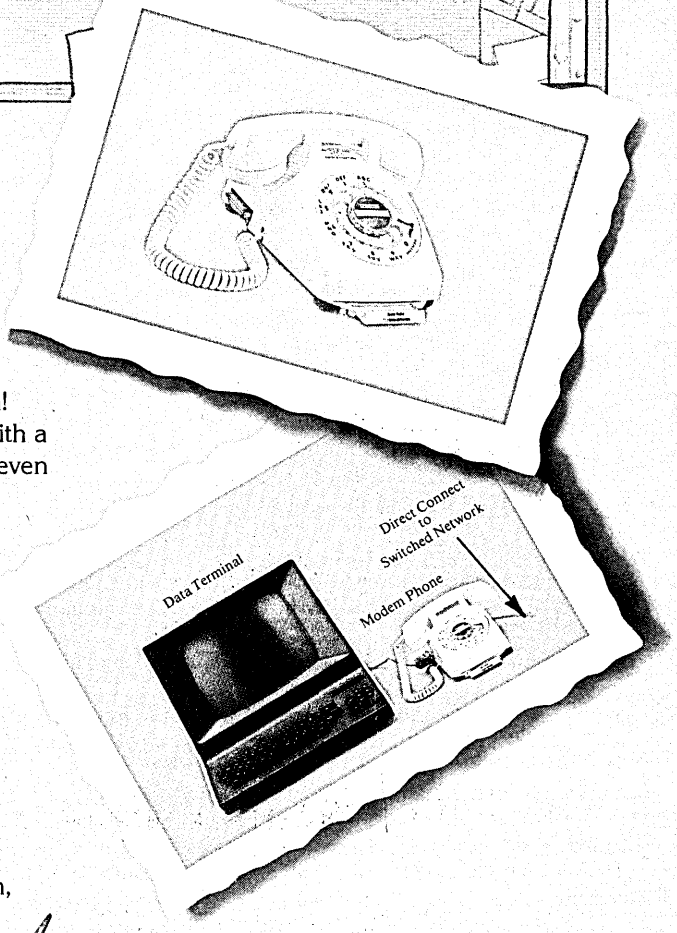
TI's attack on the $400 million microprocessor market is the TMS 9900 family. This line was broadened in 1979 by the addition of eight peripheral devices and 17 module boards with capabilities ranging from synthetic speech to magnetic bubble memory, and four new software products, including the PASCAL high-level language.

While home computer makers scurried into the small business market, TI announced its first home computer, the TI-99/4 with color display. At $1,150 it is considered high priced for its market, but the firm reportedly has plans to bring that price down into the more competitive $600 range. It was not a big seller in 1979, although TI is said to plan to sell at least 50,000 next year, worth about $35 million wholesale.

TI's terminal product line, estimated to account for about $210 million in sales, was not as big a growth market as minicomputers in 1979 because the favorable impact in unit volumes was checked by price reductions.

Dear Ma:

Stop looking for Racal-Vadic's new modem. It's inside the telephone!



Better sit down for this, Ma. Racal-Vadic has an invisible modem! Called a Modemphone, it's a standard rotary or tone telephone with a built-in 103/113 compatible 0 to 300 bps full duplex modem. It's even direct connect and full originate/answer, too.

It's amazingly simple to install and operate. Just plug the terminal cable into the Modemphone's RS232C connector, plug the 8-foot switched network cable into the voice-data jack, and start communicating.

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PS: Racal-Vadic has shipped over 250,000 modems to date.

Alexander Graham Jr.

Racal-Vadic Member IDCMA

RACAL *The Electronics Group*

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CIRCLE 79 ON READER CARD

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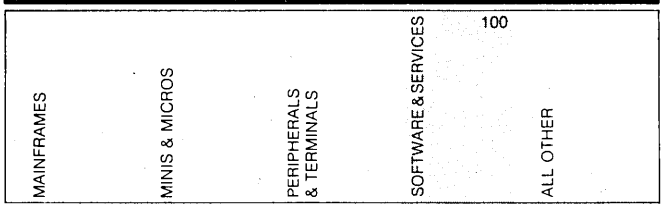

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$416 (M)	29	100	$366 (M)	22	88	$416 (M)	29	$18.8 (M)	20

COMPUTER SCIENCES CORP.

650 North Sepulveda Boulevard
El Segundo, CA 90245
(213) 678-0311

Computer Sciences Corporation, with excellent growth in both contract and processing services, saw revenues increase by 29% to $415 million in 1979.

Contract services—systems development and facilities management—continue to be CSC's mainstay activities, contributing over $307 million to its dp coffers last year. Data services, which include the Infonet network services and other bureau operations, crossed the $100 million line in 1979 and may have the chance to reach $150 million in 1980, thanks to the purchase of three operations from Itel. These acquisitions, which reportedly had $36 million in revenues, specialize in on-line order entry, income tax preparation, payroll, and general accounting services. CSC says they are part of an ongoing acquisition program for which it has both the cash and "funds flow."

Drawing from March-to-December 1979 figures, CSC contract and data services revenues break down, respectively, as follows: federal government, 76% and 40%; commercial, 4% and 44%; state/local gevernment, 10% and nil; and international, 10% and 16%.

The federal government is CSC's major customer. In contract services (up 24% in this period), this is the result of huge long-term contracts from NASA, military, General Services, and other departments. State and local government contract services were up 71%, primarily due to the $129.5 million five-year California Medical contract for software development and facilities management of a claims processing system. This is CSC's big first entry into the Medicaid market and the health care market in general—for which a special marketing force has been formed. Internationally, contract services were up 163%, mostly because of a $221.5 million five-year contract for a dp/communications network in Saudi Arabia.

In data services, CSC has concentrated on commercial activities, where it achieved a 43% increase. The firm is experiencing almost no growth in government business—partly because of general stagnation and partly because CSC in the last two years has had to bid competitively to provide the on-line services for which it was once sole-source contractor. International data services revenues, while small, are growing at a 58% rate, an opportunity CSC will help through network expansion.

Generally, CSC Infonet is upgrading its installations by phasing in new Univac 1100/80s to replace 1108s. As is true of most network services companies, CSC is expanding into distributed systems, starting this year and involving minisystems integrated with the network.

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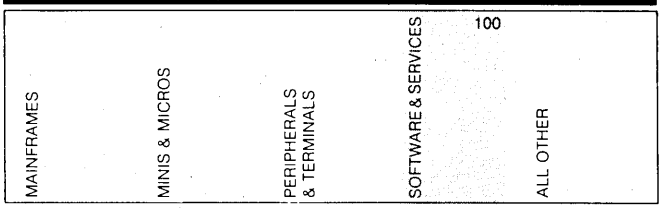

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$401 (M)	22	98	$368 (M)	22	92	$409 (M)	22	$35.9 (M)	20

AUTOMATIC DATA PROCESSING, INC.

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

Automatic Data Processing, Inc. celebrated its 30th anniversary with another year in an unbroken string of revenue and profit increases. Calendar 1979 revenues passed $409 million for the industry's second largest independent computer services company. This represented a 22% increase, while earnings grew 19.9% to almost $36 million.

The firm says it was "an unusually quiet year for acquisitions," having completed only four buys and one joint venture. The acquisition of Itel's Audatex division adds a new proprietary data base product to ADP's existing stable of network-based applications. A 70% interest purchased in SERIG Informatique, S.A., a French company providing payroll and general dp services, means that ADP now has a presence in all major European markets. ADP spread into the Canadian market last year through a joint venture with the Bank of Montreal to provide basic payroll and accounting services. The purchase of Programmed Tax Systems, a tax return preparation specialist in the New York area, signals ADP's entry into a rapidly growing market with rapidly increasing competition. Data Computation of Georgia, a $1 million banking services firm, was also acquired last year.

All ADP's fundamental services—commercial, industry specialized, and network—expanded in many directions in 1979. Commercial Services, built up around ADP's original business, payroll and general accounting, provided almost half the corporate revenues and continues to grow faster than ADP overall. Expansion here is in two directions: more employer services, such as the Unemployment Cost Control service announced in 1977 and now used by 5,000 customers; and a wider range of accounting services. For the latter, ADP is developing an interactive system for on-line order entry, invoicing, credit inquiry and inventory control, based on Hewlett-Packard computers. An earlier version is currently being offered to more than 200 clients on Microdata equipment.

The Network Services group is claiming growing success with its ADP/Onsite program—distributed processors on-line to ADP centers. Since it was first announced in 1978, approximately 30 DEC 2020 systems have been installed, and last year were offered in Europe for the first time.

Financial services are being expanded through on-line brokerage services and ADP management of securities processing. Auto dealer services, suffering heavy losses in recent years, are seeing growth in on-line accounting and manufacturer-dealer use of the ADP network for information exchange.

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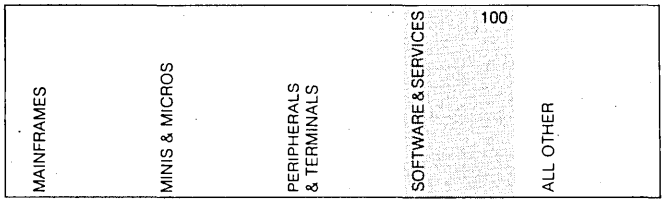

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$350 (M)	27	2	$275 (M)	15	79	$22980 (M)	14	$1409.0 (M)	15

GENERAL ELECTRIC COMPANY

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

GE escalated its top 50 standing five places to 17 last year. Its mainstream services and terminal businesses contributed most of the growth, but an additional "kicker" resulted from a consolidation into GE of Honeywell's overseas time-sharing operations. Acquisitions also contributed, but to a much smaller extent. The bottom line of all this is that estimated revenues (GE shuns comment on these figures) for GE are $350 million, up 27% over last year's $275 million.

Prior to 1979, GE's time-sharing services were sold in the U.K., Western Europe, and Australia through a marketing agreement with Honeywell. In 1979 GE's Information Services Division and the Honeywell marketing organization were merged into a new company, General Electric Information Services Company (GEISCO), owned 84% by GE and 16% by Honeywell.

Apart from the reorganization, 1979 was an active year for GEISCO on the product front. Now serving over 6,000 customers in 24 countries, GE's MARK III service was extended to provide a single-course distributed processing capability called the MARK III DDP System. Designed for transaction-driven applications requiring both local and remote processing, the system provides all the required pieces, including applications software, telecommunications network, host computers, minicomputers with terminals, and customer support.

Also added last year was MARK 3000, an IBM-compatible companion service to MARK III, which provides remote batch processing on IBM 3033's running the MVS operating system.

Like many other time-sharing services, GEISCO MARK III service provides a broad complement of data bases and general purpose software for modeling, statistical analysis, and applications development. Much of the software is licensed to GE and supported externally.

In an antithetical vein, two 1979 acquisitions give GEISCO strong internal product development and support capabilities in important functional markets. The addition of Mitrol Inc. in August furthers a corporate GEISCO goal of becoming a full function provider of manufacturing services. The Mitrol Industrial Management System (MIMS) is a unique package for manufacturing, planning, and control. It is based on a powerful data base manager which dramatically simplifies the processes of installing and customizing complex manufacturing systems.

A second acquisition announced in November, Enercom Inc., provides a system of software, data bases, and engineering services to create customized energy audit systems. ENERCOM software has been up and running on the MARK III system for the past two years.

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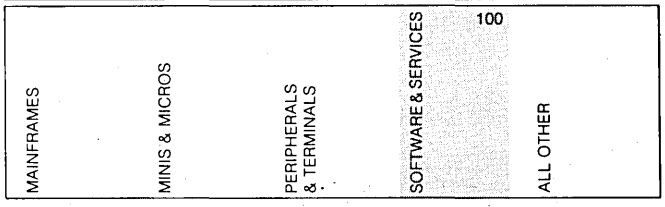


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$312 (M)	32	96	$300 (M)	31	96	$325 (M)	34	$25.8 (M)	18

ELECTRONIC DATA SYSTEMS CORPORATION.

7171 Forest Lane
Dallas, TX 75230
(214) 661-6000

EDS moved into 18th place this year owing largely to another strong performance in its mainstream facilities management (FM) business. Corporate revenues grew 34% to $324.8 million, placing EDS third among all independent computer service companies. At mid-year, the firm had 108 FM contracts with 97 clients, contributing approximately 80% of revenues.

Despite the impressive gains in its traditional business, EDS drew attention most often in 1979 for its ventures into new business areas. Though historically shy of the acquisition game played in the services industry, EDS jumped in solidly last year, scoring twice.

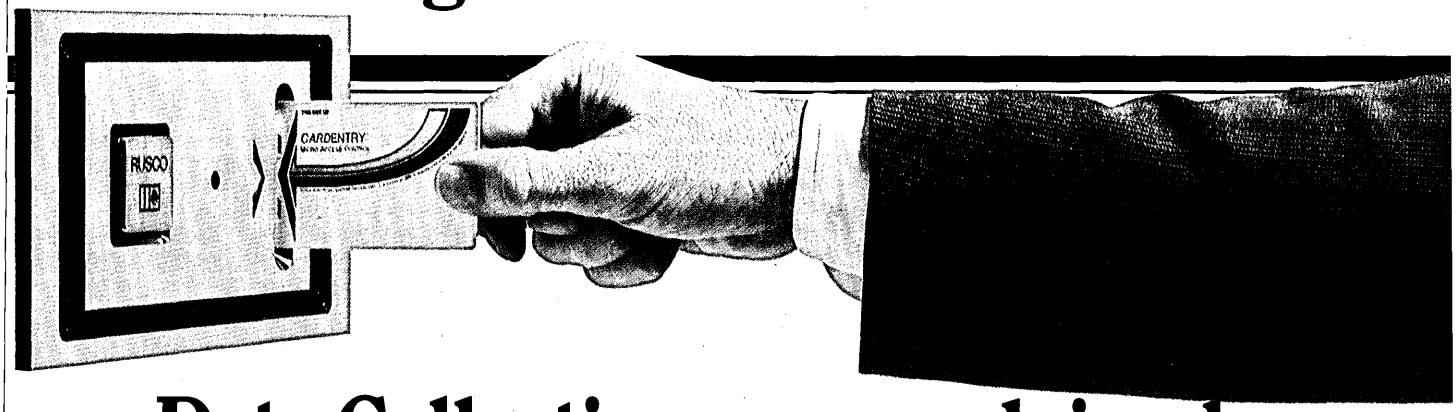
Potomac Research Inc., a $20 million research and development firm specializing in data processing and engineering services, was added to fulfill a corporate commitment to expand its government market penetration. To facilitate entry into the small computer market, EDS bought Compusource Corporation, a California-based supplier of software packages and custom programming to small businesses.

This small business effort and the Inovision subsidiary—established in August to sell personal computers, software, video recordings and assorted other "home of the future" paraphernalia—were put under a new General Systems Group, led by ex-IBMer, Herbert Jones. The plans were grandiose, and top management balked when confronted with the size of the investment. EDS disbanded General Systems, discontinuing production of home video recordings and marketing of video equipment. The remaining business systems and Inovision operations were folded into two existing divisions. While the apparent need to retrench so early is unfortunate, management skittishness in the face of such an unfamiliar undertaking is understandable. Only in the fourth calender quarter of 1979 did EDS finally reach agreement in principle to settle litigation concerning the realignment of du Pont Glore Forgan and Walston Co., an "artifact" of a prior EDS foray away from its mainstream business.

Closer to home, EDS's health care claims processing business continues to flourish. The company is now the prime services vendor for the Medicaid business.

EDS wants to repeat its claims-processing success in its other markets, including financial institutions, insurance, and manufacturing. As an example, EDS currently acts as the data processing department for 24 medium-sized banks having $200 million to $1 billion in assets. In the future it hopes to reach the much larger low end of the bank market with standardized turnkey systems.

Introducing the Identification Network.



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You simply tell the Identification Network which employees are allowed into each room and which employees are authorized to use each piece of equipment.

If someone attempts to enter a room or use a piece of equipment that's off limits to them, the door will not open or the machinery will not work.

And a central printer immediately tells your security people that an attempted unauthorized entry has occurred, where it occurred, and when.

It's that easy to account for (and control) unauthorized access and activities. And that easy to save money.

The most important control of all.

That, of course, is the ability to control losses.

The simple fact is, if you can account for detailed activities in areas where you lose money due to theft and misuse of materials, machinery and information, you can cut those losses dramatically.

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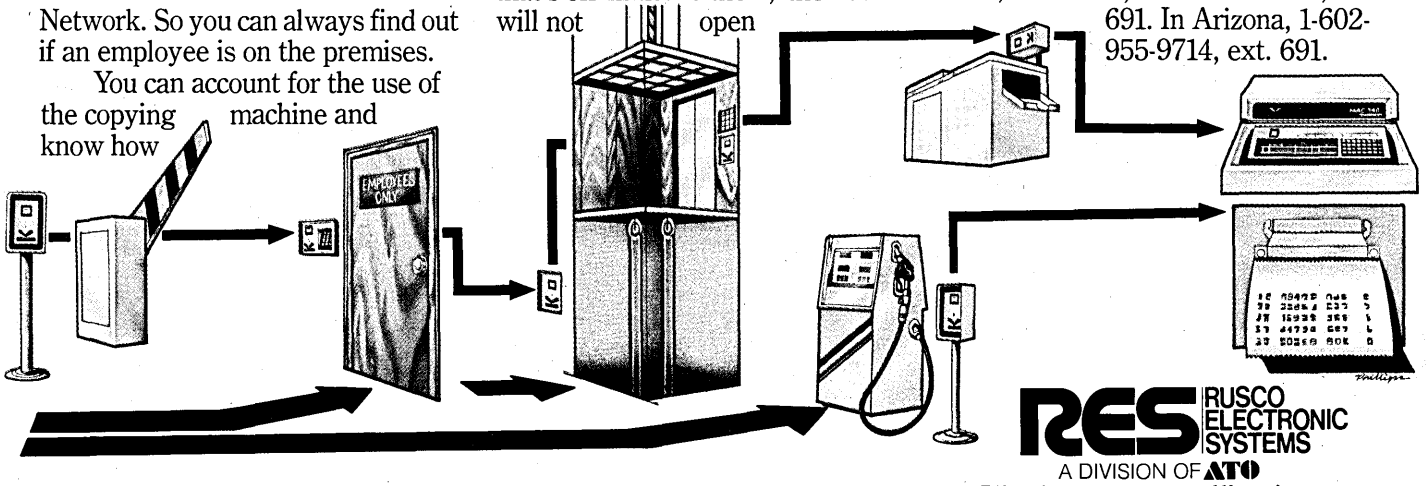

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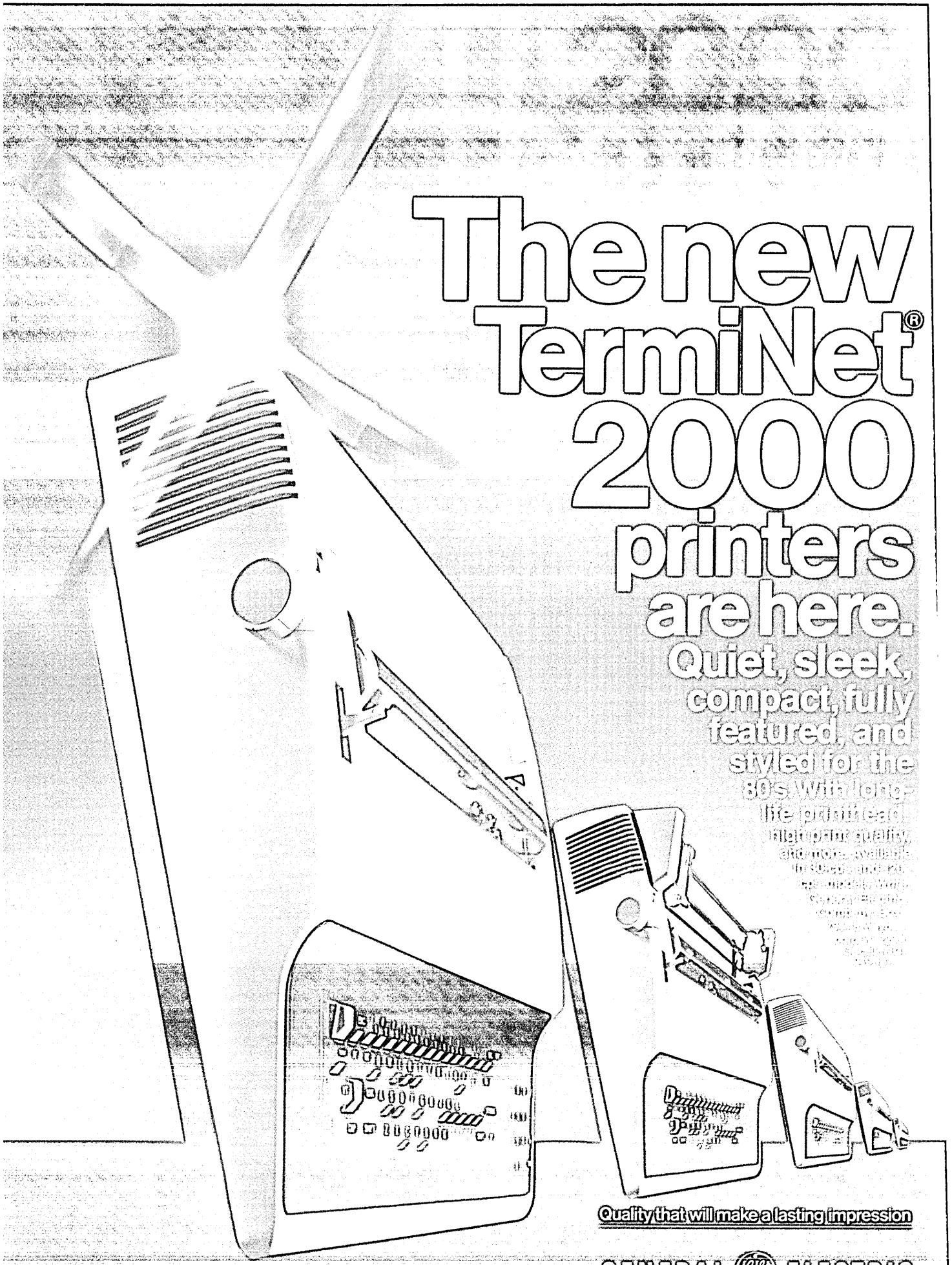

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GENERAL ELECTRIC

CIRCLE 82 ON READER CARD

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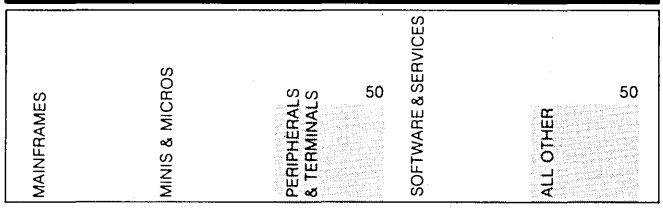

CY'79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$310 (M)	11	6	$250 (M)	12	81	$5440 (M)	17	$655.0 (M)	16

3M

3M Center
St. Paul, MN 55101
(612) 733-1110

The Business Products Group at 3M registered a 12% gain in revenues to $1.0 billion, with operating margins narrowing moderately to 14.8% from 15.6% the prior year. A bewildering array of products comprise the group's activities, including copying systems, teaching materials, microfilm supplies and accessories, carbonless paper, facsimile, word processing, and data entry equipment. The separate Recording Materials Group, with revenues of $460 million, up 17% in revenues, covers another array of products, including computer tape, diskettes, and data cartridges. At best, any estimate of 3M dp related revenues represents a hazardous guess.

3M defined its expertise in terms of coating and bonding technology in its early years. Coming from that direction, the breadth of the diverse products represents a logical extension of the basic technology. The organization and reporting practices, however, have evolved along this unique tradition. The concept of dp activity is of little significance to 3M, and consequently, of even less interest.

On the new product front, the Recording Materials Group introduced a data cartridge (the HCD-75, or high-capacity data cartridge system). With a 67-megabyte formatted capacity for users, the new 4-inch by 6-inch data cartridge will provide backup for fixed-disk memory systems. The new cartridge drive is priced at $2,650 for a system including a controller with one drive, and is expandable to include up to three additional drives at $1,050 each. The Recording Group also introduced new disk cartridge cleaning products.

A new Micrapoint automated filing system employs a microprocessor to index up to 88,000 document pages from microfilm on two diskettes.

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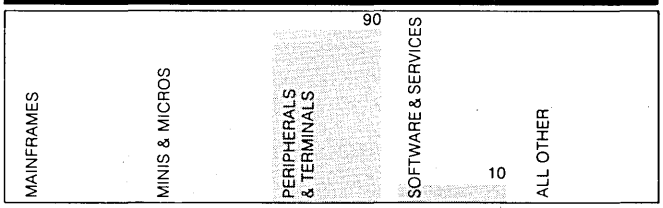

CY'79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$300 (M)	9	100	$195 (M)	9	65	$300 (M)	9	$NA (M)	NA

NORTHERN TELECOM SYSTEMS CORPORATION

1001 East Arapaho Drive
Richardson, TX 75081
(214) 234-5300

The industry is in a "wait and see" mode on Northern Telecom Systems Corp. (NTSC). This U.S. subsidiary of Canada's Northern Telecom Ltd. was formed as a result of acquisitions in 1978 of Data 100 and Sycor—two major terminal and peripheral suppliers. The idea was to combine their distributed processing capabilities with the digital communications knowhow of Northern Telecom, the $1.6 billion equipment manufacturer that is to Bell Canada what Western Electric is to Bell in the U.S.

The minor revenue growth in 1979 for NTSC, from about $275 million in 1978 to $300 million last year, shows that 1979 was a year dedicated to consolidation and housecleaning. Top management was changed, the personnel level was decreased to 6,100 from 6,500, manufacturing was consolidated into fewer sites, and headquarters was shifted to Texas. While the marketing force was reorganized, it was not cut back; also, a service company was formed to handle all products.

No new hardware products were announced in 1979, clearly hurting short-term growth of the company. Some products had been in development when the two companies were acquired, but the firm held back on 1979 announcements to sort out the product lines and decide what to consolidate and what to fade out.

This year will be different, but not because NTSC will be announcing many new computer products. One distributed processing system will be unveiled this year, but the heavy new product period will be 1981-82. The big difference for this year is the new capability brought to NTSC by the transfer of the Business Communications Group from sister subsidiary Northern Telecom Inc. in Nashville.

This group manfactures a broad range of digital private branch exchange systems (PBX), called SL-1, for handling data and voice transmissions over the same line in multiphone locations. NTSC plans to add more and more data processing capabilities to this product to be able to handle the voice/data volumes and functions of the "office of the future." From the distributed processing side, it will be a matter of adding software to NTSC's computer products to handle word processing, mail, and other functions.

The idea is crystallizing, but NTSC admits to being some distance from it, and says it will spend 1980 concentrating on more organization and planning. The company does have one big advantage: a parent corporation with extensive capital, research facilities (a 3,000-man development group in Canada), and a corporate management that devised and supports NTSC's plan.

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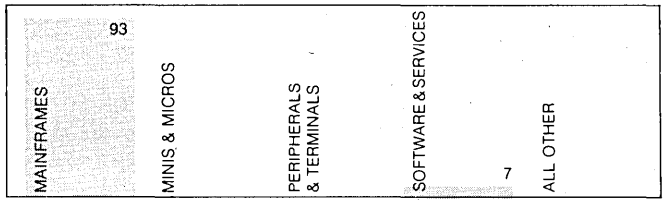

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$300 (M)	−7	100	$201 (M)	−14	67	$300 (M)	−7	$17.1 (M)	−65

AMDAHL CORPORATION

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

For Amdahl, the pioneer in large-scale plug-compatible mainframes, 1979 was a year of new initiatives and negative market influences—all of which carried into 1980.

First, Amdahl was naturally adversely affected last year by IBM's price reductions and the computer users' general shift toward leasing instead of purchase while they await IBM's H series. Amdahl saw its customers begin the shift toward leases in the second quarter of 1979, a trend which has continued into 1980. Despite Amdahl's high shipment levels, this development, coupled with the firm's own price reductions, impacted 1979 revenues and earnings. While foreign revenues increased 45% to $99.1 million, total 1979 revenues declined from $320.9 million in 1978 to $299.6 million, off nearly 7%. Net income declined even more sharply, from $48.2 million in 1978 to $17.1 million, or more than 64%.

While Amdahl was optimistic about shipment levels and a trend toward "more stable pricing" in 1980, it obtained a $260 million bank credit line internationally to help handle the leasing impact. Efforts to combine with Memorex and Comten last year failed, but at this writing substitutes had been found. Amdahl signed agreements for a merger (subject to board and shareholder approval of both firms) with Storage Technology Corp., the industry's major independent peripherals company, and for an acquisition of the $22 million Tran Telecommunications, a network development expert and manufacturer of concentrators and digital switches. Should these agreements be completed, Amdahl's competitive position would clearly be strengthened.

Returning to 1979's events, Amdahl continued its technical counterpunches to IBM product actions. In hardware, Amdahl added these improved price/performance processors: the 470V/7A, performance rated between the 470/V-611 and the V/7; and, subsequently, the 470V/7B, which is now the entry level machine to the V/7 and V/8.

The new 470/Accelerator provides for a 20%-50% performance improvement for some Amdahl processors.

Amdahl's software announcements last year were also critical to keeping up with IBM's changes: the IMS/VS Optimizer for improving the performance of the IBM HDAM data bases (this is part of a new software class to improve performance and productivity, AIDS); and new releases of the VM/Performance Enhancement, which allows users to experience 94% to 97% of the throughput of both IBM MVS and SVS operating systems.

The firm has upped its R & D expenditures 58% to $38.9 million, which includes funding for a new software development group at Dallas. This group is charged with devising Amdahl's future strategy in software to meet IBM competition.

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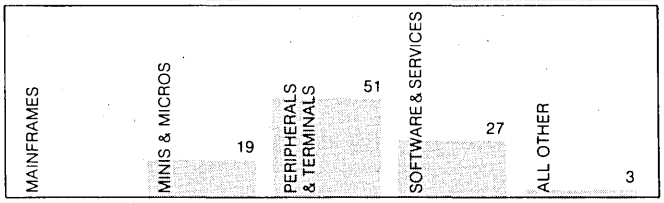


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$283 (M)	28	100	$155 (M)	17	55	$283 (M)	28	$17.0 (M)	−5

MANAGEMENT ASSISTANCE INC.

300 East 44th Street
New York, NY 10017
(212) 557-8310

Management Assistance Inc. continued to drive revenues upward in 1979. Sales of Basic Four computer systems for small- and medium-sized businesses registered a gain of 36% to $180 million, and dp maintenance activities, primarily at Sorbus, recorded a 40% increase.

Margin pressure, however, cut into operating net income, which dropped 5%. The adverse trend here was caused by losses in Basic Four's Wordstream word processing program, a shift in the mix of Basic Four systems, increased component costs, and a lower level of shipments.

Last year, MAI consolidated its domestic word processing Wordstream operations under Basic Four in order to position itself for the integrated office information system market. Until the consolidation, Wordstream systems had been marketed by a separate subsidiary since the 1977 acquisition. One major new OIS product was Dataword II, an intelligent terminal with resident text editing software for use with the Basic Four System 410.

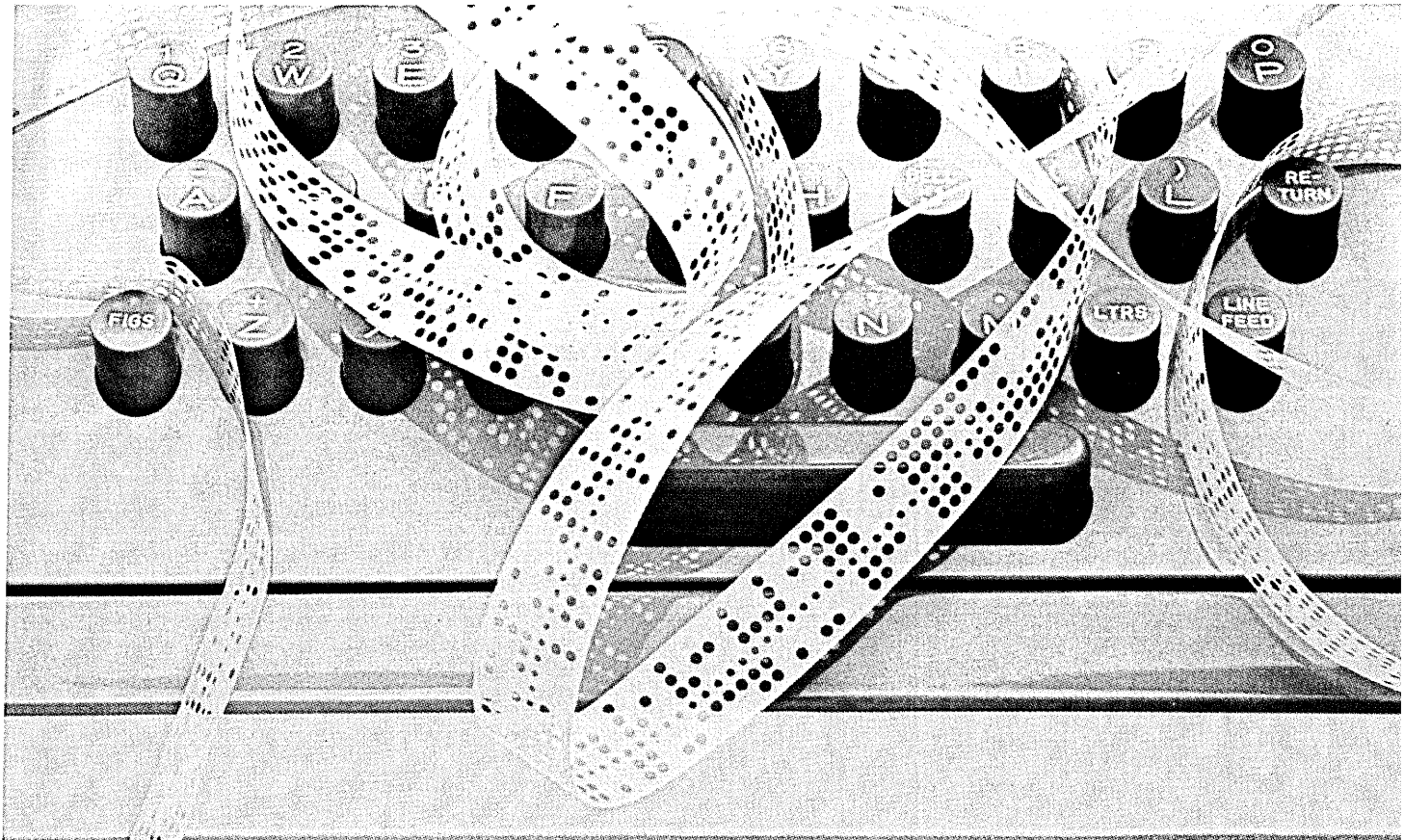
Other Basic Four product developments included enhancements to the System 610 and 730, allowing a maximum of 16 and 32 video terminals, respectively; new processors based on bit-slice bipolar technology; and a magnetic tape cartridge drive.

In software, new application packages and Forms Entry System were overshadowed strategically by the acquisition of Interactive Computer Systems Inc., which has supplied over 1,000 Basic Four customers with application software. The step may represent a growing trend throughout the subsector as suppliers of small systems continue to confront the rising requirement for fully supported application software in commercial markets.

Basic Four facilities in Orange County, Calif., have been expanded significantly from 180,000 to 365,000 square feet. A new 31,000 square foot facility in Enschede, The Netherlands, now fulfills European requirements for the 200, 410, and 610 systems. Additionally, word processing and some computer products are manufactured in the Houston, Texas, facility, which has been expanded from 36,000 to 94,000 square feet.

At year-end, Basic Four's sales force totaled 419 worldwide, up from 309 the prior year. Despite the expansion, however, backlogs have remained roughly flat at $60.3 million at year-end.

Maintenance revenues, generated primarily by the Sorbus subsidiary, registered a strong 30% gain in revenue to $76.5 million, with operating margins more than doubling to the 12% area in calendar 1979. Sorbus now services over 80,000 units, including 3,000 types of equipment used by over 10,000 customers.



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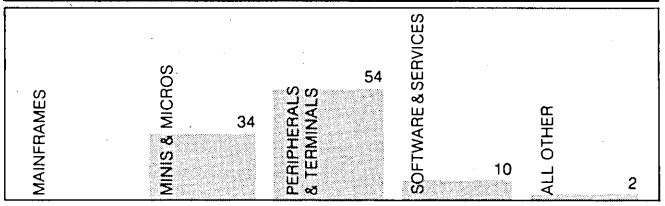

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$280 (M)	54	68	$160 (M)	58	57	$410 (M)	67	$36.9 (M)	83

WANG LABORATORIES INC.

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

In 1979 Wang Laboratories emerged from its status as an aggressive small computer and word processing vendor, into a leader in integrated office information systems. The systems orientation depends upon the coordination of three product areas in the company—word processing, which contributes a third of revenues; traditional small business, with slightly over half of total volume last year; and new VS systems for commercial markets at a little over 10%.

Total revenues grew an impressive 67% to $410 million and net income rose 83%. Roughly $130 million of word processing activity is not included in dp, since most of the equipment does not incorporate communications, data manipulation, or programming capabilities. The introduction of Integrated Information Systems in June, however, combined word processing, data processing, and telecommunications. As a result, a growing proportion of word processing will be included in dp in the future.

New OIS (Office Information Systems) models 125 and 145, also announced in June, extend product capability upwards to systems supporting up to 40 users at a selling price up to $500,000 with 170 million bytes of disk. New product momentum boosted orders to $129 million for the second half of the year—up 41% over the first six months, and more than double the orders for July-December 1978.

The continuing product drive of the VS systems, introduced in October 1977, has also achieved favorable market acceptance with roughly $80 million in orders in the closing six months of 1979, almost double the level of the preceding six months. A new VS-100 computer, announced in June 1979, increases throughput by more than eight times, while maintaining compatibility with the existing VS product line. These systems provide a full complement of word processing software based on distributed intelligence—workstations execute 90% of the word processing functions, with only 10% of the system control functions assigned to the VS processors.

Wang now faces the pressures of translating demand into production, and supporting new deliveries in the field. In manufacturing, employment rose 65% to 3,080 people at year-end; square footage is scheduled to rise by over 300,000 for 1980 on the 837,000 square feet already in place. Production lines for the VS systems have already been firmly established with roughly $60 million in deliveries for the latest year. The newest VS-100 model, however, incorporates significant new technology not yet established in production, including 32-bit hardware architecture, with first shipment now scheduled for September.

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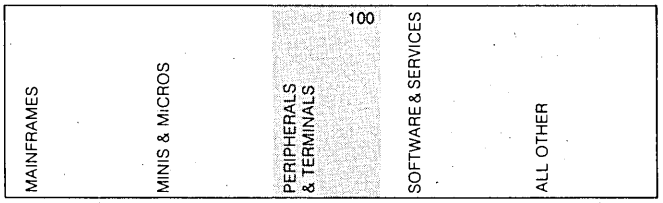


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$260 (M)	25	1	$156 (M)	25	60	$21996 (M)	13	$380.7 (M)	−42

INTERNATIONAL TELEPHONE & TELEGRAPH CORPORATION

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

International Telephone and Telegraph—$22 billion in sales from telecommunications products and services, color tvs, audio equipment, food products, hotels, insurance, coal, oil, gas, and terminals, printers, and word processors.

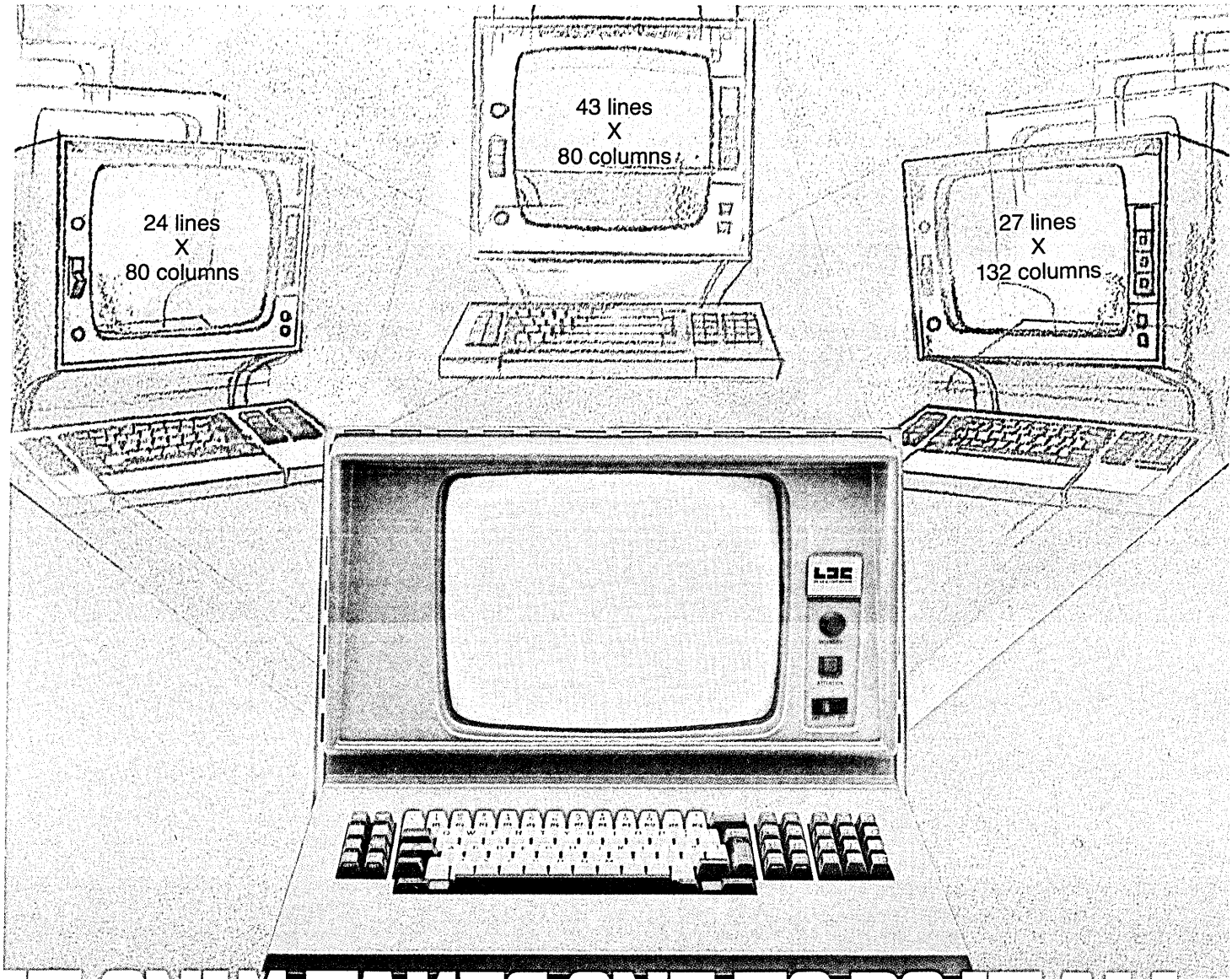
While the dp share of revenues is a mere 1.2%, ITT's computer operations—Courier Terminal Systems and Qume, combined are a sizable force in the computer industry. Last year these operations, both purchased in 1978, contributed an estimated $260 million in revenues; about $125 million from Courier and the remainder from Qume. Growth was about 25% although we believe that Courier alone registered a higher rate.

ITT-Courier Terminal Systems, Inc., which began operations in 1969, shipped its 100,000th terminal from the main plant in Tempe, Ariz., last August. And according to company president John Douglas, quoted in the trade press, there is "a pent-up demand" for terminals which cannot be satisfied. That apparently is why Courier expanded into an additional plant in another sunny spot, West Palm Beach, Fla., last year.

Douglas credited IBM with creating this demand with the 1977 announcement of a much lower-priced new product, the 3278 display terminal, to replace the 3277. As an IBM plug-compatible terminal manufacturer, Courier has joined other PCMs in trying to capture the orders IBM's overloaded facilities have not been able to fill quickly. Courier has been marketing an enhanced version of the 3277 to hungry customers, but will soon come out with its own 3278-type terminal. The competition will get tougher very shortly, however, as IBM production accelerates.

Qume, located in San Jose, Calif., manufactures and markets character printers to the oem market, data terminals to dealers, and print wheels and ribbons to the distributor market. In addition, it markets memory products, which include 5¼-inch (announced in June, 1979) and 8-inch double-sided/double density drives, to oem manufacturers like Texas Instruments. During 1979, a $12 million, 240,000 sq. ft. plant was opened, increasing production capacity by 25%.

Equally interesting to the computer industry is the fact that ITT is the second largest telecommunications equipment company in the world. Despite its broad diversification, communications and electronics account for almost 30%, or $6.4 billion, of ITT's total revenues. About $3 billion of that comes from the sale of switching equipment. ITT in recent years has invested massive amounts of money developing digital switches and the plants to build them. In addition to equipment, ITT has also been developing special communications services, such as the MCI Execunet-type service, City Call, and a facsimile network called Fax-Pax.



IT ONLY TAKES ONE TO DO IT ALL

The only one that does it all is LDC's new All-in-One SOFTPRINT™ Display System.

For the first time ever, here's the display that incorporates the features of three IBM 3278 Models — 2, 4 and 5. It's the LDC All-In-One SOFTPRINT Display, the new one that's the obvious way to go in distributed data processing.

What you get is dynamic selection of either the 27-line by 132-column or 43-line by 80-column screen format as an alternate to the 24-line by 80-column format. On top of that is the availability of operation with both LDC Local and LDC Remote 3274 compatible controllers. LDC Series 300 Display Systems offer many other pluses, including price and delivery advantages.

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LDC

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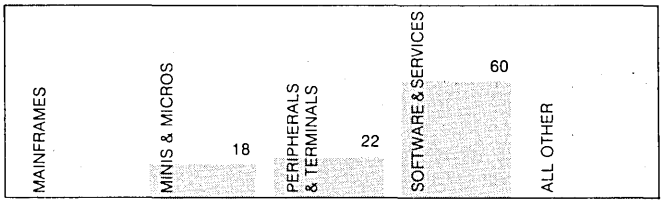

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$253 (M)	22	5	$213 (M)	18	84	$5279 (M)	28	$199.1 (M)	24

McDONNELL DOUGLAS CORPORATION

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

McDonnell Douglas significantly enhanced its position in the top 50, moving from 33 to 26, largely due to its acquisition of Microdata, a California-based manufacturer of small computer systems for data base applications. Microdata revenues for 1979 grew to an estimated $102 million, whereas MCAUTO, the company's services division, saw its noncaptive revenue grow 18% from $128.2 million to $150.6 million. MCAUTO says it is investigating joint product development with the new Microdata Division, but there are no plans to fold Microdata into the MCAUTO operation. For now, Microdata will operate as a separate subsidiary.

Unlike some of its time-sharing competitors, MCAUTO has shied away from releasing a general purpose user-site hardware service, preferring to offer network-attached minicomputer services in specific markets. A variety of these services are already up and running on DEC, Data General, Hewlett-Packard, and Four Phase equipment. In the future, MCAUTO can look to Microdata as a possible internal source for its minicomputer equipment.

MCAUTO expanded its intelligent, low-speed communications network during 1979 so that now customers in 19 major U.S. cities can dial a single local phone number and be connected with any one of several MCAUTO computer systems. Future needs for physical expansion will be accommodated in a $73 million, 74-acre campus-style office and computer center complex in St. Louis. When completed, MCAUTO believes it will be the world's largest facility designed specifically for commercial computer operations.

MCAUTO's largest single area of industry specialization is health care, which contributes revenues in excess of $50 million annually. Established in 1970 as a provider of financial services to hospitals, the Health Services Division has significantly added to its applications base. Services now include a health data collection system, a hospital patient care system, a medical records information system, and practice management services to physicians. New health services under development include a new comprehensive patient care system using Tandem minicomputers either on a standalone basis or attached to the MCAUTO network.

Other new product developments for 1979 include programs to evaluate the energy needs of buildings, a system to control material and drawings needed in project development, a financial consolidation system, and a system for structured analysis and design. In addition, conversion of all IBM mainframes at MCAUTO to MVS was completed, and System 2000, a generalized data base management system, was installed on both IBM and CDC mainframes for nationwide time-sharing access.

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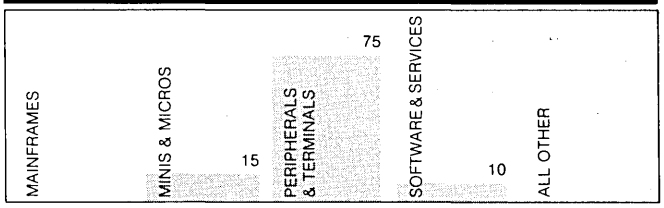


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$252 (M)	41	100	$197 (M)	46	78	$252 (M)	41	$27.5 (M)	54

DATAPOINT CORPORATION

9725 Datapoint Drive
San Antonio, TX 78284
(512) 699-7000

Datapoint came in with another strong year—up 41% in revenues, and buttressed its product position to sustain continued high growth in the future. With great fanfare, Datapoint furthered its claim to the "electronic office" in November 1979 with two software products for word processing and electronic message systems. ARC (Attached Resource Computer) and voice communications products constitute key ingredients forming the foundation.

With the announcement of the ARC System in December 1977, Datapoint charted a separate course with the objective of interconnecting multiple Datapoint systems and a large host computer with one common data base. In an area involving complex technical tradeoffs and real technical challenges, however, the cost effectiveness of this approach is not intuitively obvious, at least to some. Neither is Datapoint able to provide an analysis of the acceptance of ARC systems in the market. The *1979/80 Mini Microcomputer Survey Report* by DATAMATION does confirm, however, Datapoint's network orientation. Although only six ARC systems were specifically uncovered in the survey, 21% of the 1,653 installed Datapoint units identified were evidently operating in a minipeer network—twice the levels of Data General, DEC, and HP. The survey covered the installed base, including many older models. As a result, a significantly greater proportion of current shipments would be so classified.

Over the last four years, Datapoint's Communication Management Products Division has announced six products within the telecommunications area. Initially, Datapoint concentrated on standalone systems for long distance. A "use now, integrate later" philosophy deferred the challenge of eventual integration. Even so, the Infoswitch products pointed to the combination of voice and data disciplines, since 90% or more of all communications in the office involve voice. Infoswitch/ARC, introduced in 1978, enables customers to attach the communications products to data processing systems.

The introduction of word processing and electronic message systems (EMS) further extends the company's efforts in the office of the future. AIM, or Associative Index Method, eases considerably the task of locating documents. The unique feature of the message system is its ability to interweave both data message and voice. As software enhancements, the products remain bundled.

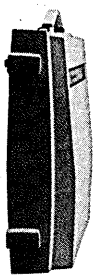
Cash on the line.

IMMEDIATE DELIVERY

Bankers Trust banks on TI's 745.

Bankers Trust has a valuable asset in TI's *Silent 700** Model 745 Portable Data Terminal.

Even before the bank's doors open in the morning, the 745 goes to work at the heart of the Bankers Trust's Cash Connector service, giving clients needed information on their accounts. The lightweight, 13-pound portable 745 can travel anywhere to provide bank clients with complete on-the-spot daily statements. Using virtually silent thermal printing, the 745 issues balance reports, money transfer reports, and the latest money market quotes.


Model 745

Connecting over normal phone lines to the bank, the 745 gives client comptrollers, financial officers and CPAs instant access to records of their accounts. And with the typewriter-like keyboard, clients have direct access to their money as well. The 745 enables clients to initiate money transfers faster than a phone call and puts all their financial transactions at their fingertips.

The versatile 745 is also earning the interest of people outside the banking industry. Salesmen, real estate and insurance agents are utilizing the 745 for remote data entry and distributed network applications.

TI is dedicated to producing quality, innovative products like the 745 Portable Data Terminal. And TI's hundreds of thousands of data terminals shipped worldwide are backed by the technology and reliability that come from over 30 years of experience in the electronics industry.

Supporting TI's data terminals is the technical expertise of our worldwide organization of factory-trained sales and service representatives, and TI-CARE†, our nationwide automated service dispatching and field service management information system.

XIII OLYMPIC WINTER GAMES LAKE PLACID 1980

That's why TI was appointed the official computer and calculator company of the 1980 Olympic Winter Games.

If you would like more information on the Model 745 Portable Data Terminal, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7784, Houston, Texas 77001, or phone (713) 937-2016.

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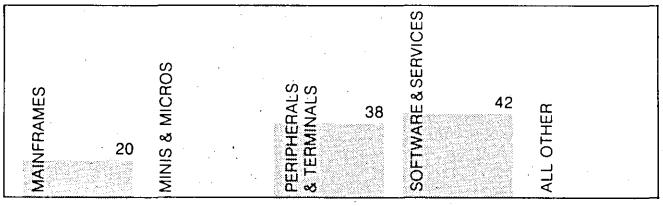

CY'79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$221 (M)	−55	48	$155 (M)	−55	70	$461 (M)	−33	$−217.0 (M)	−560

ITEL CORPORATION

One Embarcadero Center
San Francisco, CA 94111
(415) 955-0000

Itel came out of the 1979 year devastated by financial problems in its former computer operations following IBM's 4300 series announcement in January. At the time of this review, the possibility of involuntary Chapter 11 bankruptcy proceedings remained, contingent on the company's payment of $38 million principal and interest due March 31 to the banks. Employee rolls shrank from last year's 6,500 to about 1,000 by March 1980, as the company divested itself or discontinued almost all computer activities to concentrate on transportation leasing activities. Even at this late date financial results are available only for the first nine months of 1979, which include a whopping $226.2 million loss—with the likelihood remaining of major additional losses if existing reserves prove inadequate.

Insurance coverage of Itel computer lease transactions is approximately $380 million, with claims for losses expected to total $200 million over the next several years. As of Nov. 20, 1979, Itel had filed claims of approximately $8.1 million and collected $1.4 million by Dec. 12, 1979, with the balance in dispute between Itel and its insurance carrier, Lloyd's of London. The status of the full coverage remains uncertain. Although a January settlement provided for payment of all Itel losses directly to claimants, it was unclear how much Itel itself agreed to assume in payments. Any settlement is contingent upon a restructuring of private debt and approval of a definitive agreement.

To limit exposure in the computer business, Itel transferred all IBM-compatible computer sales and maintenance operations in the U.S., Canada, Europe, and Singapore to National Semiconductor, creating a new subsidiary, NASCO (National Advanced Systems Corporation), that will endeavor to liquidate the inventory. Procedures were established for the payment of $18.1 million due to National Semiconductor as of October 1979 for past purchases of computer equipment.

Itel began to liquidate its remaining assets related to IBM-compatible computer operations not transferred to NASCO. Write-downs and reserves reached $123.6 million, with remaining assets related to IBM plug-compatible computer business totaling $246.5 million.

Itel has sold off its computer services operations and discontinued minicomputer marketing operations. Reserves totaled $48.2 million at the end of the third quarter.

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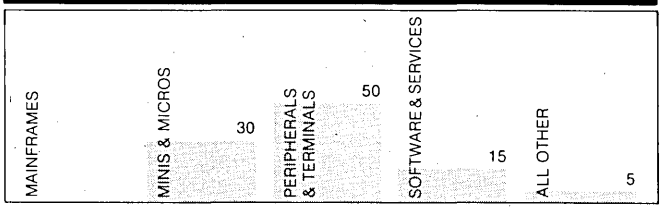

CY'79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$210 (M)	17	20	$150 (M)	15	71	$1049 (M)	13	$68.0 (M)	19

HARRIS CORPORATION

Melbourne, FL 32919
(305) 727-9100

Harris is a complex billion-dollar company operating in the fields of electronic communications, data handling systems, integrated circuits, and printing equipment. The approximate percentage contribution of total 1979 calendar revenues from each of Harris' business segments is estimated as follows: Information Systems, 19%; Communications, 19%; Semiconductors, 10%; Government Electronics, 22%; and Printing Equipment, 30%.

In total, calendar 1979 data processing-related revenues were $210 million, up 17% over the prior year. The bulk of data processing-related revenues is in the Information Systems segment, which is comprised of the Computer Systems, Data Communications, Composition Systems, and Control Systems Divisions. During 1979, another new division was added, called Information Systems International, which was formed to market Harris computers and distributed data processing, interactive, and remote batch terminals outside the U.S. and Canada.

Each division was built up individually, but Jack C. Davis, corporate vice president and group executive of the Information Systems Group, emphasizes that the corporate plan is to integrate dp, word processing, and data communications capabilities and combine them, in turn, with Harris' communications knowhow. The target—the industry's favorite new market, the office of the future. During 1979 Harris started a new office automation planning activity.

Here is how these divisions break down by product line: Harris medium-scale computers for scientific, education and business applications consist of the series 100, 200 and 50 lines. During 1979, the company added the 48-bit Series 800 as Harris' answer to the DEC VAX 11/780 system. The system can support up to 128 interactive terminals in concurrent time-sharing, multi-stream batch, remote job entry, and real-time processing environments.

Harris Data Communications Division provides distributed data processing systems and interactive and remote batch terminals. In 1979, Harris significantly enhanced the performance of its 1600 DDP system by adding a processor with three to four times the speed of the earlier model and by doubling memory capacity.

The Composition Systems Division provides word processing equipment, video typewriters, editing terminals, and computerized phototypesetting equipment primarily to the newspaper industry. Control Systems Division provides computer-based control systems for a variety of industries, but particularly for electrical utilities.

In addition to information processing and data communications, Harris points out these complementary communications capabilities: satellite communications, fiber optics, data security, voice and data switching, facsimile, semiconductors, and broadcasting.

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The Datacorder intelligent terminal is a friendly, accessible, remote-data-entry terminal. It speaks directly to you on an easy to read single-line display: it prompts, checks each entry, and tells you if a data field has been incorrectly entered. You can enter data directly from source documents in the sequence that is most convenient for you: the Datacorder will reformat the data for your computer.

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Company _____

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CIRCLE 86 ON READER CARD

The data entry people. **IESI**

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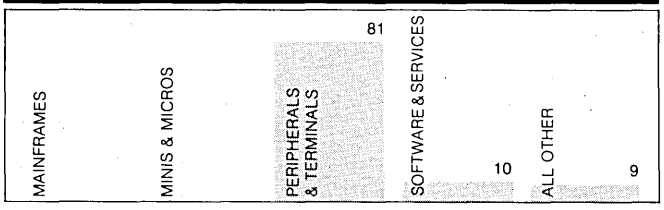

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$198 (M)	21	100	$80 (M)	26	40	$198 (M)	21	$12.2 (M)	69

MOHAWK DATA SCIENCES

1599 Littleton Road
Parsippany, NJ 07057
(201) 540-9080

Mohawk Data Sciences recorded steady progress in 1979, which marked its 15th anniversary. Market acceptance of the now established Series 21 dp/word processing terminal system and of the newly acquired Trivex crt products boosted backlogs to $181.6 million in October from $163.2 million the prior year. Meanwhile, the earnings turnaround continued. On revenues of $198.2 million, MDS posted a 69% increase in operating net income to $12.2 million for the 12 months ending in October. Revenue expansion, at 21%, benefited from Trivex, which had about $12.0 million in annualized revenues at the time of acquisition.

The total cumulative orders for Series 21 at the end of 1979 ran over 6,000 systems, valued at more than $150 million, and firmly established the new family on the market. Series 21 performs data entry, data processing, batch and interactive communications, and word processing on the same system. The line was originally introduced in 1977 in two versions: the System 21/20 for basic data entry ($12,000 to $14,000 typical configuration) and the 21/40 ($20,000 to $22,000) for customized data entry with a COBOL-type language, MOBOL, for programming. Later, a multiprogramming 21/50 was added in the $30,000 to $60,000 range. Last year, MDS added word processing capability to the 21/40 and 21/50 and provided for multiprogramming on the 21/20 and 21/40. The Series 21 complements programmable data entry and processing subsystems available from the company since the mid-1970s on the System 1200 and the System 2400.

The acquisition of Trivex in January, 1979 added editing and interactive crt functions to the MDS arsenal, with full compatibility to IBM's 3270 products. Whereas Trivex business has been largely within the U.S., MDS's worldwide marketing and service support the introduction of the product line in European and Canadian markets.

In December, Mohawk Data Sciences announced its 49% ownership in Sistemas Mexicanos de Datos of Mexico City, employing 55 sales, service, and systems personnel throughout Mexico. The marketing group concluded a $4.3 million contract with the Mexican Government for 32 large MDS System 2400 key-to-disk data entry systems. Earlier in the year, MDS formed a new subsidiary in Spain, and new dealerships in Greece, Korea, and Taiwan.

MDS has traditionally maintained a stronger market position overseas, which now accounts for approximately 60% of total revenues. Domestic revenue expansion of 26% modestly exceeded the corporate 21% rate—in large part because of the domestic orientation of the Trivex acquisition.

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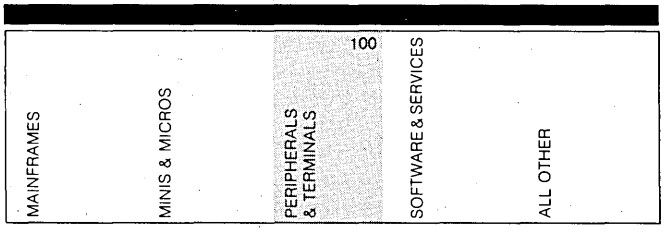

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$195 (M)	34	22	$121 (M)	32	62	$878 (M)	30	$84.5 (M)	32

TEKTRONIX, INC.

P.O. Box 500
Beaverton, OR 97077
(503) 644-0161

Tektronix's reputation began with cathode-ray oscilloscopes, which remain the major product, and has steadily expanded to include a wide range of graphic terminal systems in the Information Display Group. Hardcopy units that make permanent paper copies of screen contents and a line of digital plotters have further extended Tektronix's products.

Proprietary technology (DVST, or direct view storage tube) for many of the products eliminates the flicker of conventional raster, although the company also markets raster devices. The 4000 series has an entry-level price as low as $2,995, extending up to $19,500 for the 4016 with a 25-inch screen offering high-resolution and interactivity. The top of the product line provides plotting capability of unusual complexity, with more than 15,000 characters, and using 179 characters per line on the screen. Market acceptance has been particularly noteworthy in the engineering community.

The introduction in April 1979 of a pair of new desktop graphics computer systems, the 4052 and 4054, formed a family of 16-bit, software-compatible graphics processors. The previously announced 4051 with an 11-inch screen carries the low end at a price of $5,995, and the model 4054 with a 19-inch screen defines the top of the product line. The 4050 family features a version of BASIC that is oriented to detailed, high-resolution representations. Plot 50 software, which includes various mathematical and engineering packages, can be used with any of the systems, allowing system expandability.

Late in 1979, production constraints impacted deliveries of Information Display products using large-screen tubes. While deliveries improved, the challenges were not fully resolved at calendar year-end.

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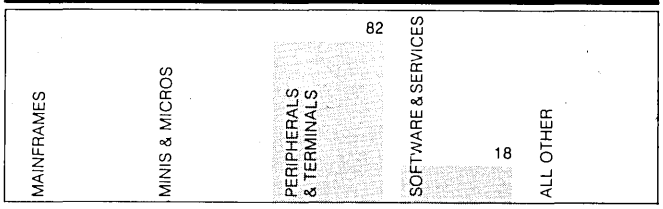

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$179 (M)	32	100	$144 (M)	26	80	$178 (M)	31	$16.7 (M)	37

FOUR-PHASE SYSTEMS, INC.

10700 NORTH DE ANZA BOULEVARD
CUPERTINO, CA 95014
(408) 255-0900

Continued momentum of shipments, up 25%-30%, boosted revenues by 32% and income by 37% for Four-Phase in 1979. Rising competition from IBM, nonetheless, appeared to impact backlogs at Four-Phase—up a modest 6.4% to $77.9 million. With an average system value of $75 thousand to $80,000, the company's products compete directly with the IBM 8100.

Four-Phase responded to IBM's 8100 in April 1979 with its own enhancements to main memory capacity and processing speeds. Serving up to 16 users, the System IV/60 and IV/65 defined new mid-range systems in the $100,000 to $140,000 price class. Along with the IV/90, released in mid-1977, the three top-end systems utilize mapped memory which extends program addressing to 256K words (or 768K bytes) versus the 32K word limit on other Four-Phase products. Up to 280K and 480K bytes of physical memory can now be attached to the IV/60-65 and IV/90 models, respectively. The memory upgrade enables Four-Phase to support more on-line terminals in individual networks. For example, the company asserts that compared to several years ago up to three times as many terminals, depending upon the application, can be in use on one system without degrading individual response times.

Greater memory capacity supports the MFE/IV (multifunction executive), which enables multiple software packages to operate concurrently and independently—including Data IV for shared processor data entry, Vision for transactions and on-line inquiry, Foreword for text editing, and COBOL. Each package may be addressed independently and concurrently by any operator. The new IV/60-65 remains compatible with the IV/90, providing an easy upgrade path for customers to add multiple functions. The trend toward multifunction was especially evident in the System IV/60-65 orders, which were predominantly for MFE/IV. With the number of installations using the new operating system software rising sharply toward the end of 1979, the company appears to be well on its way toward resolving the usual field problems associated with new software.

In January, Lee Boysel, president, cautioned his investors that near-term earnings would likely be impacted by the company's plan to sustain corporate development plans for the future despite the likelihood of a recession in the United States. Margins may be impacted by a 50% rise in engineering expenditures, and a continued buildup in field personnel contributing to an expected overall gain of 8%-10% in employment, against moderating revenue growth. The actions once again confirm that the industry, and distributed data processing in this instance, is not for the fainthearted.

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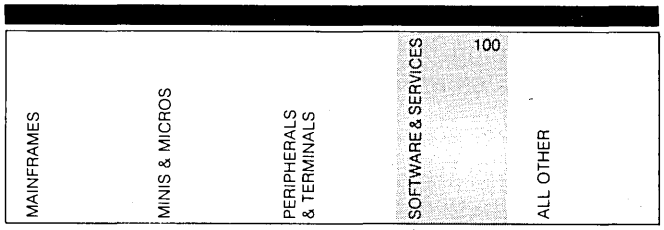

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$176 (M)	28	91	$167 (M)	27	95	$193 (M)	29	$14.6 (M)	38

TYMSHARE INC.

20705 Valley Green Drive
Cupertino, CA 95014
(408) 446-6000

One of the major network information services companies in the country, Tymshare had a good year in 1979 and took important steps to expand its business worldwide and to enter new markets. Total revenues reached $193 million, 91% of that from dp services and equipment sales. This represents a 29% growth, outpacing the estimated 20% increase the services industry is averaging. It also means Tymshare has almost 3% of the diverse and scattered $6.7 billion processing services market.

More important were Tymshare's actions in preparation for the 1980s. These ran the gamut from growth of specialized services for vertical industries, to expansion of data network availability, to entry into new communications markets.

Through subidiary Tymnet, which became a common carrier in 1977, Tymshare is already in the public data network market (estimated at $80 million to $100 million annually). And it is in the electronic mail market ($150 million). In 1979, it went after an even bigger one: private data network development ($200 million to $250 million). Several sales were made, but one publicly announced was a contract from TRW to install a network to service its 30,000 credit information customers on-line. In addition to expanding its $30 million-plus business in credit card processing for banks, Tymshare inaugurated its first electronics funds transfer service this January, in the San Fernando Valley region in California.

Tymshare also continued to develop its Augment network service for automated office applications; a Stanford Research Institute development, this system appears to be one of the first to go operational. The company also is making strides in another industry, health care systems; it says it is a "distant third" in competition, with $14 million to $16 million in revenues, but its target is to become a leader through acquisitions (such as recently acquired Medistat, which had 1979 revenues of $4 million) and through development of applications, such as patient information control.

Like other big services companies, Tymshare's main 1980s target is to serve the growing demand for "complex applications" through provision of terminals and mini- and midicomputers on-line to Tymshare's massive computer facilities. It added the 1100 intelligent display terminal to its offerings in 1979.

The way to reach Tymshare's systems is through the public Tymnet packet switching network. The company's $24 million Tymnet subsidiary did a great deal to expand the availability of this network in 1979. (Only one-third of Tymnet's revenues are from Tymshare centers.) Tymnet added 13 countries (total now 28) which have links to Tymnet in the U.S. Technically Tymnet came up with the software to make its network accessible by the vast IBM 3270-terminal base.

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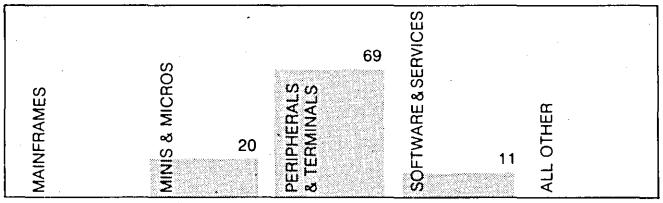

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$173 (M)	13	22	$129 (M)	16	75	$785 (M)	27	$55.5 (M)	40

PERKIN-ELMER CORPORATION

Main Avenue
Norwalk, CT 06856
(203) 762-1000

The Data Systems Group of Perkin-Elmer has improved profits and products following a period of sub-par performance. Revenues of $172.5 million for calendar 1979 rose 13%; operating profit rose 49% to $15.5 million for the fiscal year ending in July, the latest available period for profit results. Although substantial additional progress must be made for Data Systems to match the pace of minicomputer rivals in terms of both growth and profitability, the group has at least begun to narrow the gap in margins.

Three entities comprise the Data Systems Group. The largest, the Computer Systems Division (CSD), contributes to roughly half of total group activities from system sales and another 10% from service. CSD's activities are now evenly split between end users and oems—a sharp contrast to the predominant oem orientation when Perkin-Elmer entered the business through the acquisition of Interdata in 1974. The Memory Products Division (MPD) was formed from the 1976 acquisition of Wangco, a manufacturer of disk drives and magnetic tape transports. MPD contributed about 28% of revenues in 1979. The Terminals Division contributed a little under 10% of revenues.

A reorientation of business strategies at Data Systems precludes a broad frontal attack on the entire computer market, given the limited market share and resources of Perkin-Elmer. A target market approach has begun, including flight simulation and scientific computing markets. Commercial sectors will not be ignored, although the company suggests a narrower focus.

On the product front, the first of a new generation of Perkin-Elmer 32-bit minicomputers, the 3220, was announced in February, with shipments beginning in March; the top-of-the-line 3240 followed in September. The new models replace the 7/32 and the 8/32. Software introductions included a new FORTRAN VII Compiler and the Reliance transaction processing software package for commercial applications. In peripherals, a low-cost dumb terminal (the model 550 or Bantam) and the model 3500 intelligent terminal contributed to making terminals the fastest growing sector.

Production difficulties in the tape and disk drive (formerly Wangco) sector eased in 1979, in part because of the completion of a move into new and larger facilities in Garden Grove, Calif.

Overall, Perkin-Elmer's Data Systems Group may have turned the corner, even though the results only recently began to show in reported financial figures. Backlogs in July at the close of the fiscal year were only modestly up by 4% to 6% at $48.6 million, but strengthened coming into the 1980 year to around $66.5 million at the end of January—up more than a third year-to-year. Similarly, revenue gains finally began to show some spark—rising a respectable 28% for the January 1980 quarter.

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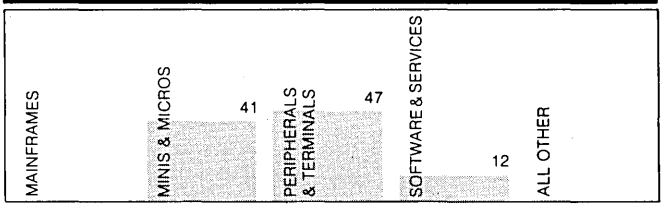


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$171 (M)	20	100	$126 (M)	23	74	$171 (M)	20	$5.5 (M)	−39

PERTEC COMPUTER CORPORATION

12910 Culver Boulevard
Los Angeles, CA 90066
(213) 822-9222

In the current world of dollar devaluations and high interest rates, many American companies—like Pertec Computer Corporation—have become both attractive and willing buys for foreign companies. Early this year, after a heated bidding contest that included N.A. Philips, Pertec was purchased by a wholly owned subsidiary of West Germany's Triumph Werke AG, an office equipment specialist. It was a marriage for money as well as talents; Pertec, facing new product costs that were far outstripping revenue growth, needed access to new technology and cash for future expansion. The firm also wanted a rapid entry into the office of the future.

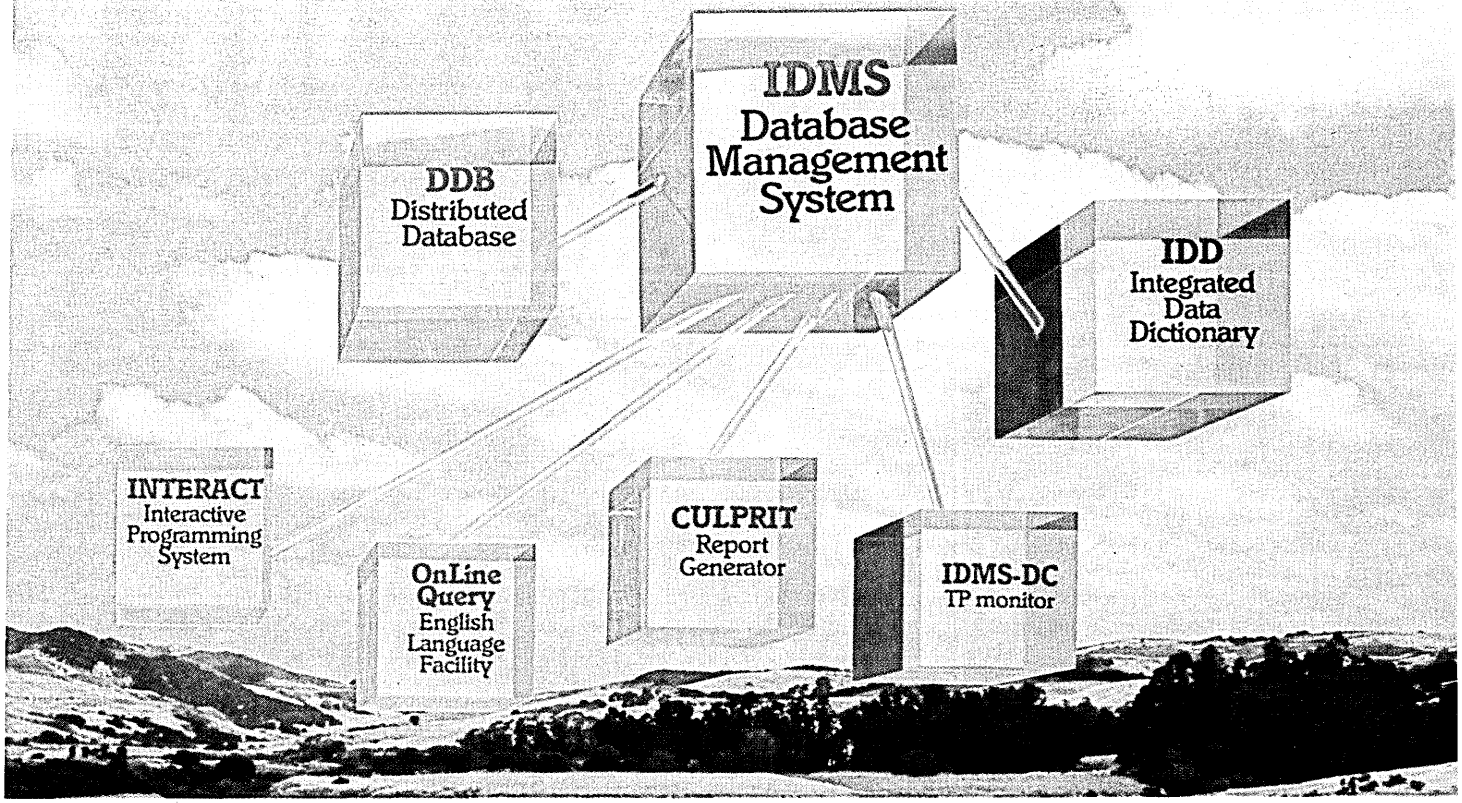
Triumph, a $400 million-plus company majority owned by Volkswagen, markets a broad range of typewriters, calculators, text editing and word processing systems, copiers, minicomputers, microcomputers, and supplies. Some products are homegrown, while many are purchased oem from U.S. and Japanese firms, including Pertec.

Pertec feels its complementary capabilities provide the data processing part of the building blocks toward the "office of the future": the PCC 2000 line of general purpose small systems ($10,000-$20,000); the XL distributed processing systems with file management, multifunction workstations, and data communications; and intelligent peripherals, including 8-inch Winchester technology fixed-disk drives, flexible disk drives, and 6250 bpi tape transports.

While Pertec and Triumph plan their cooperation, Pertec is also working to shake off the difficulties of 1979 and continue its plans for the data processing market. Corporate revenues were up respectably last year, 15.5% to $171 million, and backlog increased 50% to $55 million. But the net income (we estimate in absence of last-quarter data) was down about 40% to between $5 million and $6 million. A variety of factors contributed, including heavy startup costs on a new 6250 bpi tape drive for minis, troubles in producing dual-headed versions of new flexible disk drives, and deferred shipment schedules from recession-leery oem customers.

Pertec says that with the help of new automated manufacturing facilities the production problems have been mostly resolved, and it notes that it is one of the few suppliers of the dual-headed flexible disk that can be delivered in quantity to oems now. Shipments of XL20 and XL40 systems, announced in 1978, went over 1,000 last year and should cross 2,000 in 1980. Pertec will enhance XL with more data communications capabilities and its new 8-inch fixed disk drives. These disks, introduced in 1979 as the Mini-Wini, began deliveries this year; by 1981 Pertec plans to double the Mini-Wini capacity to 40MB.

You've ordered the new IBM 4300? Now order the database software to make the most of it.



"IDMS is the most efficient DBMS you can buy for your 4300. More important, it is the nucleus of a completely integrated Distributed Database system. At Cullinane, we've been developing and field testing a true distributed database system for over four years. That's why we are the only major vendor that can provide users with this 'future' capability today." – Robert Goldman, Sr. V.P., Prod. Dev.

Now is the time to plan your next five years. The cost of high performance hardware is coming down. That fact and Cullinane database management software means that the control, efficiency and flexibility of distributed database networks is a practical solution to your data management needs – now!

Only Cullinane has it all. The best database management system in the industry, IDMS. A powerful new data communications system, IDMS-DC, the only TP monitor specifically designed to deliver fast throughput, automatic recovery, data integrity and programming ease in the database environment. IDD, the Integrated Data Dictionary that brings a new level of control and consistently high design standards to all your data management activities. INTERACT, the flexible programmer productivity system for online program development, RJE, text editing and word processing. CULPRIT, the report generator that's easy to use and fast even on the complex reports. OnLine Query, the interactive management information retrieval system.

And Distributed Database – to get the most out of your 4300s, wherever they're located.

Like to attend a *free* seminar in your area and learn more about how Cullinane can help you implement your new hardware more successfully? Fill out the coupon, or simply attach your business card to it and send it to us.

Cullinane Corporation

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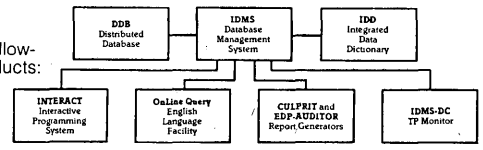

Name/Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ My computer is _____

Mail to: Cullinane Corporation, 20 William St.
Wellesley, MA 02181, Phone: (617) 237-6600

DM780

Database: Cullinane

CIRCLE 87 ON READER CARD

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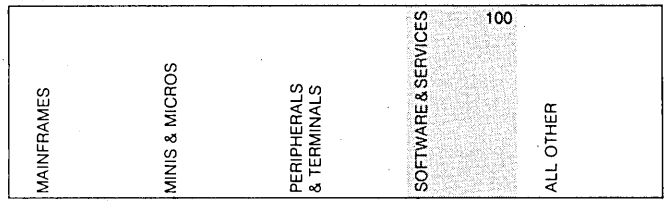

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$163 (M)	2	100	$163 (M)	2	100	$163 (M)	2	$6.2 (M)	210

SYSTEM DEVELOPMENT CORPORATION

2500 Colorado Avenue
Santa Monica, CA 90406
(213) 820-4111

Still the U.S.'s largest privately held dp company, SDC used 1979 as a year to bolster its backlog and realign its product and services businesses with an eye to going public "within the next two years." Fiscal 1979 (ending June) revenues of $166 million were up 14% over last year, and pretax profits staged a 41% gain to $6.4 million, recovering from a poor 1978 showing. Divestitures of several nonmainstream businesses contributed to the realignment process and were largely responsible for the fact that SDC calendar 1979 revenues tally in at only $163 million, up just 2% over 1978. On the other hand, profits in this period were up sharply. SDC maintains that after a 10-year transition away from its origins as a nonprofit organization, "we have finally installed making money as the driving force of this company."

Concern for making money has not interfered with at least one bold new product initiative which gained attention during 1979. SDC plans to enter the office of the future market with an electronic filing system called Record Manager, which it will not only design and develop but also manufacture and market. The system will store 75,000 full pages of text and be available in production quantities late in 1980. Though some critics have voiced uneasiness over starting something this late in the crowded office products market, SDC sees the vertical integration opportunity as a way of fetching higher profit margins for a longer term. In fact the company expects 20% of 1985 revenues to be hardware based and 1985 profit margins on revenues in the $340 million range to approach 8%, double current levels.

Besides the new hardware business, part of the 10-year transition effort has meant establishing SDC in new markets to reduce its dependence on the government systems business, an area where profit margins are generally slimmer. Milestones in this area during 1979 include the extension of its Search Service on-line bibliographic retrieval system to a new computer center in Tokyo, managed by SDC of Japan. Another is the completion of the design, development, and installation of the world's largest on-line health insurance processing system for the Australia Health Insurance Commission.

Lastly, SDC's U.S. government business is alive, well, and largely responsible for its $225 million calendar year-end backlog. Contracts with the defense department accounted for 40% of 1979 revenue and another third of the total came from nondefense federal agencies and state and local governments. Large recent awards include a $24.4 million contract to provide two Cray-I computers and support services to the Air Force Weapons Laboratory (AFWL) for research in future weapons development and a $14.5 million contract for a variety of services to DOT Transportation System Center.

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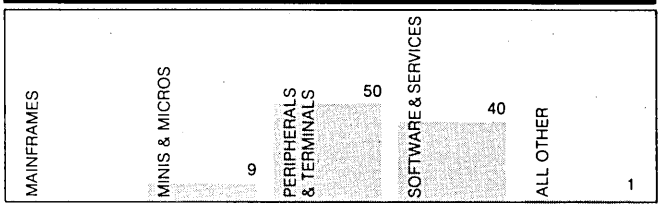


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$160 (M)	28	4	$125 (M)	29	78	$3728 (M)	15	$197.0 (M)	31

RAYTHEON COMPANY

141 Spring Street
Lexington, MA 02173
(617) 862-6600

Raytheon Company is a bigger participant in the data processing industry than it will publicly admit. We have added the revenues of foreign subsidiary Data Logic (U.K. turnkey systems and software house) to those of Raytheon Data Systems for both 1978 and 1979 to show figures of $95 million and $160 million, respectively.

However, the Raytheon Service Company provides maintenance for IBM 360 systems and other computer equipment; Raytheon Equipment sells systems to publishers for copy and ad display processing; and Raytheon Seismograph markets turnkey systems for seismographic research. In the absence of any information on these operations from which to make an estimate, this survey ranks Raytheon lower than it should be.

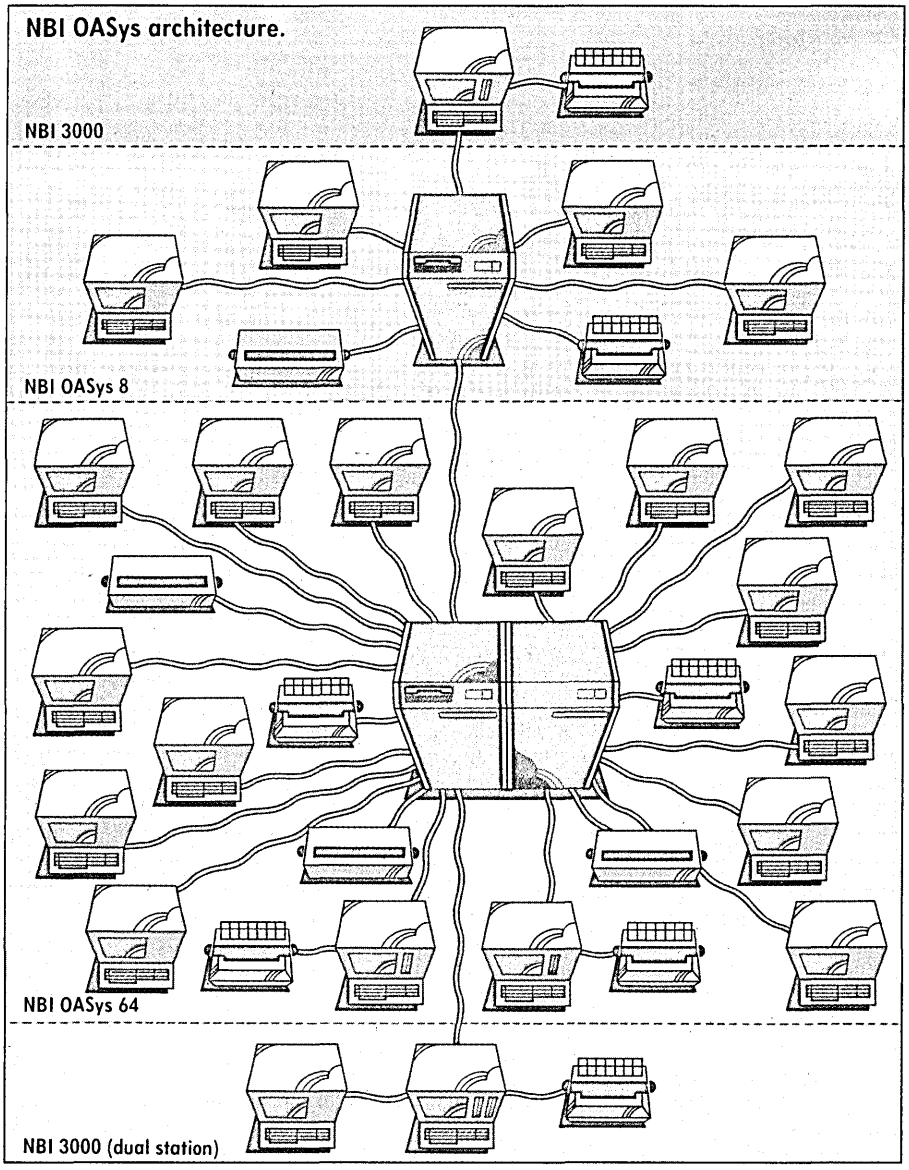
The major dp operation in Raytheon is, however, Raytheon Data Systems (RDS), which manufactures intelligent terminal systems, data communications processors, and word processing systems. Excluding the word processing systems sold by Lexitron (about $55 million), RDS garnered about $125 million last year in revenues, a 29% increase over 1978.

RDS activities in 1979 revolved around important new product announcements in its major lines. A new data communications family, RAYNET, consists of five models, I through V, and starts with a line concentrator. The configurations progress, adding "virtual terminal" capabilities to communicate with up to eight host mainframes under a variety of communications line disciplines (bisync, SDLC, PARS/IPARS, and Univac 100). The Model V system provides for communications among up to five RAYNET processors.

A participant in the plug-compatible 3270 market, Raytheon Data Systems announced the first in its next generation of terminals, the PTS 2000. While unveiled in West Germany last year, it was only recently announced in the U.S. The terminal will emulate all IBM 3270 products and support both bisynchronous and SNA/SDLC protocols. RDS has installed more than 100,000 of its PTS 100 and 1200 terminals around the world, including thousands used for passenger reservations at 125 airlines.

The other major announcement in 1979 came from Lexitron, the manufacturer of display-based word processing systems, which was purchased by Raytheon in 1978. Lexitron grossed an estimated $55 million in 1979, but these pure word processing revenues are not included in this survey. The new product, RayText, will alter that next year, since it combines Lexitron's VT-1000 word processing terminals and Raytheon Data Systems PTS/1200 (3270-compatible) distributed processing system. Unveiled last year but formally announced this March, RayText allows from four to 10 VT-1000 terminals to be linked to the PTS/1200 to perform both word and dp functions.

NBI MADE WORD PROCESSING OBSOLETE TODAY.



What the Office Automation System of the future looks like today.

With the advent of the NBI Office Automation System (OASys), the old concepts of word processing are suddenly obsolete.

NBI OASys provides office automation solutions that can't be outgrown. Because it grows as your needs grow, and allows you to spread increased productivity throughout your office. Work-group by work-group, location by location, as needs arise. And as expansion occurs. With systems designed to fit your applications, sharing information and resources as desired.

Easily, simply, economically.

Starting with the NBI System 3000, known as the finest high-performance word processing system in the world, you add the resource sharing capability of the new NBI System 8 and 64, so you can build optimum solutions to your office automation needs. They all use the same powerful operating software, while taking advantage of new breakthroughs in information and text management techniques.

NBI OASys gives you the advantages of stand-alone dedicated systems, plus the benefits of shared resource systems, combined into truly integrated office information networks. Without the high-costs, operational delays, and reliability problems associated with old-fashioned shared logic systems.

It's the perfect combination of capabilities and simplicity.

For more information, call us toll-free at 800/525-0844. In Colorado, call 303/825-8403.

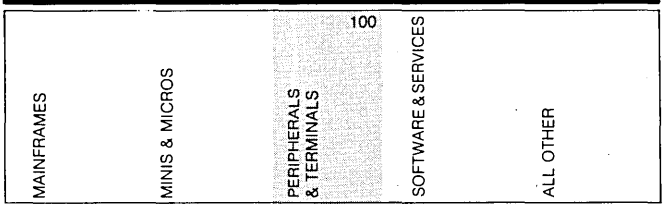
The NBI OASys.

The leader in information processing just ushered in a new era.

NBI

NBI 1695 38th Street, Boulder, CO 80301 **CIRCLE 88 ON READER CARD** **LIFTING AMERICA FROM UNDER THE PAPER WEIGHT.**

37



CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$156 (M)	18	35	$83 (M)	11	53	$442 (M)	23	$36.6 (M)	54

AMPEX CORPORATION

401 Broadway
Redwood City, CA 94063
(415) 367-2011

Ampex may be listed as the Signal Corporation in the DATAMATION 100 next year, if the proposed takeover announced in February is completed. Ampex, a $442 million company specializing in computer and audio/visual equipment and magnetic tape, would become part of a $4 billion conglomerate. Signal lists among its possessions such corporations as Mack Trucks Inc., Garrett Corporation, and Signal Landmarks Inc.

The data processing, or "data memory," operations of Ampex account for about 35% of total corporate revenues, and last year this amounted to $156.3 million, an 18% increase over 1978.

An oem and turnkey-systems supplier, Ampex' keystone products continue to be in core memories. While this market is declining, industry reports say that Ampex has nearly half of an estimated $150 million to $200 million independent core memory market. Ampex itself estimates that 65 billion units are still produced each year, and states that its own production of the Unibit tape core rose 39% to 36 billion units last year.

The firm continues to see "a unique place for core memory products in the hierarchy of digital memory systems." But it says it has already developed competence in technologies such as semiconductors, charge-coupled devices, and magnetic bubble memory systems, and is planning new families of products utilizing them.

Ampex has other product lines, present and planned, that may take up some slack in core memory sales as well. The firm reports that its DM families of disk drives are growing faster in sales than the 25% to 30% average annual growth in this sector. In 1978, Ampex expanded its line to include a 150MB fixed disk drive and a fixed/removable disk drive. Shipments of these products began in 1979. The firm also reports strong oem sales in its digital tape drive line.

Announced last June was a line of minicomputers for the oem and turnkey systems markets, plug-compatible with the Data General Nova minis. Ampex is expanding the capabilities of these miniprocessors beyond their 64K word capacities and has added ruggedized versions. (Suits filed by Ampex and Data General against each other over this mini were recently settled out of court.)

Like many peripheral manufacturers, Ampex is also expanding into the crt terminal market. The first product was due in May.

Finally, Ampex—building on its long established capabilities in magnetic tape and disk media for commercial and industrial uses—announced last year that it was entering the magnetic media "business products" sector, with a line of data and voice cassettes, flexible disks, and magnetic cards for the word and data processing markets.

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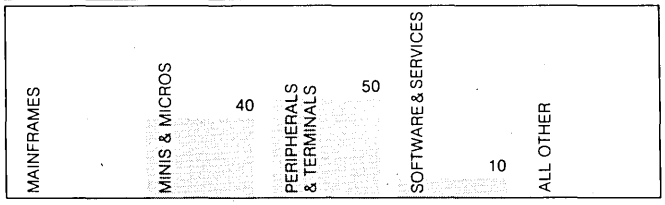


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$153 (M)	63	100	$103 (M)	64	67	$153 (M)	63	$16.9 (M)	101

PRIME COMPUTER, INC.

40 Walnut Street
Wellesley Hills, MA 02181
(617) 879-2960

"Demand remains unabated," said Ken Fisher, president and ceo of Prime Computer, as the minicomputer manufacturer posted 64% growth in 1979. With $153 million in revenues, Prime jumps from 48th place to 38th in the DATAMATION Top 100. Prime's market, predominantly large interactive minis for end users, faces encroaching competition both from large mainframers moving down the product line and dropping in prices, and from minicomputer companies that are bringing out higher-priced top-of-the-line products. IBM's 4300 and DEC's VAX systems are the most formidable challenges—VAX due to its advanced architecture and ease of use, and the 4300 due to the price/performance and IBM's support. Although Prime has just racked up 87% and 64% gains in revenues in the last two years, volume 4300 shipments and anticipated new VAX low-end products for commercial dp increase the pressure.

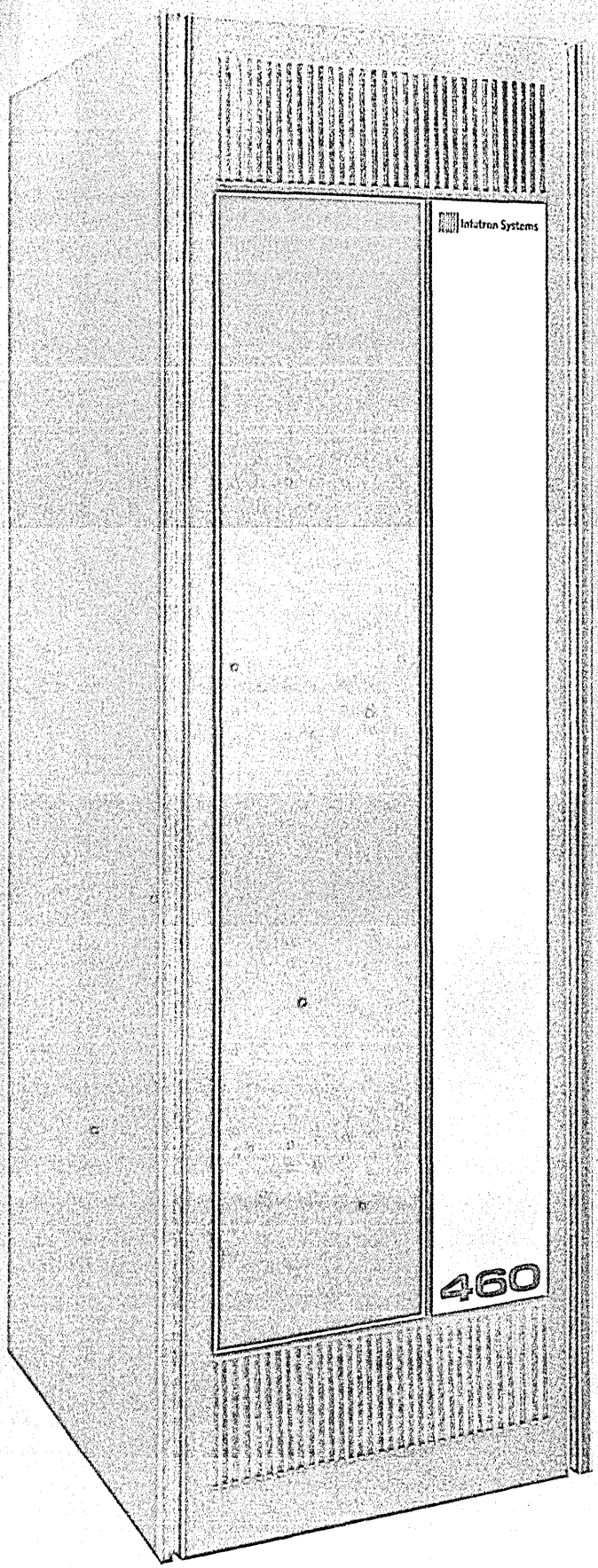
Prime took aim at first-time computer users in 1979, supported in part by Microdata dealers. The Information 500, 1000, and 5000 software included a major new component, Info/Basic, which is a compatible implementation of Data/Basic, originally developed by Microdata.

Nine dealers had signed for Prime systems by the March announcement date; as many as 40 systems to dealers had been booked by midyear; an estimated 72 units worth $5 million had been shipped by the third quarter; and by year-end 30 dealers had signed up worldwide and total volume approached $10 million. Domestically, dealer marketing provided considerable impetus to Prime's expansion. Direct domestic sales rose by 48% compared to the total 64% in the U.S., including dealer activity.

Prime entered the 32-bit architecture era last year with its new 50 series, which ranges from the model 450 at $52,000-$60,000, to the model 750, at $130,000 to $300,000. Demand ran ahead of production, with the difference being filled on an interim basis with model 550 system shipments allowing deferred upgrade. The company hoped to catch up in the first quarter.

As the year drew to a close, Prime prepared to announce two new low-end models—the 150 for systems builders and software houses and the 250 for end users. The January 1980 introduction cut Prime's low-end entry-level systems list price by 35% to $49,000 and $59,000, respectively.

During 1979 Prime, like so many other minicomputer companies, experienced a slight decrease in profit margins because of the costs of expanding the service function. Prime noted that it had finally made a profit with service revenues in 1979, although it didn't reach overall company profitability. In line with its sales and service expansion, Prime added people, with total employment shooting up to 2,562 from 1,665—no mean feat, in light of the severe scarcity of qualified personnel in industry and the stiff competition for those available.



SUPERSTAR

Infotron's New Data PBX

Top performance in any data network. To the user it means quick connection to any resource with no hassles. To the network manager it means system flexibility and control. Infotron's new TL460 easily meets the demands of both.

The TL460 allows terminal users to access any port on any computer. If no port is available the TL460 queues the callers. It even tells them why they weren't connected and their place in line. The hassle of having to redial—a complaint when ports are busy—is eliminated.

The network manager will find the TL460 flexible enough to meet ever changing conditions. It handles up to 2000 simultaneous connections, even if all are operating at 9600 bps, and provides 256 different classes of service. System parameters, such as class assignments, busy messages, connect criteria and disconnect criteria, *all can be changed from the console.*

The TL460 is not limited to certain data types or speeds either. Any combination of synchronous and asynchronous inputs from 110 to 19,200 bps is perfectly okay. To help maintain good service, the TL460 provides a variety of traffic reports such as successful and unsuccessful access attempts, line not found, use, idle time in queue, etc.

The TL460 is cost-effectively enough for the smallest [illegible] to handle enough for the largest PBX [illegible].

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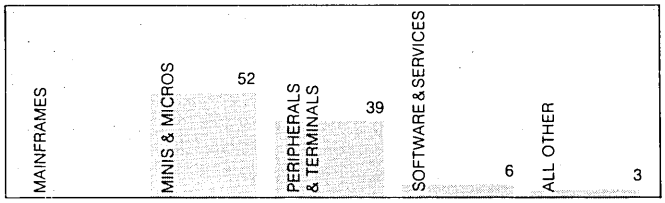

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$150 (M)	131	12	$140 (M)	126	93	$1296 (M)	12	$92.7 (M)	22

TANDY CORPORATION

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

Dp professionals who haven't yet been to a Tandy Radio Shack demonstration had better schedule the next one in their city to sample the aura of mass merchandising. Rolling in to the Warwick Hotel in New York City in March, the show began with a lottery of a TRS-80 at the entrance. Over 50 separate workstations in the demonstration room appeared to stretch into uncountable numbers through the slick effects of mirrors on both walls.

In half an hour, the instructor led the audience through general ledger, word processing, and mailing list packages, ending up with an open session for programming in BASIC. The simple process of physically touching the keyboard and interacting with the computer in a carefully preprogrammed environment seemed to calm fears of the hidden technology. The Radio Shack salesmen didn't even "pitch" the machine, but stood ready to answer questions.

The polished performance made it easier to understand how Tandy has become the leader in microcomputers, with over 150,000 shipped. Tandy entered the microcomputer business with the August 1977 introduction of the TRS-Model I, which now sells at $499 for the Z80 8-bit processor with 4K of ROM and 4K of RAM memory and a video terminal with cassette interface. The Model I is expandable to 48KB of RAM, and up to 356KB on four 5-inch disks. The May 1979 introduction of the new TRS-80 Model II provides twice the speed of the Model I, and extends maximum memory capacity to 64KB of RAM and up to 2 megabytes on four 8-inch disk drives. Aimed at small businesses and departments within larger corporations, the TRS-80 Model II purchases are expected to average up to 10 times the cost of the Model I systems. Deliveries began in September 1979.

On the distribution front, Radio Shack had opened 50 major market computer centers in the U.S. and nine overseas by year-end 1979. The centers typically have demonstration, service, and classroom areas, staffed by a center manager who may also be the resident software expert, and generally two to three technicians. In addition, the company established computer departments headed by a computer marketing representative in 100 additional "regular" Radio Shack stores—establishing a "lead horse" in all of the 150 districts for Tandy in the U.S. Finally, systems are sold throughout the retail sales outlets, which numbered 6,028 domestically and 1,579 overseas in 1979.

With the dramatic expansion of more than 100% annually registered by microcomputers, systems grew to roughly 11% of Tandy's calendar 1979 revenues. Tandy Corporation, a leader in consumer electronics retailing, carries a multitude of electronic products including antennas, radios, receivers, magnetic tapes, speakers, turntables, public address systems, intercoms, calculators, electronic and scientific toys, games, and kits.

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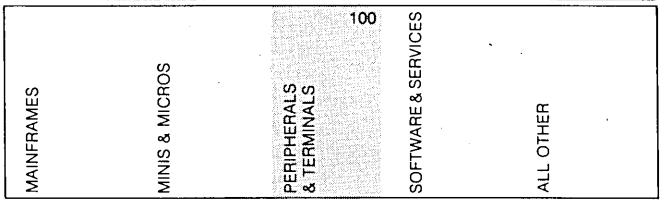


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$150 (M)	7	87	$118 (M)	2	79	$173 (M)	10	$9.8 (M)	−39

DATAPRODUCTS CORPORATION

6200 Canoga Avenue
Woodland Hills, CA 91365
(213) 887-8000

After a record 1978, Dataproducts Corporation's financial picture in 1979 was not a very bright one. Dp-related products, primarily printers, increased in sales by only 6.6% to $149.5 million. Overall, corporate net income dropped 39%. But the cause of the problem—start-up for new thermal, matrix, band, and daisywheel printer lines—was also the major cause for a record backlog at year-end 1979: $108 million, up 57% over the prior year.

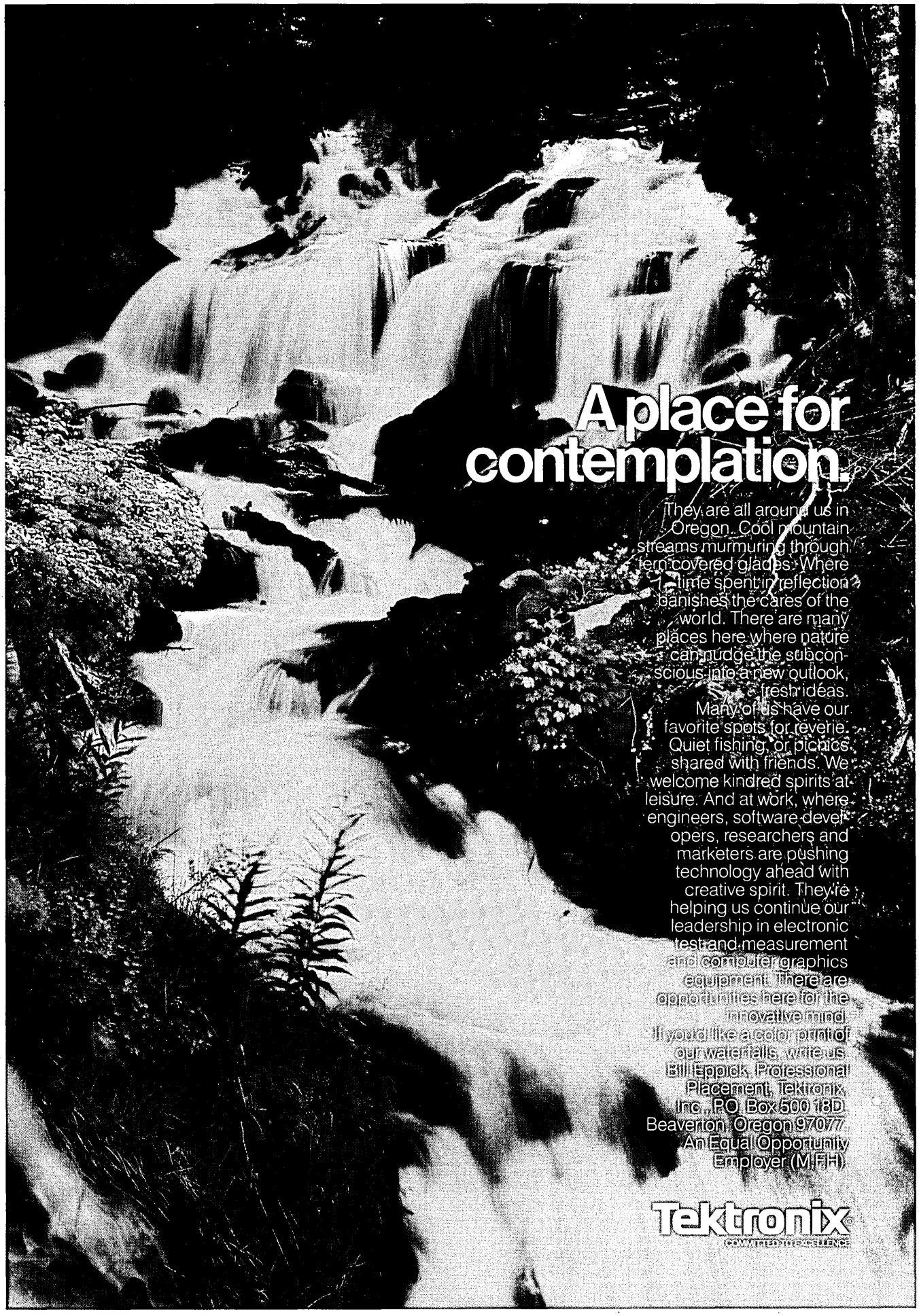
Big long-term oem contracts came tumbling in during '79: the largest in the company's history (amount undisclosed) was from IBM (a new customer) for printer assemblies; $12 million to $16 million orders each came from Wang, Burroughs, and Univac; and two very important agreements were signed with Brazilian companies. Brazil's Globus Digital S. A. will buy $17 million worth of the band B-300 and B-600 printers and the matrix M-200 printers (and the technology) over the next five years. Minicomputer manufacturer Cobra will buy printers for banking applications and a special MICR printer mechanism for bank teller terminals, which Dataproducts is now developing.

Fading out of its core memory business and selling off its 18% equity interest in Data Card Corp., Dataproducts is now set to concentrate on its full range of printers and its small, but fast-growing data communications products. Line printers continue as the mainstay of the business, but additional significant growth is expected in the new low-speed/low-cost matrix and daisywheel printers. (The daisywheel printers are the result of an acquisition of Plessey's printer division and were announced as the D-50 family in 1979. The start-up for the thermal and matrix printers began in 1978, and because of snags took longer than expected. The firm expects these new lines to become profitable in 1980, however.)

The reason for great growth expectations for the new lines is simply because the markets they are targeted for are growing so rapidly—25% to 35% annually. The M-200 (announced in 1977) and M-120 (announced in early 1980) matrix printers are tailored for the small systems market; the T-80 non-impact thermal printer—for the crt, personal computer, and graphics plotter markets; and the daisywheel printer—for the burgeoning word processing market. Dataproducts puts the daisywheel oem market at $150 million annually.

The line printer market has scarcely reached saturation. Dataproducts forecasts continued 15% to 20% revenue growth here—a forecast based mostly on the demand caused by proliferation of high-powered distributed processors.

Finally, foreign revenues, while only 21% of dp revenues, grew by 31% to $32 million last year. Dataproducts has been beefing up its European as well as U.S. networks of distributors to help market the new lines.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Bill Eppick, Professional Placement, Tektronix, Inc., P.O. Box 500 18D, Beaverton, Oregon 97077.
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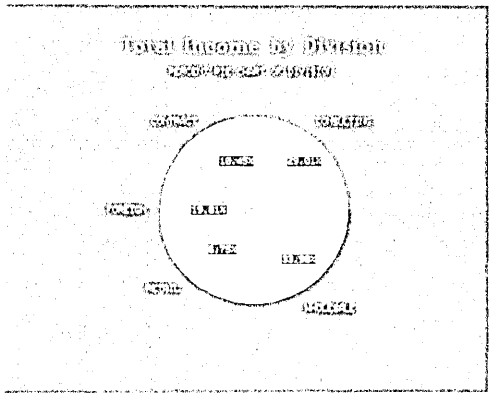

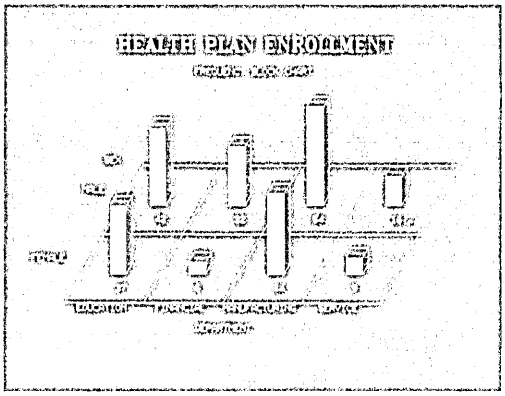

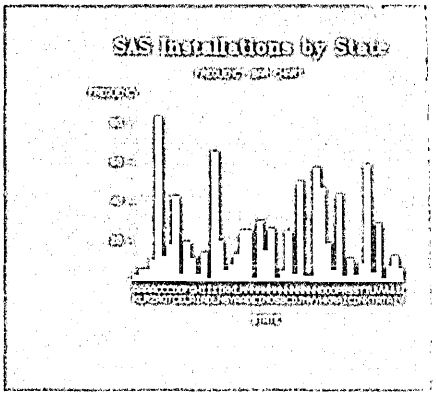

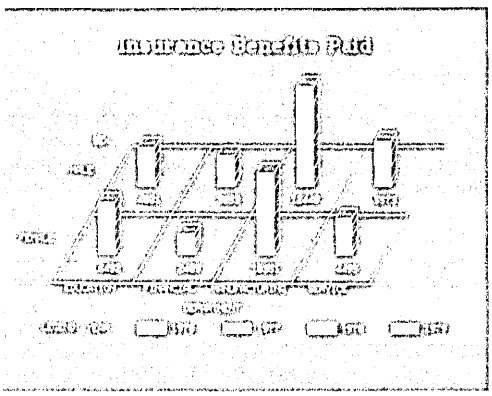

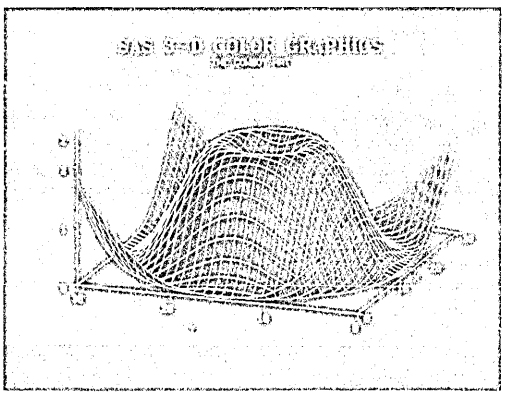

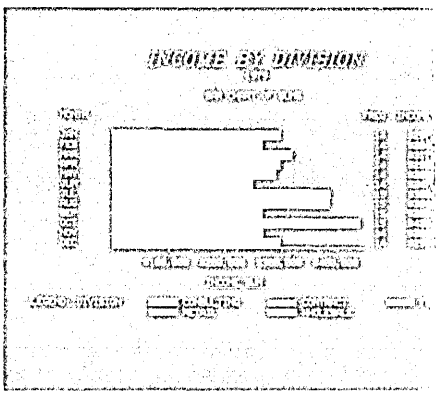

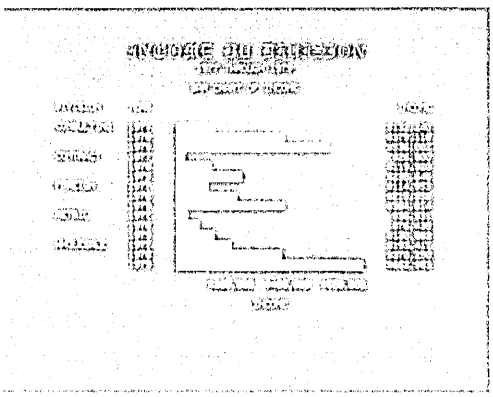

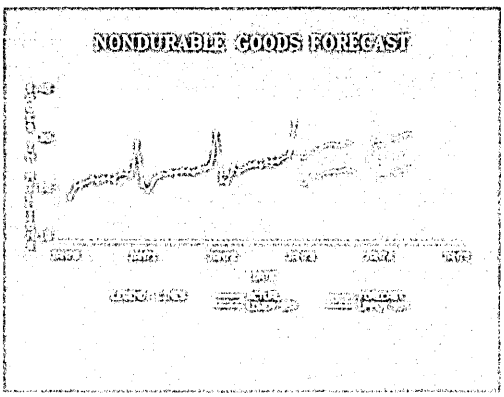

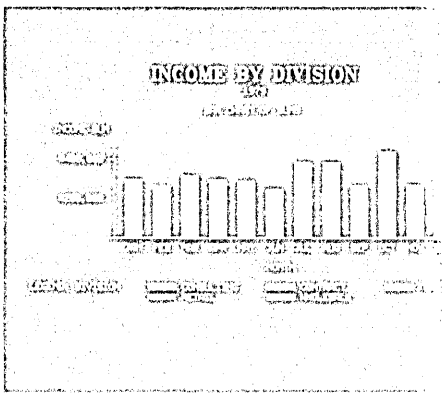

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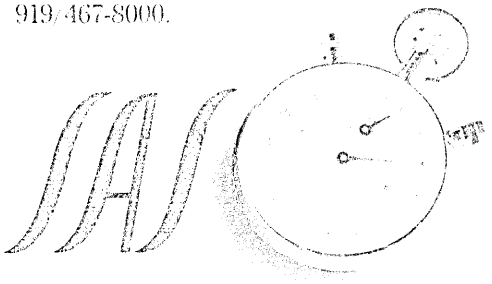

Images produced by SAS/GRAPH with Tektronix 4027, Dunn Instruments 631 Color Camera System and Polaroid film.

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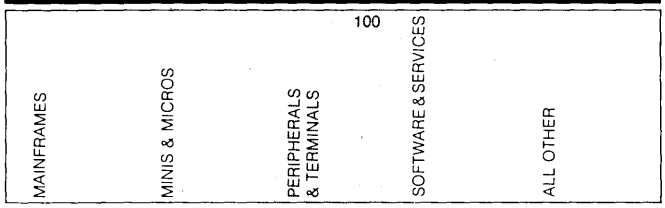

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$145 (M)	17	44	$145 (M)	17	100	$327 (M)	NA	$NA (M)	NA

TELETYPE CORPORATION

5555 Touhy Avenue
Skokie, IL 60077
(312) 982-2000

"As important as voice-to-voice telephony has been and will continue to be, we stand today on the threshold of another telecommunications revolution which will bring voice together with print, data, video, and other media into comprehensive, fully integrated office information systems. In the not-too-distant future, these total communications systems [TCSS] will be as pervasive as the telephone is in today's business environment."

In an in-house AT&T publication, executive vice president Thomas E. Bolger gathered up multiple industries and labeled their products as elements of a total communications system. It is a semantic difference of consequence to legislators and regulators perennially trying to define the boundaries and permissible overlap between these industries.

Outside its networks, switching systems, and other communications products, AT&T has one major group busy at work on what the industry calls data terminal systems. The $327 million Teletype Corp. is a subsidiary of the $11 billion Western Electric Company, which is a subsidiary of the $45 billion AT&T (1979 revenues).

Teletype does not break out its dp revenues, but in light of the fact that volume shipments of its major new product, the 4540 keyboard/display system announced in 1978, began fairly recently, we are estimating a 15% to 20% growth to about $145 million.

Teletype's first entry into intelligent terminals was the Dataspeed 40. It has since unveiled lines of printers and terminals of increasing sophistication and complete with bit- or character-oriented protocols, such as IBM's SDLC. The 4540, announced as a Dataspeed 40/4 replacement, is a microprocessor-based keyboard/display system (both elements detached) with a controller that can handle from eight to 32 printer and/or display devices. Down-line loading of programs allows users to use a multitude of keyboards.

While the 6,000-person firm does not release figures on orders, sales are reportedly going well. With its widespread sales and support force, the benefits of being part of AT&T, and its vertical integration down to the component level, Teletype has the ability to be an important participant in the total communications system market.

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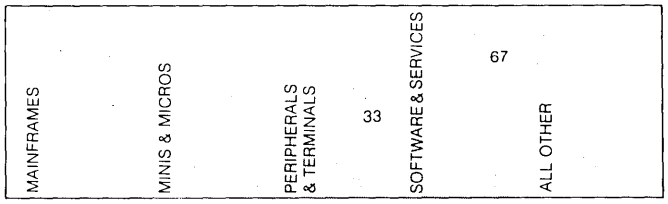

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$141 (M)	22	21	$136 (M)	17	96	$667 (M)	28	$45.7 (M)	50

GENERAL INSTRUMENT CORPORATION

1775 Broadway
New York, NY 10019
(212) 974-8700

General Instruments' Data Products Division recorded an estimated 21% gain in revenues based on strength of betting and lottery systems which contributed roughly two-thirds of the division's revenues. In on-track systems, General Instrument's AM Tote 300 sell/pay computer system, introduced in 1978, permits selling and cashing of all bet types at any parimutuel window, contributing to increased labor productivity and betting volume. Installation of the system at New Jersey's Meadowlands Racetrack in September continued the string of 15 successful installations at the nation's racetracks. By year-end 17 installations had been completed—giving General Instruments an 80% share of the on-track electronic betting systems used in North America.

The features and efficiencies of the AM Tote 300 have established a new market internationally, whereas AM Tote had not participated previously outside North America. The Royal Hong Kong Jockey Club employs 700 units; the San Isidro Racetrack of Buenos Aires uses 320 terminals, and awarded General Instrument a five-year, $3 million contract to operate the system; the Trinidad and Tobago Racing Authority selected the AM Tote 300 System for its new racetrack.

In off-track betting (OTB) and lottery systems, Ohio signed a two-year contract, with an anticipated 1,000 terminals to be in operation. The New York OTB contract, extended to 1984, covers a system which handles over $1.4 billion per year through 1,200 terminals at 237 branches. The Massachusetts State Lottery award of 1978 continues to be in dispute. After seven years of effort, GI opened the first Teletrack "theatre of racing" in New Haven, Conn., in October—with four of the seven years required to plow through interstate regulations. Thoroughbred racing is transmitted live via microwave in full color to a 24-foot by 32-foot screen in a 2,200 seat clubhouse from New York's racetracks. Since opening, attendance has run slightly under anticipation, at 53% of capacity. The amount bet on "handle" per person at each racing program has been considerably higher than expected, at $120.

The Unitote/Regitel Division retains a leadership position in electronic point-of-sale (POS) systems for the top 100 full-line department stores, with an estimated 40% share. IBM's 5260 and 3680 retail terminals represent a rising competitive challenge.

Data processing activities account for only a fifth of total revenues for GI, with cable tv products, semiconductors and components contributing the remainder. An intensive program of divestiture—with 11 businesses and facilities worldwide sold or closed—and cash management has strengthened the balance sheet. The outlook for cable tv equipment, which has turned around from an earnings laggard, appears particularly promising.

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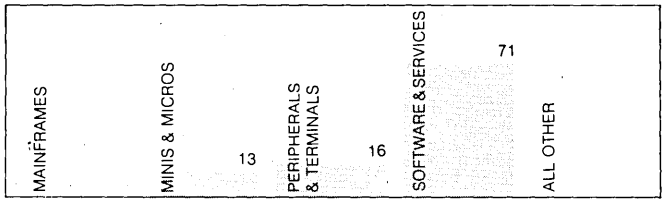

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$138 (M)	34	8	$105 (M)	34	76	$1792 (M)	25	$182.9 (M)	9

UNITED TELECOMMUNICATIONS INC.

2330 Johnson Drive
Westwood, KS 66205
(913) 676-3000

United Telecommunications, a $1.8 billion company, is primarily known as the second largest independent telephone company in the U.S. Its data processing services and activities, under the United Information Systems (UIS) group, are a small but rapidly growing portion of its business. Thanks in part to the acquisition of On-Line Systems, Inc. last November, UIS's restated revenues for 1979 were $138 million, up 34% from $103 million in 1978.* And this pushed it well into the top 50 of this survey.

United Information Systems, previously called United Computing, has grown threefold since 1975 through acquisition and internal expansion. UIS includes operating companies United Computing, Inc., On-Line Systems, Calma, United Computing International, and UNINET (the private data communications network for the services operations).

Network Services of United Computing and On-Line represent 68% of dp revenues. The former is built around the remote scientific and engineering services provided by a host of supercomputers (CDC and Cray) and smaller CDC systems. On-Line's specialty is business and data base applications offered through DEC time-sharing systems; this division will include the $12 million Utility Data Services, a computer time-sales company, purchased from Itel in December.

The Calma division is the fastest-growing segment for UIS, registering a 57% increase last year to $43 million. Its products are turnkey systems for computer-aided design. A new Calma product last year was DDM, a system which solves design, documentation, and production problems of three-dimensional parts and assemblies.

The Business Information Products division, with $4 million in sales last year, produces software packages for the financial and business markets, such as Foretax, a corporate planning system, and Informational, an accounting system. The Uninet division provides the interconnection among United centers in 225 metropolitan areas in the U.S., Canada, and Europe. The overseas component, United Computing International, grew 32% to $33 million last year.

Both UIS and parent United Telecommunications are restructuring themselves for growth markets of the 1980s. In UIS's case, a major target is the integration of remote business and scientific computing services and interactive graphics systems —and ultimately robotics—into a complete package for the "factory of the future." United Telecommunications Inc. is preparing to attack competitive telecommunications services and product opportunities, and has separated out a group, United Communications Systems, to handle them.

*Without On-Line's $27 million in revenues, United's 1978 dp revenues were $76 million.

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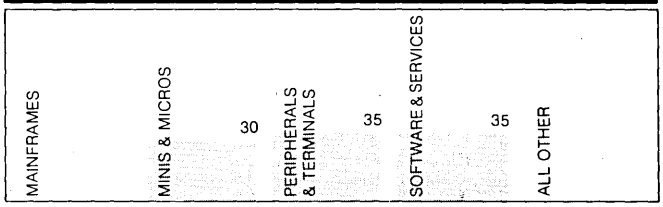

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$136 (M)	14	32	$110 (M)	11	82	$426 (M)	11	$23.3 (M)	24

BUNKER RAMO CORPORATION

900 Commerce Drive
Oak Brook, IL 60521
(312) 986-2700

Bunker Ramo, a pioneer in on-line banking systems and financial information services, remains a reliable factor in the dp market although its financial picture on the surface has not been a spectacular one. For the last five years, the Electronic Information Systems Division has fluctuated in revenue growth between flat and 15%. Last year was not an exception; revenues were up nearly 15% to $139.5 million. The order backlog, at $139 million at year-end, was up slightly over 1978.

But the real story was better than that. The drag on dp revenues was from military information systems. (Government dp sales seem to have been off generally in the industry again in 1979.) In commercial areas, the sales of minis, terminals, and other hardware to the brokerage and banking industries, combined with sales of information services to brokers, were up 25%.

Bunker Ramo has well over 20,000 crt terminals installed in 3,000 brokerage offices now (vs. 2,500 in 1978). It doubled the number of commercial bank clients in 1979 to 100 and now has equipment in more than 3,500 offices. More than 250 thrift institutions are also on its customer list.

Its hardware sales account for about 65% of dp revenues. Prominent in this category is the constantly evolving System 90 for banking (a configuration of minis, teller and administrative systems terminals, and devices such as credit card readers and journal printers). Bunker Ramo's financial information services comprise 25% of revenues and include on-line data from stock, bond, option, and commodity markets, as well as from private financial data bases. The firm also operates the Nasdaq system for the over-the-counter market.

Where to in the 1980s for Bunker Ramo? It will keep its sights completely on the financial market. Plans for growth include adding to the customer base and/or adding applications. The "and/or" has to do with the nature of the markets. The brokerage industry is fairly "mature" in installation of dp; in fact, because of the recessions in the 1970s, that market shrank due to consolidations and reductions in the industry, and only now is the number of registered representatives reaching the pre-recession levels. Bunker Ramo's main banking thrust, commercial banking, is still quite young in use of on-line teller and other applications, so the customer base can be expanded.

In both industries, Bunker Ramo will make its target expansion of applications. One of its long-term goals is to develop software for its systems for integrated dp/word processing applications, i.e., office information systems. The firm has a significant contract with Rome Air Force Base to develop an on-line administrative system, Lonex.

Bunker Ramo is also working on overseas expansion. Operating abroad for just a few years, its banking systems sales have begun to escalate, contributing to a 35% increase in 1979.

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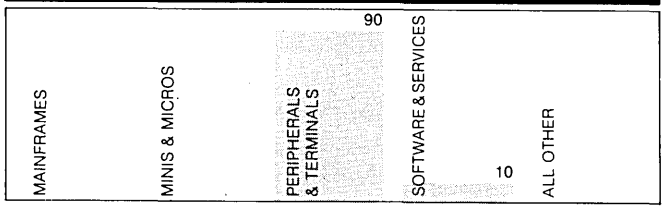

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$129 (M)	35	100	$87 (M)	30	67	$129 (M)	35	$18.2 (M)	33

CENTRONICS DATA COMPUTER CORP.

1 Wall Street
Hudson, NH 03051
(603) 883-0111

In calendar 1979, Centronics increased its revenues 35% to $129 million, and its net income 27% to almost $18.2 million. This represented a slowdown from its 1979 fiscal performance (ending June 1979), when revenues expanded a whopping 62%. Clearly, such rapid growth almost guarantees problems, and Centronics is now in the process of consolidating its gains, improving its balance sheet, and tightening its production.

Centronics is engaged in the development, production, sale, and service of families of serial dot matrix impact printers, fully formed character-band line printers, and nonimpact microprinters. Centronics now has over 1,000 customers, the vast majority of which are oems.

More specifically, Centronics offers a line of four band printers, jointly developed and manufactured with a subsidiary of Hitachi of Japan. The series took a long time to get off the ground, but major oem contracts are now beginning to come in.

Centronics is also the major producer of microcomputer printers, with a line of very low cost products, including a new proportional spacing high-density model 737 which retails at $995, and a nonimpact electro-sensitive hobby machine. But the primary product is the basic matrix printer line (the 700 Series), which represents, together with continued production of earlier products, the bulk of Centronics' business.

During 1979, Centronics announced a new product, offering electronic font flexibility, multicopy capability, fully formed characters, and quiet operation. The company believes that the new model, called the Quietwriter, is an attractive solution to the problems associated with noisy and inflexible typewriters and impact printers used in the fast-growing office, word processing, electronic mail, communications terminals, and multilingual markets. The Quietwriter prints in a manner similar to handwriting with a pen and can duplicate either script or standard typewriter characters. The company has said that in about 18 months it plans to develop one or more product implementations utilizing the Quietwriter's unique stylus and character-generation techniques in machines specially configured to meet multiple office market needs.

One of the company's most substantial strengths is Compextron, its service and support organization, which, because of Centronics' strategy of supplementing its oem customer service, is substantially larger than other printer firms. This operation generates revenues and profits in its own right, and has been growing at a 40%-per-year clip.

Centronics' foreign operations are growing faster than in the United States. Although they represent perhaps 33% of current revenues, the percentage should be 50% within five years.

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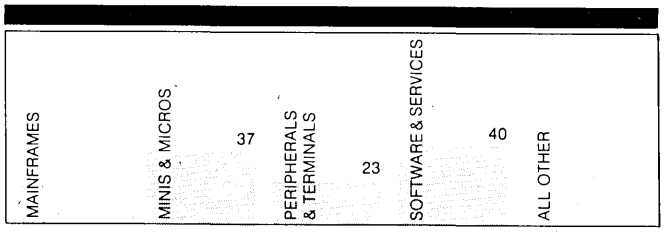


CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$122 (M)	11	100	$82 (M)	5	67	$122 (M)	11	$0.1 (M)	−98

GENERAL AUTOMATION, INC.

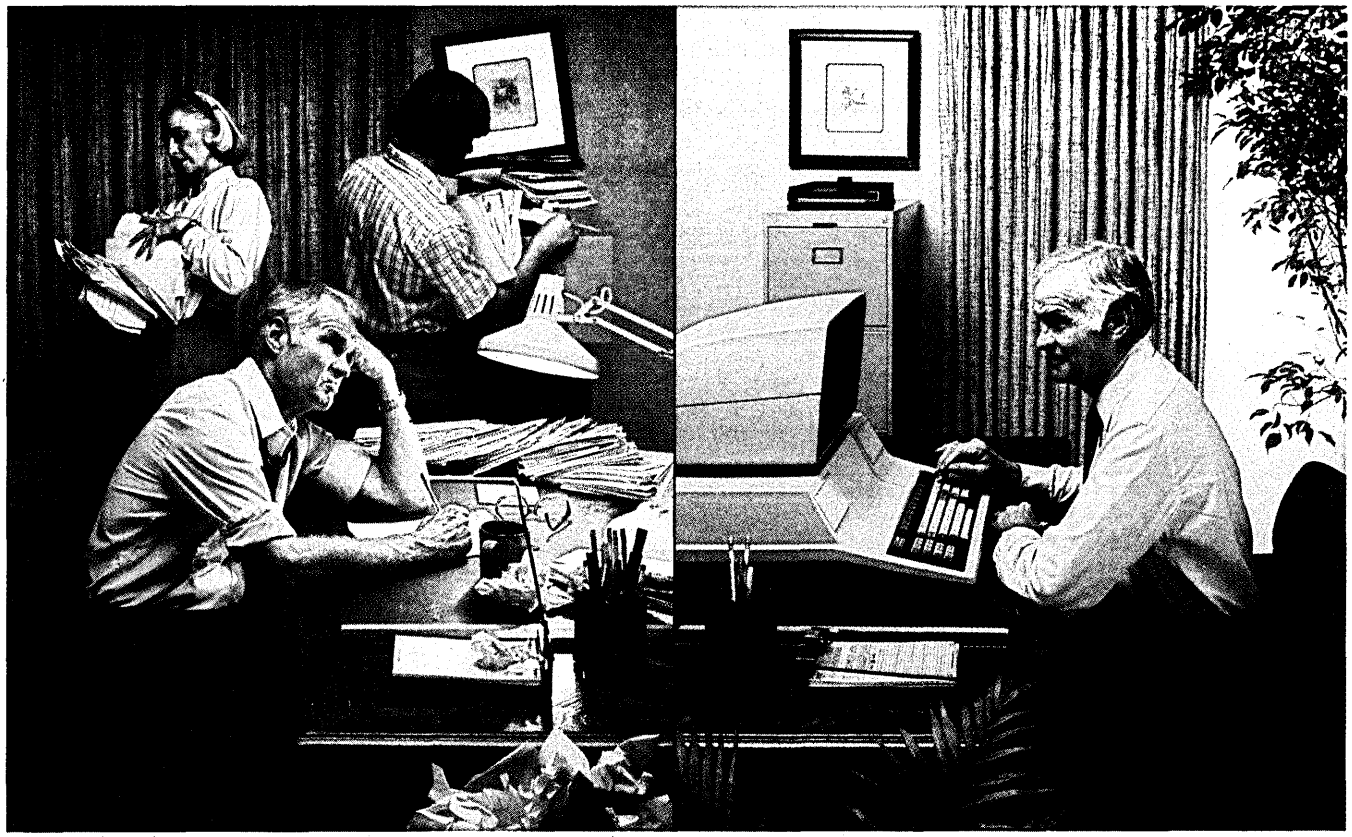
1055 South East Street
Anaheim, CA 92805
(714) 778-4800

The last year represented another rocky period under a new—and temporary—president and chief executive officer, Frank A. Grisanti. Adverse operating results, combined with a checkered financial record, dashed hopes for a bond offering in the spring, while high inventories and receivables continued to burden the financial position of the company. Given critical shortages of items and excesses of others, the company opted to work out imbalances gradually rather than force inventory liquidation.

Possibly less tractable, rising receivables related to performance shortfalls on existing contracts. The management commented that "the company was trying to cover too much ground with too few resources." Industry wags, however, were asking whether the company was in too deep with turnkey systems bids. In the latest fiscal year, profitability for the components side held—generating 24% of revenues and a whopping 90% of operating profits. Operating margins for the bulk of the business, systems and service, plunged from 7% to .7%. General Automation has been criticized for concentrating narrowly on particular applications problems which cannot be generalized and resold to other accounts, and which draw the company too heavily into individual accounts. The policy of assigning no more than eight or nine active accounts to a salesman fulfills the company's stated objective of allowing the salesman to become involved in the customer's planning—but does allow for the possibility of his becoming too involved.

In November, management announced that sales and gross profits of the Austrian marketing office were incorrectly recorded, requiring a downward restatement of 1979 fiscal year results. Subsequently, the company announced the discontinuance of Tal-Star, a subsidiary serving the newspaper industry.

Finally, hopes expressed at the December shareholders' meeting for a solid turnaround in the current fiscal year faded in January as losses continued. The possibility of a loss for the full fiscal 1980 year continues.



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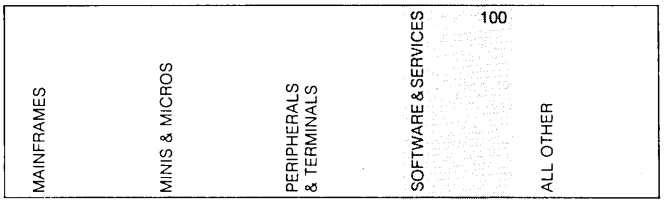

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$120 (M)	1	100	$120 (M)	1	100	$120 (M)	1	$5.7 (M)	16

BRADFORD NATIONAL CORPORATION

67 Broad Street, 16th Floor
New York, NY 10004
(212) 530-2400

Bradford National Corporation, a $120 million New York company, provides a broad array of services to financial institutions, securities firms, industry, and government. The services generally fall under computerized recordkeeping, systems development, and facilities management, but the following should indicate its labyrinthian structure. Bradford is a leader in shareholder services for banks; acts as a transfer agent for mutual funds (through subsidiary Bradford Trust Co.); does securities clearing for commercial banks, municipal bond houses, and brokers (Bradford Securities Inc.); and operates a new back-office service for broker-dealers (Bradford Broker Settlement, Inc.).

Among other activities, Bradford's Medicaid service provides facilities management for the New York State Medicaid Management Information System; it has developed a computer-directed fire equipment dispatch system being installed throughout New York City; it does dp facilities management for the Trident Nuclear Submarine Program; and has developed a Federal Model Data Processing System for the HEW Office of Child Support Enforcement.

While Bradford has profited from its facilities management (FM) activities, the termination of two large contracts last year hurt its financial performance. Since 1973 the firm has nearly tripled in revenues, but 1979 was the first no-growth year (1%) in that period. The National Securities Clearance Corp. and the Pacific Coast Stock Exchange ended their FM contracts, the former because of changes in its organization. The rest of Bradford's business did grow about 12% in 1979, and the company expects 1980 to continue that momentum, projecting 10% growth.

Bradford makes a good case for calling itself a 100% data processing company, since it would not be in business unless its services were automated, but only half its staff of 3,800 are dp personnel. Also, its revenue breakdown is rare in this industry. About 15% of its revenues are listed as "interest." The distinction between service fees and interest is often only a matter of form to the extent that interest is earned in lieu of fees billed to customers.

In 1980, Bradford will be putting considerable emphasis on a business outside the industry—insurance. Last year it purchased for $2.2 million the Eagles' National Corporation and its subsidiary Eagles' National Life Insurance Company.

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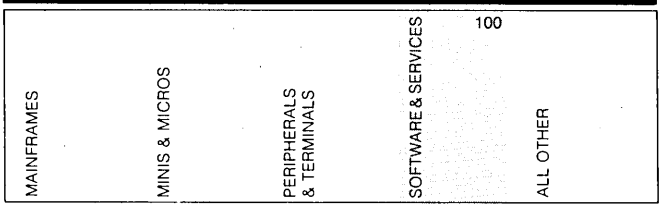

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$120 (M)	−8	46	$110 (M)	16	92	$260 (M)	3	$5.0 (M)	−9

PLANNING RESEARCH CORPORATION

1850 K Street, NW., Suite 1100,
Washington, DC 20006
(202) 293-4700

Having passed the quarter-billion-dollar milestone in 1979, PRC now believes it is the largest diversified professional services organization in the world. Revenues were up 3% to $259.7 million at calendar year-end but profits slumped 10%, punished by Iranian income loss and investment write-downs which were only partially offset by gains made on the sale of several subsidiaries. Undaunted by this setback, the company plans substantial increases in capital spending and employment next year which should lead to significantly higher growth and a profit recovery.

PRC's dp revenue, entirely contributed by its Information System Science and Services and Management Consulting Group, amounted to $120 million in calendar 1979, 46% of the corporate total. The nine subsidiary companies in this group provide a wide assortment of data processing services, including the design and implementation of complex systems, system design, training and support of client facilities, and provision of on-site dp services for specialized projects.

Growth in dp revenue declined 8% last year, penalized by the midyear divestiture of PRC's 75% interest in Logica, a London-based software firm, and the sale of its interest in H. B. Maynard & Co., Inc. PRC estimates a $25 million annualized revenue loss from these sales, but intends to close the gap through stepped-up overseas marketing programs.

Excluding Logica and Maynard, PRC's other Information Services Group business grew a healthier 26%, with 58% backlog growth to $107 million, a strong starting position for 1980. Especially strong in 1979, and expected to do well this year is PRC Realty Systems Inc., a $24 million-plus operation which furnishes on-line multiple listings as well as computer-generated photo listing books to over 80 real estate boards throughout the U.S. The on-line terminal network service also supplies analysis of local real estate markets and calculates amortization schedules, closing costs, and return on investment for income-producing property.

Also during 1979, PRC introduced Central Software, a software productivity package which permits computer programs to be written in less time by less experienced personnel. In its traditional government market, the company received an award from the Army for a contractor owned and operated computer services center at Fort Hood, Texas, to support Army field testing of new equipment and tactics. GSA retained PRC to manage the Alaska Federal Data Processing Center in Anchorage, which provides automated data processing services to federal agencies in Alaska.

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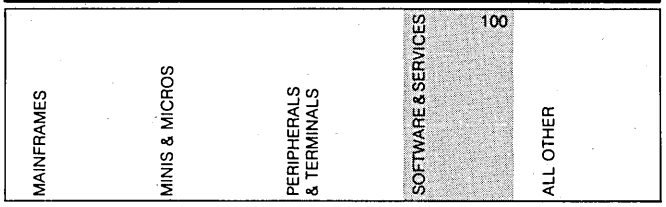

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$112 (M)	22	100	$97 (M)	15	86	$112 (M)	22	$3.1 (M)	107

INFORMATICS INC.

21031 Ventura Boulevard
Woodland Hills, CA 91364
(213) 887-9040

Informatics turned in a "respectable" 1979 revenue and profit performance even though assorted disappointments in two of its three groups led to results somewhat shy of expectations. Nonetheless, 1979 revenues for the company exceeded $112.3 million, up 21% over last year, and profits before tax continued a four-year recovery trend, growing 59% to $5.1 million.

Also during the year, Informatics became a public company. Equitable Life Assurance Society moved to reduce its ownership stake from 90% to 63% by selling 600,000 shares of Informatics common stock to the public.

Informatics organizes its business along functional lines represented by three groups:

Software Products, which grew 12% to $35.7 million last year; Professional Services, 25% growth to $35.4 million; and Processing Services, 28% growth to $42.2 million.

The most widely recognized is the company's Software Products group, whose Mark IV implementation language cumulatively exceeded 1,700 installations at 1979 year-end and has contributed over $90 million in revenues since its introduction in 1967. Mark IV accounts for nearly half the revenues of the group.

Among a variety of other software products are three new system software products introduced in 1979: Answer/2, a report writer; Inquiry/IV, an on-line file query system; and Trans/IV, which provides interactive processing for CICS/VS. Slow start-up of these products, as well as some glitches in new releases of the company's accounting applications products, held revenue growth well below the 25% to 35% industry growth rates typical of this business.

The biggest revenue gains last year were in processing services, in spite of the loss of Citicorp, which took its business in-house in July. This group operates data centers in four U.S. cities. These centers provide specialized services to wholesale distributors and insurance companies, as well as generalized data base and financial products. Customers number over 350. The third group, Professional Services, includes a variety of programming support services for commercial firms and government agencies.

Looking ahead to the 1980s, Informatics does not see an approaching quantum jump in dp industry technology but rather a jump in "squeezing the maximum benefits from the technology we already have." Apparently believing that familiarity breeds friendship, Informatics is positioning itself to take advantage of a maturing American friendship with the computer, similar to that with the automobile, which could invite "vast commercialization of new software offerings from large mainframes to the microprocessor and workstation level."

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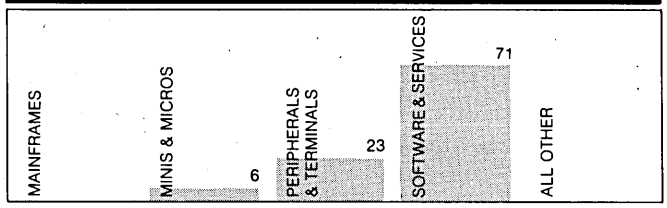

CY '79 DP Rev.	% Change	% Tot. Rev.	CY U.S. DP Rev.	% Change	% DP Rev.	CY Tot. Rev.	% Change	CY Net Income	% Change
$110 (M)	83	12	$90 (M)	53	82	$952 (M)	25	$88.8 (M)	26

NATIONAL CSS

187 Danbury Road
Wilton, CT 06897
(203) 762-2511

Dun & Bradstreet leaped into the dp business in 1979 through its successful top dollar tender offer for National CSS, one of the dp service industry's largest providers of remote computing services. The acquisition was one of several made by large "information services" companies seeking new product and distribution capabilities by linking up with the proven capabilities of an established time-sharing services vendor. With revenues an estimated $110 million for 1979 (up over 80% from the prior year with assistance from two acquisitions) and a prognosis for healthy future revenue and profit increments, the NCSS deal may not have been as expensive as first appears.

NCSS's services fall into three general categories: its traditional general time-sharing business; its 3200 computer series (supplied by Two Pi) designed to give customers access to NCSS software on a dedicated on-site machine; and its computer output microfilm (COM) services—added through NCSS's December 1978 acquisition of Zytron Corp. All areas grew in 1979. In its time-sharing business, Nomad, a data base management software system, remained its largest revenue producer, growing 60% to nearly $20 million in revenues last year. NCSS's time-sharing products tend to be functionally specialized rather than industry specialized and include among recent offerings an enhanced version of the Nomad data base management system, called Nomad II, a text processing system, and an information storage retrieval system. Products under development include systems for on-line accounting and project management.

The NCSS 3200 computer series, which got off to a slow start in 1978, contributed to revenue growth during 1979 but remained behind expectations. Installation activity rallied later in the year and closed with over 30 systems installed.

Zytron also posted gains in revenue and income last year. This NCSS unit transfers computerized information to microfilm and provides equipment and software for microfilm storage and retrieval systems.

D&B has not wasted any time hooking NCSS into several of its other operating units. So far a total of 12 joint projects have been initiated. Examples include network delivery of Duns Vue, a new credit product; availability of Moody's Municipal Credit Report Service on the NCSS network; and D&B use of various NCSS products such as inventory control and freight cost variance.

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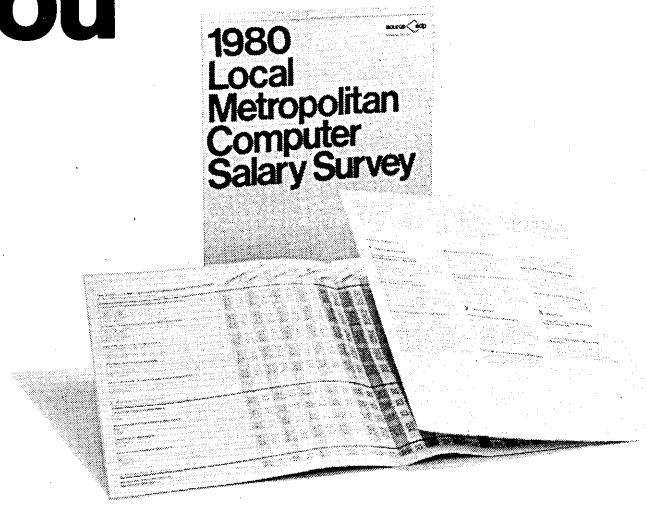

Includes 23 New Categories

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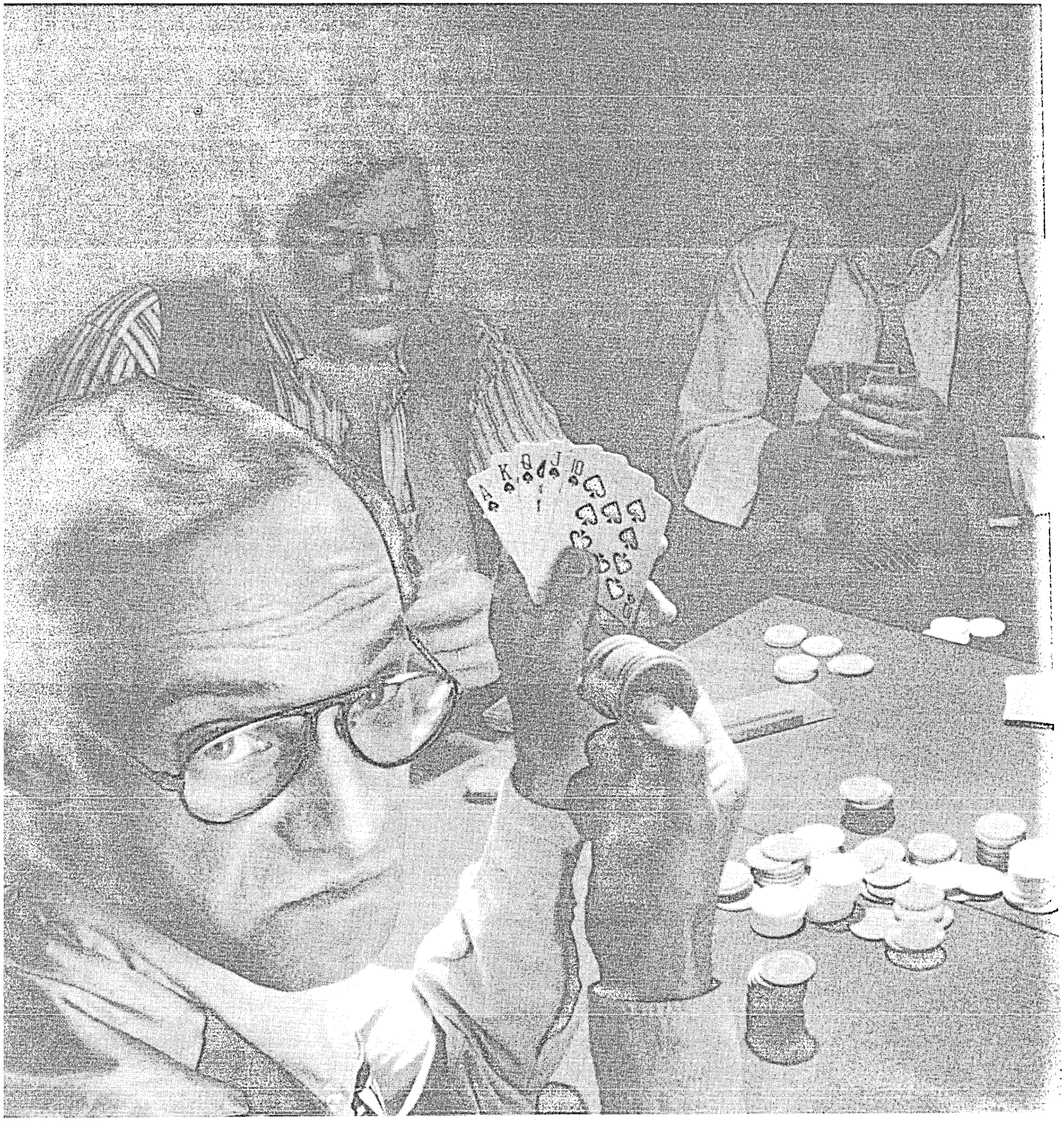
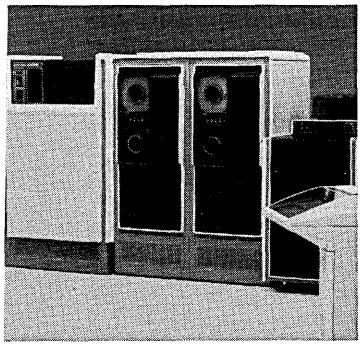


INDUSTRY'S RAISED 'EM.



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51 THE REYNOLDS & REYNOLDS COMPANY

Dayton, OH 45401
(513) 443-2000

Reynolds & Reynolds (R&R)—a processing services, turnkey systems, and business forms company in Dayton, Ohio—increased its dp revenues from $76.5 million in 1978 to $109.5 million last year, an impressive 43% increase.

This 80-year-old company has been providing batch and on-line services for selected industries since 1969; these now account for about $50 million in revenues. But the real growth has been in sales of turnkey systems (up 51% to $40 million in 1979) and terminals (up 30% to nearly $20 million).

Reynolds & Reynolds says its on-line business, called VIM II, is gradually slowing in growth because of turnkey systems sales. Batch business has been falling for some time, but two regional bureaus bought in the last two years will be expanded nationwide to rejuvenate it: Atlanta Bureau Data Systems Corp. (general ledger and client accounting), and Accumation Inc., of Oakland, Calif. (tax return processing). Reynolds estimates the tax market is growing a hefty 30% annually.

R&R targets the following markets for all its offerings: automotive dealers, hospital and medical offices, specialty contractors, professional accountants, and attorneys. In the dealer market, the firm has sold 1,200 minis since 1976. In hospital services, R&R has recently signed a joint marketing agreement with Travenol Laboratories to sell hospitals an on-line computerized management system linked to Travenol computers. In other markets, it will be announcing various new turnkey systems and applications packages in 1980.

While it buys minicomputers oem, Reynolds has formed a joint venture with Zonic Technical Laboratories in Cincinnati to manufacture its TC-100 standalone and clustered terminal systems (crt, keyboard, floppy and hard-disk drives, and printers).

52 CALIFORNIA COMPUTER PRODUCTS, INC.

2411 W. LaPalma Avenue
Anaheim, CA 92803
(714) 821-2011

CalComp was 20 years old in 1979, and the year meant the end of an era and an entirely new beginning for the California-based company as a subsidiary of a $168 million defense electronics specialist, Sanders Inc.

A friendly tender offer made last May by Sanders developed into a merger completed this February. CalComp, hurt by the "price erosion in IBM plug-compatible peripherals," had found itself in severe cash and debt problems. Last year it sold off its lines of PCM disk drives and add-on memory, oem peripherals for mainframes and minis, and automated tape library products. These moves were not quite enough to allow CalComp to go it alone with its mainstay plotter lines and new interactive graphics operations. Hence, the Sanders lash-up.

As one might deduce, CalComp did not score well in the revenues column in 1979: $107 million (down almost 17%), with a $17.9 million net loss. This completes a poor five-year showing for CalComp, which had only one "up" year, 1978, in this period.

How do Sanders and CalComp fit? CalComp has five electromechanical plotter lines, a new interactive graphic systems line, and a line of electrostatic printer/plotters purchased from Gould Inc. last year. Sanders makes graphic systems for computer-aided design, air traffic control, and flight simulation and training; it manufactures IBM's 3250 interactive graphic display system (a contract worth $27 million in 1979 alone).

Also, CalComp brings to Sanders 2,141 employees, foreign operations accounting for $37 million in sales last year, and a host of new products announced in 1979, including new graphic controllers, a wide belt-bed plotter, six-foot-wide drum plotter, and mini-based interactive mapping system.

53 THE TELEX CORPORATION

6422 East 41st Street
Tulsa, OK 74135
(918) 627-1111

The Telex Corporation, the plug-compatible peripherals leader of yesteryear, still appears to be suffering from its defeat in its antitrust suit against IBM in the early 1970s. Within the last year, making references to adverse effects of IBM technical and pricing changes in peripherals, Telex has withdrawn from manufacturing and/or marketing several PCM products.

While it has a new product that is plug-compatible with IBM's 3420 tape drive and manufactures 3270-compatible crt terminals, Telex has ceased new production of its 6420 tape drives and 7211 high speed printers (IBM 3211-compatible), and stopped marketing Univac ISS drives (except by customer request) as well as add-on memories. However, it continues maintenance and refurbishment of these products, contributing about 25% of revenues.

The PCM problem, difficulties in getting component deliveries for its terminal lines, and startup problems with the new Series 80 tape subsystem (now resolved), contributed to a sharp drop in net income for 1979, 82% to $1.3 million.

Still, Telex did report that dp revenues were up overall by 19% to $104.4 million* (the rest of total revenues is accounted for by instrumentation, recording, and communications equipment). The dp backlog at year-end was $26 million, much improved over $16 million in 1978. Much of this, says Telex, is due to sales by its Terminal Communications Division, which accounts for 42% of dp revenues.

Telex is concentrating increasingly on specialized terminal products, such as those for the graphic arts, financial loan, and trucking industries. The firm is looking for more such niches to avoid collisions with IBM.

The company is still paying for the Telex antitrust suit, having lost suits by two of its attorneys for fees and other costs.

*Telex reported this year that dp revenues in calendar 1978 were $88 millon, contrary to the $103 million listed in last year's survey.

54 COMPUTERVISION CORPORATION

201 Burlington Road
Bedford, MA 01730
(617) 275-1800

Computervision is the largest supplier of computer-aided design and computer-aided manufacturing (CAD/CAM) systems for the automotive, electronics, aerospace, and energy industries. These turnkey systems enhance productivity by shortening product development cycles, improving product yields, and automating repetitive design and manufacturing tasks.

Growth was explosive in 1979. Through their Productivity Systems Division, CAD/CAM sales increased over 100% to $103 million. This is mainly attributed to large increases in worldwide market demand. Profitability also improved, reaching 9.9% of sales compared to 7.3% in 1978. Overall, profit increased 149% in 1979.

Computervision was active in new product introductions in 1979. A new generation CAD/CAM system was announced in November (Designer V) with initial shipments scheduled for mid-1980. This system includes a new cpu, new display terminals with intelligence and raster scan, and a new software operating system. Existing systems will be field-upgradable. To further penetrate the CAM business, the firm introduced a software product, CV-Micrographics, which aids manufacturing management in more efficient production scheduling.

Computervision's outlook for itself and the CAD/CAM business is positive. Fourth-quarter sales and earnings increased over 100% from the previous year and almost 30% from the third quarter. It believes a mild recession may further spur demand for CAD/CAM products as competition will necessitate investments in capital expenditures to improve productivity quickly.

55 NIXDORF COMPUTER CORPORATION

168 Middlesex Turnpike
Burlington, MA 01803
(617) 273-0480

Nixdorf Computer Corporation, with sales up 23% to $100 million in 1979, is a subsidiary of its privately held $722 million West German parent, Nixdorf Computer AG.

Nixdorf, which manufactures small workstation-oriented computer systems, had a very active year in 1979. For the third year

in a row, it shipped more data entry key-to-disk systems than any other U.S. manufacturer. In February, the firm took the plunge into the office automation market with the introduction of the 8840 word processing system; in April, Nixdorf opened its new corporate headquarters in Burlington, Mass.; in August the 600/x5 series of computing systems with 300KB to 8MB of virtual memory was introduced; in September an agreement with Lexicon Corporation gave Nixdorf marketing, engineering, and manufacturing rights to the LK 3000, a personal computer aimed at the consumer marketplace; and in October, Nixdorf relocated its manufacturing facility to North Reading, Mass., doubling capacity. With all this activity in 1979, it is not surprising that plant and equipment expenditures increased 45% to $17.6 million and R&D expenditures similarly increased by a hefty margin (62%) to $4.7 million.

In January 1980, Nixdorf named Carl Janzen, a former marketing executive with IBM and Digital Equipment, as president of Nixdorf. With backlog and order momentum at all-time highs, Mr. Janzen is very optimistic about continued growth and becoming a major force in the U.S. computer market.

56 RECOGNITION EQUIPMENT INC.

2701 East Grauwyler Road
Irving, TX 75061
(214) 438-8611

Recognition Equipment Inc. (REI) continues to survive and grow as a leader in one of the toughest sectors of the computer industry—large-scale OCR equipment for banks, insurance companies, post offices, and credit card companies.

With systems whose prices run mostly to six figures, REI has managed to nearly double its sales in the last five years, reaching $98 million in 1979. Profitability growth has been difficult, however, and net income last year dropped 45% to $2.6 million.

Among contributing factors was a $5 million decline in sales of OCR WAND readers. REI has sold more than 70,000, but last year cheaper competitive entries appeared on the market. Another problem was a slower development of the market than anticipated for the big MAPS mail processing system. These disappointments contributed to a total shipment drop from $62.2 million in 1978 to $54.5 million last year. However, REI's backlog at fiscal year-end (October) was a record $75.6 million, up 32%.

Two major new products announced in 1979 helped. One was TRIM, the first of REI's image processing systems, used for "image statements" by banks and credit card companies. TRIM optically "lifts" the image of the check or remittance and prints it on the statement sent to the customer—saving labor, printing, and mailing costs. The other product is S80/88, a lower-cost version of the Input 80 page reading system, handling various page formats and type sizes and styles. The REI emphasis in the 1980s is on lower-cost OCR and image processing products.

57 THE BOEING COMPANY

P.O. Box 3707
Seattle, WA 98124
(206) 655-2121

The Boeing Company, long known for its expertise in aircraft, has a significant dp services group, the Boeing Computer Service Company (BCS). Initially formed to service internal computing needs for jetliner production, BCS has developed a large ($96 million in 1979) and growing (annual growth rate in excess of 30% since 1975) business for commercial customers. The major objective fulfilled in 1979 was the expansion of its commercial customer base. By introducing several new financial and engineering programs, commercial accounts were increased from 1,800 to 2,500.

Expansion of services and facilities has been the keynote for the past two years. Computing power doubled in 1978 as 10 new computers were installed; communication systems have been expanded to provide access to customers in over 110 cities in the U.S., Canada, and England; 11 new financial packages and six new engineering applications were introduced in 1979; and a new computer center was established in June 1979 to provide more time-sharing services to commercial and government markets.

BCS was very successful in procuring government contracts in 1979. It landed a contract from the U.S. Department of Education to process the student loan program; the Department of Energy gave a three-year extension to an existing contract for supporting nuclear research and power generation; and the Navy selected BCS to support a recruiting and training program.

58 WYLY CORPORATION

UCC Tower/Exchange Park
Dallas, TX 75235
(214) 353-7100

Wyly Corporation, which was pushed out of the top 50 this year by higher growth companies, finished 1979 with a smart 81% increase in earnings on a 13% sales increase. These results indicate that Wyly has continued the turnaround that started in February 1978, when the company restructured its capitalization by exchanging $100 million in debt for equity. The financial reorganization was required after its six-year effort to build a microwave data communications business failed and ceased operation in 1976. In March 1980, Wyly cleared away the last vestige of this unsuccessful effort by dropping its antitrust claims against AT&T and settling for $50 million.

Wyly's domestic business, with 47% of corporate revenues, is divided equally between services and software. The Computing Services Division had an active year as four large-scale computers were installed in the Dallas supercenter. Revenues from remote processing increased most rapidly in the numerical control, electronics, large structures, and nuclear industries. The Software Division is expanding its business by acquiring marketing rights to new products on a royalty basis.

International operations, centered in Europe, are mostly service revenues. The largest operating group, Automation Centers International (ACI), grew 30% in 1979. The major industries serviced by ACI are electronic wholesalers, electrical distributorships, tourist agencies, and automotive companies. Another subsidiary, the European Computer Utility, is based in the U.K., with a communications network throughout Western Europe. In 1979, the London center was enlarged and applications were developed for general accounting and the furniture trade.

Wyly is targeting revenue growth at 20% to 25% over the next few years. Much of this expansion will come from acquisitions of specialized products and services that fit well with current products and markets. Digital Systems of Florida, a turnkey system supplier for accounting offices with $10 million in sales in 1979, was the first company acquired by Wyly in 1980.

59 DOCUMATION INCORPORATED

P.O. Box 1240
Melbourne, FL 32901
(305) 725-5520

Documation, a leading independent manufacturer of impact printers and other electromechanical products, has grown at an average rate of 57% since 1975. In 1979, revenues grew 66% to $84.9 million. However, the excitement of this exceptional growth must be tempered by Documation's reduced profitability ($2.4 million vs. $5.9 million in 1978) and a $2.7 million loss in the last quarter. Lack of financial planning seems to have been the problem. Documation acted quickly by bringing in new financial executives shortly after the deficit was announced.

In other ways, 1979 was a productive year. A 73,000 sq. ft. plant was opened in Ireland and construction was initiated for an additional 70,000 sq. ft. With other expansions, production capacity was increased to allow a doubling of the current shipment rate.

High-speed impact printers represent 70% of Documation's revenue. The growth in this line marketed to the end user has been phenomenal considering that the initial product, a 2250 lpm printer, was introduced in 1976. Two new products, 3800 lpm and 600 lpm printers, were introduced in 1979. Documation plans to introduce a nonimpact laser printer, rated at 18,000 lpm, in 1980.

Documation's other products are marketed through their oem sales forces. Card handling equipment, Documation's first product line introduced in 1970, accounts for 20% of 1979 revenue. The remaining business is in printed circuit boards.

60 SHARED MEDICAL SYSTEMS CORP.

650 Park Avenue
King of Prussia, PA 19406
(215) 265-7600

Shared Medical Systems (SMS), which provides data processing services to acute-care hospitals, had another solid growth year in 1979. Profits increased 26% to $10.8 million, while revenues increased to $82.8 million, 31% greater than the prior year. The company's financial performance has improved each year since 1970. Since 1973, revenues have grown at an average annual rate of 43% and earnings at 55%. In light of their historical growth, management considers its objective of 20% growth in the future conservative and attainable.

SMS services acute-care hospitals by providing financial management systems (patient accounting, financial reporting, revenue reporting, and accounts payable); resource management systems (payroll, personnel, inventory, and fixed assets); administrative management systems; patient care systems (inpatient admissions, outpatient files, medical records, pharmacy, etc.); and hospital interdepartmental communications systems. Data are collected in the hospitals via terminals and minicomputers and are sent by telephone lines to SMS data centers, where the data are processed.

The company's market is approximately 3,000 nonfederal acute-care hospitals having 100 or more beds. SMS currently provides services to 485 hospitals in 42 states. Management estimates that it currently has a 14% share of the market for dp services in hospitals. Market penetration can be enhanced, but more company growth will result from the large expected market growth. SMS will participate in this growth by enhancing current applications, adding new applications, particularly in patient care, and penetrating new hospitals.

In 1979, SMS opened a new 83,000 sq. ft. on-line data center. This center currently supports 6,000 terminals connected by 125,000 miles of leased telephone lines.

61 APPLE COMPUTER INC.

10260 Bandley Drive
Cupertino, CA 95014
(408) 996-1010

Apple Computer, a personal and small business computer manufacturer, far surpassed the growth rate of all companies in the DATAMATION 100 Survey, as sales reached $75 million in 1979, a 650% increase from its $10 million level in 1978.

Because large computer companies have been slow in entering the personal computer marketplace, Apple has been able to achieve viability. Funded by venture capitalists in 1976, Apple began shipping its computers in June 1977. After initially focusing on the hobbyist market, Apple successfully penetrated the education marketplace, and signed a marketing agreement in February 1979 with Bell & Howell, a major audiovisual equipment distributor. Then in late 1979, Apple began marketing a second generation model for very small business applications including accounts payable, word processing, and data base handling. A new generation of computers to address the scientific and industrial market is expected in 1980.

Apple's computers are sold in retail computer stores. Marketing had previously been handled by distributors. The strategy of eliminating distributors, who are strapped by the high cost of money, will create more efficient distribution and improve inventory control. Five distribution/repair centers in Boston, Dallas, Los Angeles, Charlotte, N.C., and Sunnyvale, Calif., have been established. Management hopes to create a telecommunication network to hasten order processing.

International sales, mostly in Europe, accounted for 25%. ITT, through a nonexclusive oem arrangement, has dominated existing oem activities. Management expects to establish a local operating company in Europe, possibly in Amsterdam, and looks forward to substantial international growth.

62 HAZELTINE CORPORATION

Comack, NY 11725
(516) 462-5100

Last year, Hazeltine achieved $73.9 million in dp revenues through the display systems sales of its Industrial Products ($51.2 million) and Government Products ($22.7 million) divisions.

Within the Industrial Products Division (IPD), the Computer Terminal Equipment product line (CTE) had sales of $41 million, 80% of total division sales. Hazeltine entered the Teletype-compatible terminal market in 1970 and shipped its 100,000th terminal in 1979. Shipments reached 32,000 terminals in 1979, 25% greater than the prior year.

New CTE terminal introductions were frequent in 1979. Announced in January was the low-cost Hazeltine 1410, with separate numeric and alphabetic keyboards, designed for the general business and accounting market. In April, the Hazeltine 1420 terminal with 94 displayable characters was introduced to support word processing applications. Finally in June at the NCC, Hazeltine introduced the 1552 conversational terminal with software compatibility with Digital Equipment's VT-52 terminal. Hazeltine sells its terminals to oem customers and through retail computer equipment sales.

Most of the rest of IPD's revenues were from graphic displays for CAD/CAM applications, provided by wholly owned subsidiary Imlac Corporation, which was acquired in September 1978. Sales of its Dynagraphic low cost terminal are primarily to oem accounts. Imlac also manufactures a computer composition system, Composer 1550, which is used in the production of catalogs and manuals.

In 1979, the Government Products Division initiated a program to supply command and control situation display systems under contract from Boeing Company for the NATO E-3A "Sentry" AWACS aircraft program. Orders for this $29 million program will be filled from 1981 to 1984.

63 MODULAR COMPUTER SYSTEMS, INC.

1650 West McNab Road
Fort Lauderdale, FL 33309
(305) 974-1380

Modular Computer (Modcomp) manufactures minicomputers for the process control markets and for data acquisition and experiment monitoring. Its series of computers, according to industry surveys, has a good reputation for quality and reliability.

Operating results for 1979 were moderate. Profit increased 7% on an 11% revenue increase. By year-end, however, the backlog had increased by over 30% to $24 million. Results in 1979 were impacted, said Modcomp, by its inability to hire qualified sales personnel, resulting in lost orders.

New product introductions continued in 1979 with the expansion of its Classic family of computers in June. The new 7830 and 7835 models, ranging in size from 128KB to 556KB and costing $23,000 to $29,500, fit between the existing low-end 7810 microcomputer and the high-end 7860 and 7870 models. Software enhancements were also announced.

The most significant event relating to Modcomp's future was the infusion of $30 million in equity capital in January 1980. The cash was received from AEG-Telefunken for 1,089,000 shares of common stock, 25% of the total shares outstanding. Considering that the stock ranged from 10 to 17 in 1979, Modcomp is said to have made a judicious deal. In addition, a joint venture company to be 25% owned by Modcomp and 75% by AEG-Telefunken will be formed in West Germany to capitalize on opportunities in Europe.

Several key management changes were announced in February 1980 which should strengthen the management team. Alexander W. Giles, who was president, has become chairman and chief executive officer. Gabriel A. Rosica, who joined Modcomp from Foxboro where he had been vice president/general manager of United States operations, has become president.

Management approaches 1980 with caution, as capital spending within its markets may slow in a recessionary environment.

64 SYSTEMS ENGINEERING LABORATORIES, INC.

6901 West Sunrise Boulevard
Fort Lauderdale, FL 33313
(305) 587-2900

Systems Engineering Labs (Systems) grew a modest 15% to $71 million last year. Much of

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

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

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FEATURE COMPARISON CHART

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

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

VISUAL See for yourself

Visual Technology Incorporated
Railroad Avenue, Dundee Park, Andover, MA 01810
Telephone (617) 475-8056

CIRCLE 97 ON READER CARD

this growth came from increased international sales, now accounting for 26% of revenues. One of Systems' major problems last year was its reliance on energy-related business; the Three Mile Island nuclear power plant incident caused business from such plants to be delayed or canceled. At midyear, backlogs were down 4%.

Systems, a manufacturer of a super minicomputer line labeled the 32 series, concentrates on three major application areas: simulation (41%), laboratory computation (28%), and energy monitoring and control (10%); however, Systems is targeting industrial automation for increased market emphasis.

In 1979, the firm's development expenditures were high—10% of revenues. New tape and disk drives were announced, as well as an attached array processor. In software, a new multi-use operating system, Mapped Program Executive (MPX-32) was introduced, along with FORTRAN software tools enhancing programmer productivity. Further product announcements anticipated for this spring will continue Systems' trend toward development of new markets.

65 AM INTERNATIONAL, INC.

1900 Avenue of the Stars
Los Angeles, CA 90067
(213) 556-9500

AM International continued to increase its presence in the data processing industry through heavy investments—both in acquisitions and increased product development. As a result, dp revenue increased to $69.5 million, up 99% from calendar 1978. This high growth is expected to continue, as AM International is making substantial investments in electronic-oriented technologies as part of corporate strategy to transform AM from a duplicating company to an information processing company. Over half of 1980 revenues are expected to be generated by new technology machines in data processing and phototypesetting.

Dp revenues are generated by three divisions—AM Jacquard Systems, AM ECRM, and AM Documentor. Jacquard Systems, a minicomputer manufacturing company with strong software capabilities in word processing and business applications, was acquired in early 1979. Besides software expertise, Jacquard offers AM a national network of dealers located in major markets. By yearend AM's existing standalone word processing products were combined into the Jacquard Division. Although this division offers a wide range of products including standalone word processing, full page text editors, and multistation systems, product focus will be on the high-end market, where industry growth rates are projected in excess of 50%.

The largest dp division, Documentor, with 1979 sales of $31 million, serves the food service industry with microprocessor-based management control systems. This division accounts for 35% of the total market for control systems in the food service industry, which is growing at a 17% average annual rate. To generate new growth, Documentor may participate in other markets.

The ECRM division, acquired in 1978, is a leading vendor for laser scanning systems and OCR devices.

66 COMPUTER AUTOMATION, INC.

2181 Dupont Drive
Irvine, CA 92713
(714) 833-8830

Based on recent financial results, Computer Automation (CA) appears in the midst of a turnaround. For the fiscal year ending June 1979, CA had a $4.2 million loss on a $63.5 million sales level. However, CA has had two successive profitable and improving quarters, with net income reaching $1.5 million for six months ending December 1979 vs. a $500,000 loss the previous year.

Management attributed the poor fiscal 1979 performance to bad inventory controls, increased corporate borrowings, the expense of foreign expansion, and competitive product announcements. To address the financial problems, Paul Hoff, former chief financial officer of MSI Data, was named chief financial officer of CA in July. In addition, George Pratt was named chairman of the board of directors in December following the resignation of Robert Rawlins.

CA's Naked Mini Division, with sales of $41.2 million, supplies minicomputers to oems. With the introduction of the low-end Scout Naked Mini announced in April 1979, CA now has a full line of minicomputers for its customers. To date, 30,000 computers have been delivered worldwide. In October, oem contracts were signed with Docutel and Key Corporation valued at about $4 million.

CA also participates in the distributed data processing industry through its Commercial Systems Division with its SYFA series of computing systems. This division, with $13.5 million in fiscal 1979 sales, introduced the SYFA JR-20 computing system in 1979, which can handle both standalone and network applications. Offered for $30,000 and $40,000, it is a two- to four-terminal system that can grow to a full-scale network processor supporting 32 terminals and 2400MB of disk storage.

Remaining dp revenues are from minicomputer-based automatic test equipment through the Industrial Products Division.

67 MARTIN MARIETTA CORPORATION

6801 Rockledge Drive
Bethesda, MD 20034
(301) 897-6000

Martin Marietta Data Systems (MMDS), with a healthy 43% revenue increase in sales to $67.1 million in 1979, is a leading services firm for manufacturing environments. Remote Computing Services (RCS) accounts for 45% of sales. With two massive data centers in Orlando and Denver, MMDS's network transmits 1 billion characters per day. Some subscribers use their own software, which is accommodated in COBOL, PL/1, FORTRAN, BASIC and RPG, and others use one of MMDS's 400 applications.

Martin Marietta's Modular Applications Systems (MAS) is a series of manufacturing software packages that provide total materials management and control. These modules offer engineering control, inventory control, manufacturing control, master production scheduling, purchasing, costing, order processing, and general ledger accounts. MAS-H, designed specifically for the HP 3000 minicomputers, provides each plant manager with an integrated manufacturing system that includes on-line floor control, inventory control, and purchasing capabilities. Other versions of MAS are designed for use in batch processing with Honeywell, Univac, and IBM computers; as an interactive system for small IBM 370 systems and IBM 4300 computers; and for use with MMDS's remote computing network.

MMDS formed a Federal Systems Group in 1979 to satisfy dp service requirements of the government separately from their commercial business. Current projects are with the armed forces, Department of Agriculture, GSA, HUD, TVA, and the Treasury Dept.

MMDS International, based in England, provides dp services, consulting services and software to various industries including retailers, fleet management systems for automobile leasing, check-in and check-out programs for hotels, and materials management systems for manufacturers.

68 COMSHARE, INC.

3001 South State Street
Ann Arbor, MI 48106
(313) 994-4800

Comshare, an international computer services firm, vaulted into the DATAMATION 100 list by doubling revenues to $66.9 million in 1979. Much of that increase can be attributed to gains in foreign revenues. Comshare International, BV (CIBV), originally a 45%-owned foreign affiliate, became a wholly owned subsidiary in 1979.

Comshare concentrates on providing computer services for professional disciplines such as personnel administration, certified public accounting, financial planning, trust administration, and foreign exchange banking. Comshare works very closely with its clients, which currently number over 5,000; no single client accounts for more than 3% of revenues.

Future revenue growth will come from internal product development as well as acquisitions. New product introductions in 1979 included Digi Trust, a personal trust accounting system, which represents the first in a line of minicomputer-based services. Also announced was VSCOM-33, an automated system for fulfilling the disclosure requirements of the government's new inflation accounting standard. Computer Research Company, a

Vincent van Dumb.

The Dumb Terminal® video display terminal has done it again.

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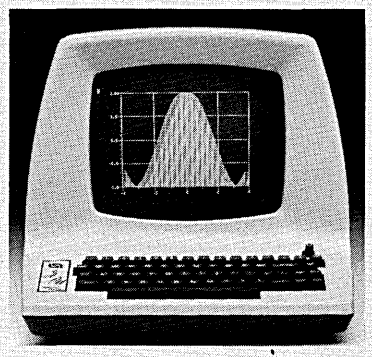
The package consists of an ADM-3A Dumb Terminal plus a single plug-in card engineered to fit neatly inside the ADM-3A without soldering, special tools, or a service call.

Retro-Graphics is a product of Digital Engineering, Inc., and is sold separately or installed in the ADM-3A by local Lear Siegler distributors. Contact the distributors listed below, any Lear Siegler sales office or Digital Engineering, Inc., 1775-C Tribute Road, Sacramento, CA 95815, 916/920-5600.



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leading supplier of IBM-based computer services in the Chicago area, was acquired during the last quarter of 1979.

Because the network services market is growing more quickly than other services sectors, Comshare expects its revenues to grow at an average annual rate of 25%—greater than the general 19% growth ADAPSO estimates for the services industry.

69 TANDEM COMPUTERS INCORPORATED

19333 Vallco Parkway
Cupertino, CA 95014
(408) 725-6000

Tandem achieved another year of explosive growth (116% over 1978) and profitability (119% over 1978) in 1979. The revenues of $66.4 million are quite impressive considering that the company's first sale occurred in 1976. During 1979, Tandem delivered 389 processors to 118 customers, more than in all previous years combined.

Tandem's success is due in large part to the uniqueness of its product line and the niche it found in the emerging market for on-line transaction processing systems. Tandem's product, the Non-Stop System, has an innovative architecture which greatly reduces the risk of system failures, therefore protecting on-line data bases. A Tandem system, with its modular design, can range from two to 16 processors.

Tandem has invested heavily in software. Its Expand network operating system enables users to build a distributed data processing network of over 200 dispersed Tandem systems. Product introductions in 1979 included the software package, Pathway, which, by handling terminal and control functions, makes on-line applications easier and faster. A crt display terminal was also introduced this year. Tandem has not manufactured the other peripherals sold as part of its systems, nor is this planned in the near future.

70 LEAR SIEGLER, INC.

3171 South Bundy Drive
Santa Monica, CA 90406
(213) 391-7211

Lear Siegler, through its Data Products Division, increased dp revenues by 35% to $65 million. The bulk of the revenues came from the ADM-3A Dumb Terminal. This terminal, introduced in 1976, has become the largest installed general purpose crt, with over 100,000 shipped. This basic Teletype-compatible terminal was the first to break below the $1,000 barrier.

Although intelligent terminals were introduced by Lear Siegler in 1972 (ADM-1), there was minimal activity until late 1978, when two microprocessor-based terminals, ADM-31 and ADM-42, were introduced. Large volume production began in 1979. These terminals provide full editing capabilities and contain multiple pages of resident memory.

Lear Siegler also manufactures printers, having entered the business in September 1977 by acquiring Hydra. In late 1978, the 3000 Series Ballistic Printer with a superior print-head design was introduced for just under $2,000.

Unlike most terminal manufacturers, Lear Siegler markets 80% of its products to distributors and dealers. The firm estimates it has two-thirds of the distributor and dealer market for terminals. This network then sells to end users, small oems, and system houses. The other 20% of Lear Siegler's sales are to oem accounts and large-volume end users. Lear Siegler signed major oem contracts with both Zilog and Xerox in 1979.

71 THE SUN COMPANY, INC.

100 Matsonford Road
Radnor, PA 19087
(215) 293-6000

Sun Information Services Company (SIS), a subsidiary of the Sun Company formed in 1975, provides computer services, including remote computing and batch services and software packages, for electronic and telecommunication systems.

SIS revenues reached $64 million in calendar 1979 and management expects annual revenue growth to exceed 30% in the coming years. Through growth of current operations, acquisitions, and investment in new business development projects, SIS projects annual revenues in excess of $100 million by 1981.

Processing services account for almost two-thirds of total revenues. The manufacturing and banking industries are the major markets, representing 70% of SIS revenues. The major competitors include Boeing Computer Services, Martin Marietta, Service Bureau Company, ADP, Interactive Data Corp., Informatics, GEISCO, and MCAUTO.

SIS is organized into three divisions: Banking Services, Computer Services, and Electronics and Telecommunications Systems (ETSD). The entry into the banking services division has been accomplished through four acquisitions: Applied Financial Systems in May 1979, Weilard Computer Group in May 1978, a computing division of Metridata in February 1979, and Catallactics Corporation in November 1979.

This division and the Computer Services Division have been targeted as the higher growth sectors for SIS. The Computer Services Division uses IBM and CDC computers from three data centers to offer services in distribution (railroad car management), management control, technical, data base management, financial, and planning applications. This division also handles a disaster backup and recovery service, Sungard, which became operational in 1979. It also markets a microcomputer system for distribution management and provides micrographic services. ETSD is a new division which is developing software products and services for electronic and telecommunications users.

72 CONRAC CORPORATION

Three Landmark Square
Stamford, CT 06901
(203) 348-2100

Conrac Corporation is a diversified electronics manufacturer which derives 45% of its revenues from data processing products. Dp revenues, amounting to $62 million last year, came from Conrac's data handling and display business segment, telecommunications business segment, and its aerospace segment.

More than half of its dp revenues, $37 million, was contributed by the data handling and display business segment. The major products are crt displays, sold to markets in computer-aided design (CAD), medical electronics, and process design. Conrac has captured 20% of the growing market for CAD displays, and a 70% share of the high-margined, high-technology medical displays market. Although government restrictions have limited growth in the CAT scanners market, planar X-ray and ultrascanners continue to experience good growth. Conrac also participates in the intelligent terminal market and the computer airline/airport management information display systems market. Conrac signed a $4.3 million contract in March to develop a flight information display system for the Singapore airport.

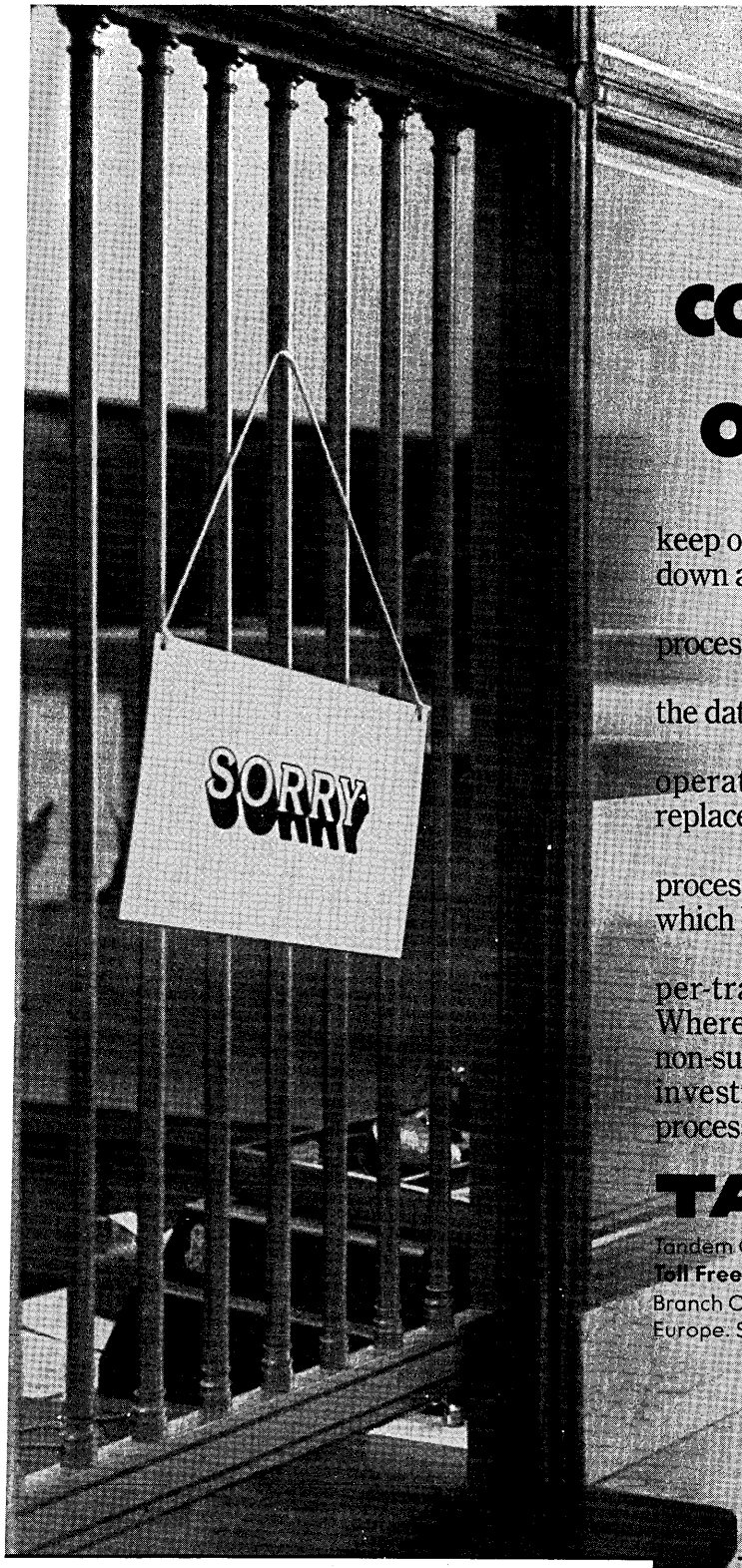
In telecommunications, Conrac sells $15 million in dp products and systems through its Alston Division. This division has a 20% share of the market for computer-based traffic engineering and maintenance systems to help telephone companies achieve maximum utilization of existing plants. This division also manufactures standalone and portable traffic data terminals for optimization of communications systems. In November 1979, the Alston Division signed a contract for a telephone traffic control system with Brazil for $8.3 million.

The remaining dp revenues come from the aerospace segment, where they manufacture digital data acquisition systems for sophisticated aircraft.

73 INFOREX, INC.

186 Middlesex Turnpike
Burlington, MA 01803
(617) 272-6470

For Inforex, 1979 was more than a disappointment. It was a year in which its very existence was threatened. On October 3, Inforex filed for protection under Chapter 11 of the Federal Bankruptcy Code. The key-to-disk system company lost $7 million through nine months ending September; revenues are estimated to have declined 15% to $61 million. Management cites the lack of long-term lease revenues, costly sales of upgrade equipment, and a lack of third-party leasing companies' sales as causes of its problems. In January 1980, the U.S. Bankruptcy Court approved an operating order allowing Inforex to continue operations under Chapter 11 pending another review on April 1, 1980.



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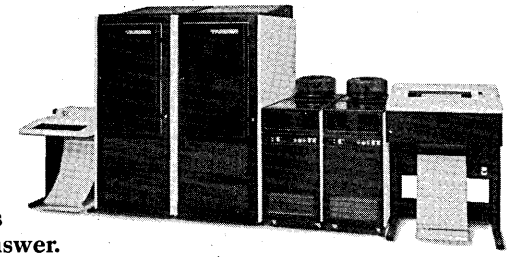

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CIRCLE 99 ON READER CARD

Tandem Computers, Inc.
19333 Vallco Parkway, Cupertino, California 95014
Attn: Marketing Communications, Department D-7

☐ Please send me your introductory brochure on the benefits and applications of NonStop computing.
☐ Please arrange a demonstration of your unique NonStop capabilities.

My potential application is in _____

Name _____ Title _____

Company _____ Street _____

City/State/Zip _____ Phone _____

As a consequence of the financial difficulties, the company has dramatically reduced U.S. operations. Since July, the U.S. work force has been reduced 40% to 612 employees. In addition, strict expense controls were effected which should lower domestic spending by 30%; plant consolidations are also expected. Management was also restructured, naming Gerald E. Jones, a vice president of Worldwide Marketing and former executive at Wang Laboratories, as chief executive officer. Financial responsibilities are split between William Walker, who was named vice president and controller, and John Doyle, who was named vice president and treasurer.

The company's main product line, accounting for approximately 86% of 1979 revenues, is key-to-disk data entry systems. In January 1979 the company added two systems which provide more functions than previous models, such as sophisticated software editing features. Other products include file management systems (about 13% of 1979 revenues), and an intelligent terminal for distributed data entry, file management, processing, and data communications. In October, Inforex was awarded an $8 million contract by the U.S. Army for these terminals, but after the bankruptcy proceeding, the contract was voided.

74 QANTEL CORPORATION

3525 Brakewater Avenue
Hayward, CA 94545
(415) 783-3410

Qantel Corporation was founded in 1969 as a privately held communications computer company. In 1973, a new management team, with Douglas Baker as president, took over the company and focused on the small business computer market. Management decided to sell turnkey systems to the small end-user market, such as small accounting firms.

Since then the company has accomplished impressive growth; revenues of $2 million in 1973 mushroomed to a $21 million business in 1979. While 1979 revenues were up nicely, 26%, profits leaped 150%. The future looks promising considering that the $31 million backlog at year-end 1979 was more than double the $12 million backlog in 1978. Management is looking to grow at 30% in 1980, and increase its installed base by 2,000 units to 5,500 total systems installed.

Marketing is done through local independent distributors. Internationally, over 120 distributors carry the Qantel line. Foreign sales are expected to reach 40% of total sales in 1980.

Qantel designed all of its computing systems to be fully compatible in both hardware and software. As a turnkey vendor, Qantel offers a variety of application packages, as well as its own high-level programming language, which is similar to BASIC.

The Series 200 and 300 computers, reportedly ranging in size from 64KB to 1MB of main memory, were under development in 1979 and are expected to be announced in 1980. These computers are manufactured in both California and Puerto Rico, as are its existing lines. A new 50,000 sq. ft. facility in Puerto Rico is under construction and planned for completion in March 1981. A new 160,000 sq. ft. facility in California, to be used as headquarters and for manufacturing, is scheduled for completion in September 1980.

75 COMMODORE BUSINESS MACHINES, INC.

3330 Scott Blvd.
Santa Clara, CA 95051
(408) 727-1130

Commodore's continued strong presence in the personal computer market was evidenced by its more than 100% growth in dp revenues to $55 million. The Pet computer, a self-contained personal computer retailing for less than $1,000 and aimed at the hobbyist and education markets, contributed heavily to this growth.

Commodore markets its computers through its own sales organization to dealers and large end users in eight countries including the U.S., Canada, England, Germany, and Japan. These dealers are typically retail stores that sell personal computers, business machines, and consumer electronic products. Sales are also made through distributors in 25 countries. In addition, Commodore owns several retail stores in the United States; this distribution channel is being evaluated for further expansion.

Among many product introductions in 1979 was a line of small business systems for the professional and small business market. Peripherals available are single and dual floppy disks, modems, and thermal and letter quality printers; software offerings include a word processing package. New product introductions will continue at a rapid pace in 1980 with a new generation computer system and enhancements of Pet systems already planned.

Commodore acquired Micro Display Systems, a manufacturer of liquid crystal displays, in 1979.

76 NATIONAL DATA CORPORATION

One National Data Plaza
Corporate Square
Atlanta, GA 30329
(404) 329-8500

National Data Corporation (NDC), which provides data exchange and processing services for cash management, consumer credit, and health care markets, had revenues of $54.4 million in 1979, an increase of 23%.

Cash management and management information services, representing more than one-third of NDC's revenues, grew at 36% in fiscal 1979. Financial services include deposit reporting, balance reporting, money transfer, information reporting, a remittance processing service, and other specialized cash management applications.

Growth was aided by the acquisition of Interactive Science Corporation. ISC is a good fit for NDC because of its expertise in data base management, information gathering technology, turnkey distributive processing, and financial applications.

Credit card and consumer services, at 34% of total revenues, is the next largest area of business for NDC. These services span the entire spectrum of credit card operations—evaluation of the application, credit card authorization, and consumer billing. NDC customers include 200 banks serving over 2 million retail merchant locations. Divisional growth will be achieved as more sophisticated services are offered, particularly after the customer base is upgraded with the addition of voice authorization and point-of-sale terminal systems, and data communications networks.

"In order for our money to work for you, Mr. Thompson, you have to work for our money." ©DATAMATION

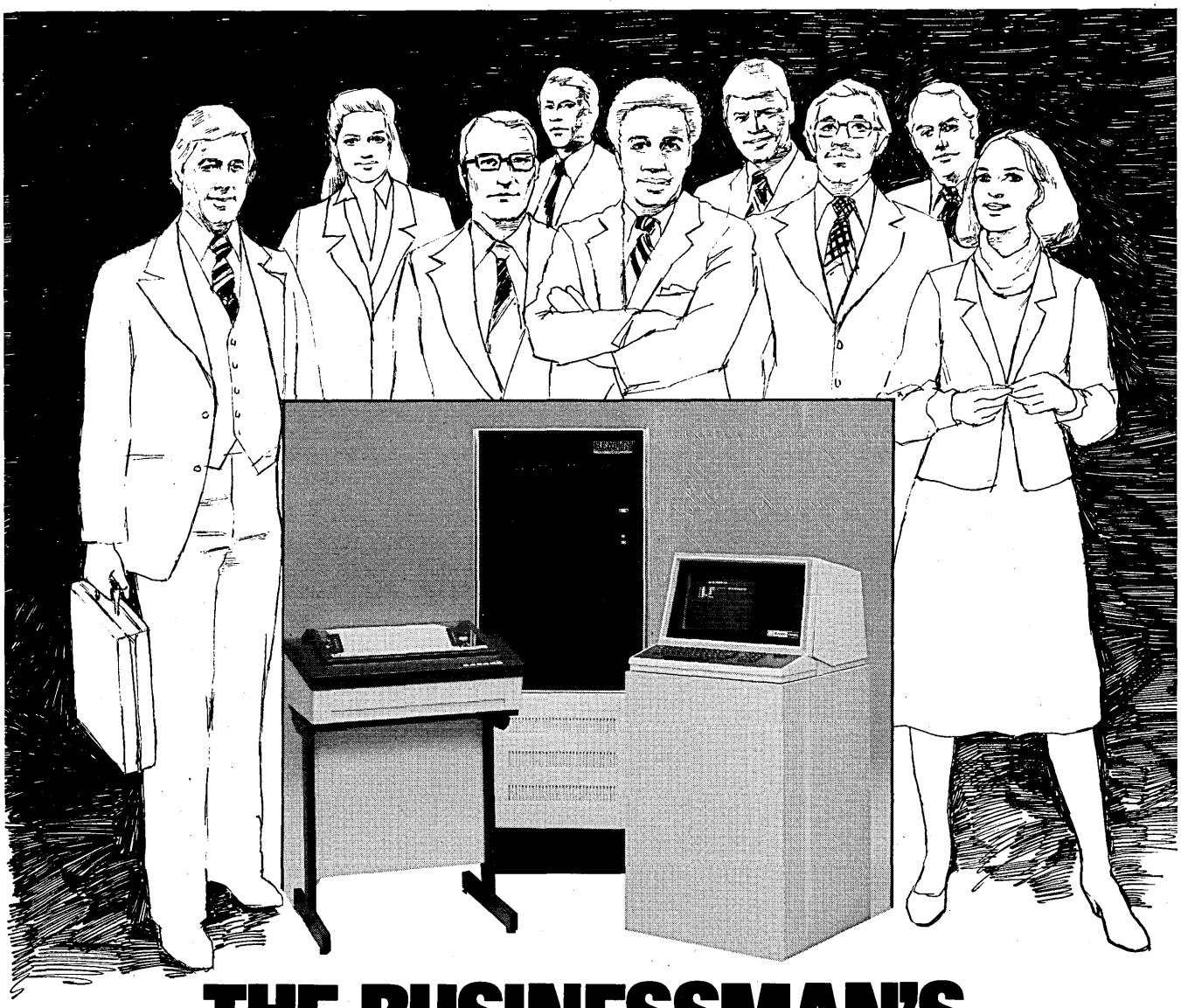
CARTOON BY TOM MASON

77 BASF SYSTEMS

Crosby Drive
Bedford, MA 01730
(617) 271-4000

BASF Systems, one of the few fully integrated computer media manufacturers, increased revenues by 35% to $54 million in 1979. It manufactures both digital tape media (including the Endura line and the premium 2000 A.D. line) and disk media (including disk packs, data modules, flexible media, and mag cards).

Sales increased as a result of capital expenditures made in 1978 and 1979 which expanded production capacity by 30%. In



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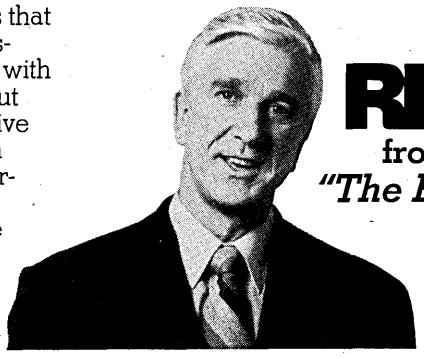
Microdata Corporation,
P.O. Box 19501,
Irvine, CA 92713.



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1980, over $16 million has been appropriated to buy capital equipment for the media division to make production more efficient and to increase manufacturing yields.

Hardware sales were initiated in 1979, when the Peripheral Products Division, located in Billerica, Mass., and the Memory Division, located in Los Gatos, Calif., were established. The Peripheral Products Division, a manufacturer of 5¼-inch floppy drives, began shipments of the single-sided drive in July 1979 and the double-sided drive in January 1980. Its drives are among the most compact in the business, being two-thirds the size of the industry standard, the Shugart SA-4000. The Memory Division is in the new and growing 8-inch fixed disk drive market. Shipments began in January 1980 from the 34,000 sq. ft. plant.

78 APPLIED DIGITAL DATA SYSTEMS, INC.

100 Marcus Boulevard
Hauppauge, NY 11787
(516) 231-5400

Since it shipped its first teletype-compatible crt terminal in 1970, Applied Digital Data Systems (ADDS) has become a leading independent manufacturer of video display systems. Primarily a supplier to the oem market (70% of revenues), ADDS went over the $50 million mark last year. Its major customer, NCR, accounted for 45% of that.

Financial results were disappointing in 1979. Sales increased almost 11%, but pretax operating margins decreased to 15% from 26% in 1978. ADDS blames the poor profitability performance on an unfavorable sales mix and a buildup of resources resulting in an increase of expenditures. As of September, employment reached 850, a 27% increase from September 1978. Research expenditures were also up almost 100% compared to last year.

ADDS was very active in new product introductions and construction activity in 1979. The year-end backlog of $38.6 million, up 21% from the prior year, included over $10 million of new products. These include the Regent 20, 40, 60, and 300 terminal series. The Regent 60 is an intelligent terminal with a buffer and the 300 series is used as part of a clustered series of intelligent terminals for use in distributed data processing. Construction activity included completion of a printed circuit board facility, a subassembly facility, and a new warehouse addition. ADDS enters the '80s with major capital expenditures behind it.

79 ELECTRONIC MEMORIES & MAGNETICS CORP.

15760 Ventura Boulevard
Encino, CA 91436
(213) 995-1755

Electronic Memories and Magnetics (EMM) had a very difficult year as pricing aggressiveness and the announcement of the 4300 series computers by IBM caused major disruptions in the plug-compatible add-on memory business. As a result EMM had a major reorganization, reevaluating and discontinuing businesses and consolidating operations. Results for 1979, profits up 14% on a 5% revenue increase, are deceptive since they do not include results (or comparisons) from discontinued operations.

EMM stopped manufacturing plug-compatible add-on memory but plans to continue serving its lease base. After the shock waves, other operations were evaluated. The disk pack leasing business was sold in August 1979 to North American Leasing. The disk drive business could not be sold so EMM just shut down the operation because it had been plagued by operating deficits. Too much capital was needed to fully modernize plant and equipment, and its level of expenditures could not be justified, based on expected returns on investment.

EMM also sold its semiconductor operation in Phoenix to GTE for $20 million. The product manufactured, an 8K static RAM, is in good demand but manufacturing yields were bad, and the operation was not profitable. Again management felt that the capital required to modernize the plant was not a worthwhile investment.

By eliminating the troubled divisions, EMM is in a better position to enjoy controlled growth. Its balance sheet is stronger (no

The Office of The President

To: ALL DATA PROCESSING DEPARTMENT HEADS

It is becoming increasingly clear to me that your department must work more closely with the operating departments of this company to develop new and better information systems.

If we are to compete effectively in today's marketplace, you must help us to develop more accurate sales forecasts, better inventory control systems, better financial planning systems and do a hundred other jobs faster and more accurately than they have ever been done before. (And, of course, do a lot of jobs that have never been done before.)

With this in mind, I strongly urge you to attend INFO 80, a show and conference on information management, which will be held at the New York Coliseum, October 6-9, 1980. As far as I know, this is the only show that addresses itself to the task of developing total information management systems, the only show that covers data processing, word processing, and data communications in depth.

Since all the leading companies in the field will exhibit at INFO 80, it seems to be the ideal place to make a comprehensive study of all the alternatives available to us.

The concurrent conference stresses management's attitude toward information systems, and many sessions should be helpful to you in developing a better understanding of your company's objectives as they relate to your department.

I look forward to seeing your reports on your visit to INFO 80.

MAIL TODAY

for reduced-price advance registration cards, Conference topics and speakers, and complete information on exhibiting companies, products and services.

The Seventh International

INFORMATION MANAGEMENT EXPOSITION & CONFERENCE

NEW YORK COLISEUM
OCTOBER 6-9 1980

info 80

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CLAPP & POLIAK, Inc.
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DTM 7/80

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Company _____ Phone _____

Address _____

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short-term bank debt) and it is no longer being weighted down by unproductive capital.

EMM still manufactures core and semiconductor memories and other magnetic and ferrite products for oems, mainly in minicomputer and microcomputer systems. Manufacturing operations are located in Taiwan and Hong Kong because the products are labor intensive. The final assembly is in California.

80 FIRST DATA RESOURCES, INC.

7301 Pacific Street
Omaha, NE 68114
(402) 399-3950

First Data Resources (FDR), a leading vendor in credit card processing, was acquired by American Express in January 1980 for $50 million—an amount equal to its 1979 revenues. FDR is to remain a wholly owned subsidiary autonomous from its parent with no comingling of its customers with the credit card plans of American Express.

First Data's customer base, with about 250 accounts, is focused in the banking and airline industries, although some clients are retailers. Services include credit card authorization, embossing, data entry, billing, and on-line balances and processing transactions.

This company has shown remarkable growth considering operations began in 1971, and 1972 revenues were only $2 million. In 1979, sales grew at 20%. During the past 18 months, the company has invested in excess of $10 million for capital equipment and for increasing and training staff. Most of the investment was directed toward its Omaha data center, where an Amdahl V/6 and multiple IBM Series 1 minicomputers were installed in 1979. There is another computer center in Atlanta and two other centers where data entry and customer services are handled. These expenditures have resulted in doubling capacity in terms of the number of customer accounts that can be handled and the number of ticket transactions (data entry).

81 COMMERCE CLEARING HOUSE, INC.

4025 W. Peterson Avenue
Chicago, IL 60646
(312) 583-8500

Dp revenues, primarily through the wholly owned CCH Computax subsidiary, increased 28% to $49.3 million in 1979. Computax provides computer processing services for professional income tax preparers, mainly accountants and lawyers. The entire range of income taxes are handled, including personal, partnerships, corporations, and fiduciary returns.

Revenues increased for several reasons, among them increased volume, additional computerized services, and price increases to meet inflation. The Multi Tax Division of United Computing Systems, acquired in late 1979, will provide further growth in 1980. In addition, this acquisition will help to stabilize cash flow for the division since it specializes in tax planning, which is a full year business.

Computax management feels it has significant growth potential because the market for dp services in tax preparation and planning has barely been penetrated; in addition, there are more preparation and planning applications that customers want automated.

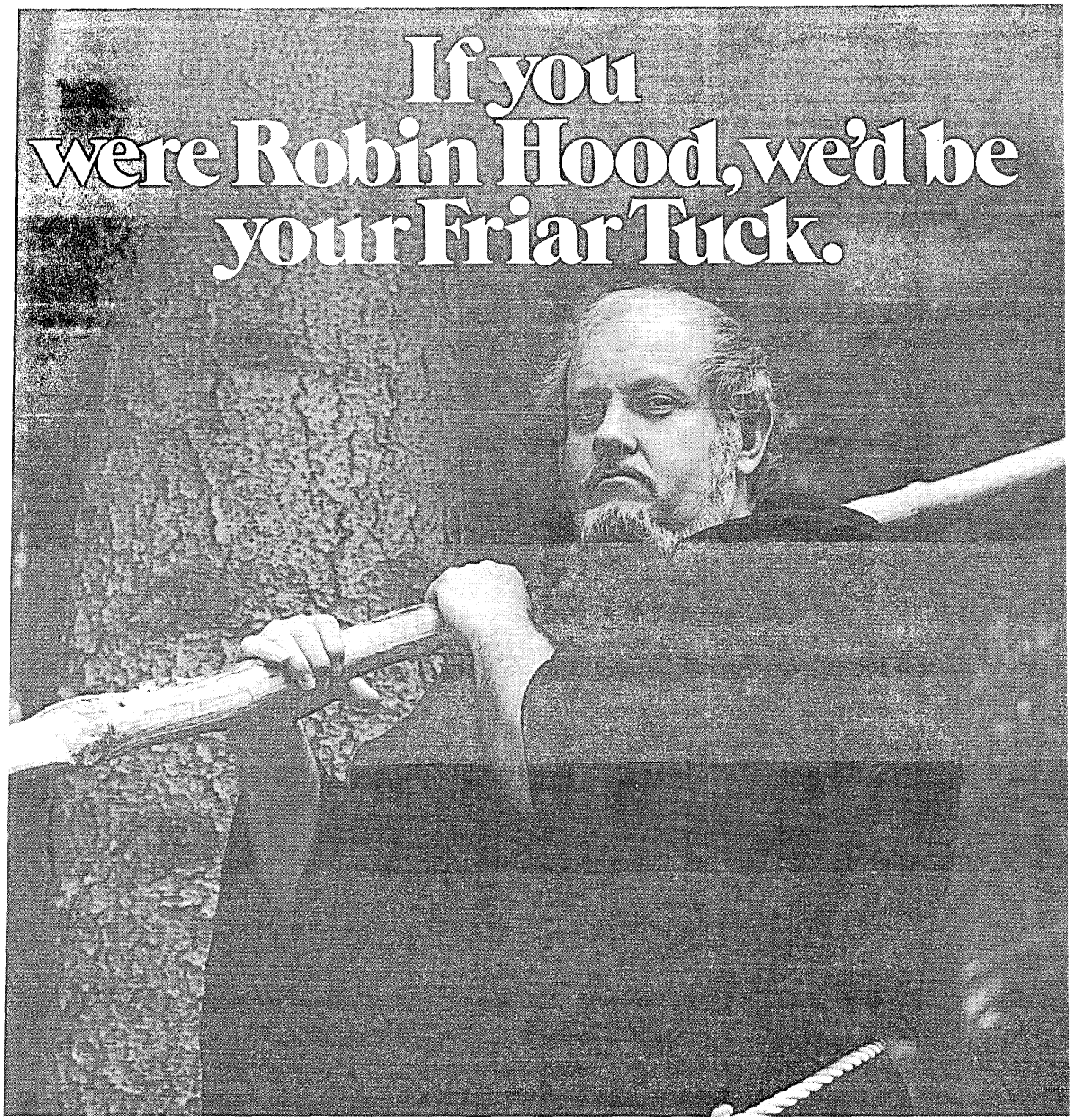
There are several scattered competitors but most are not as well capitalized. CCH, with 1979 sales in excess of $200 million, will be able to support Computax with additional capital for either internal development programs or further acquisitions.

82 AMERICAN MANAGEMENT SYSTEMS, INC.

1515 Wilson Boulevard
Arlington, VA 22209
(703) 841-6000

American Management Systems (AMS), a software and services firm, has three business segments: computer systems (48% of sales), computer services (37% of sales), and consulting (15% of sales). Government clients account for 56% of 1979 revenues, with state and local government agencies the leading sector at 33%.

AMS, which was organized in 1970, has compiled a strong growth record since 1975, as sales grew from $7.2 million that year to



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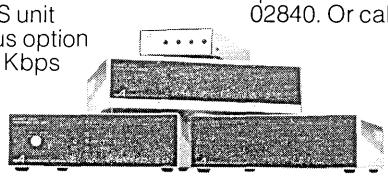

AVANTI

Avanti Communications Corp., Aquidneck Industrial Park
Newport, RI 02840, Tel: (401) 849-4660, TWX: (710) 387-6543

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$48.1 million in 1979, an annual growth rate in excess of 60%.

The computer systems group designs and implements large customized application systems. After years of performing a strictly custom business, AMS is beginning to develop standard application packages in its areas of expertise—government, financial, and distribution systems. A commitment in research and development expenditures, up 80% to $3.8 million in 1979, has been made to develop these packaged programs, designed to operate on Digital Equipment and IBM computers. The first package, Local Government Financial System, was announced in May 1978, and in 1979 a group of packages entitled Commercial Financial Systems became available. Clients can select any subset of these financial modules.

AMS's time-sharing services facilities were expanded in 1979 with the addition of an IBM 3033 and computer systems from Digital Equipment. AMS went public in April 1979 and raised $2.3 million by issuing 150,000 shares of stock.

83 QUOTRON SYSTEMS, INC.

5454 Beethoven Street
Los Angeles, CA 90066
(213) 398-2761

Quotron Systems, which provides financial information systems and services for the brokerage industry, increased earnings 56% on a 20% increase in revenues. Revenues have grown to $47.4 million in 1979 from $16.2 million in 1975. Management expects this growth trend to continue and is projecting a 20% increase in revenues in 1980. Pretax earnings are projected to grow at 50%; however, since investment credits are used up, after-tax earnings are projected to increase by under 20%.

Quotron has developed a leading market position in the financial information service (FIS) industry. Market share has increased to almost 45% in 1979 from under 10% in 1970. The lease base, accounting for 90% of revenues, grew to 24,000 terminals. Merrill Lynch, with over 7,000 terminals on lease, is Quotron's leading customer. In 1979, new contracts were signed with three firms—Drexel, Burnham, Lambert; Bear Stearns; and Clayton Brokerage. Bunker Ramo and GTE are Quotron's leading competitors.

Additional services are the key to continued growth as further market penetration is becoming increasingly more difficult. In 1979, Quotron offered a new stock and commodity options service, and a monitoring service whereby brokers could register their favorite stocks and monitor them as a group on a crt. One service planned in 1980 is a news retrieval system that will index and save all news items about a company occurring within 90 days.

Quotron wants to diversify and is researching the insurance industry as a potential new market.

84 MSI DATA CORPORATION

340 Fischer Avenue
Costa Mesa, CA 92626
(714) 549-6000

MSI Data Corporation, the leading supplier of handheld portable data entry terminals, posted revenues of $46.6 million in 1979, an increase of 17%. In September, 13 years after its first shipment, MSI installed its 100,000th terminal. Half of these shipments have been solid-state terminals introduced within the past three years. Today, most of its 70% in hard product revenues (30% of revenues are generated by field service) come from the MSI/77 and MSI/88 solid-state portable terminals. Sales are primarily to distributors with food (57%) and drug (22%) outlets. The mass merchandise and discount store markets are major targets for the future.

In many ways, 1979 was a very active year for MSI. In May, MSI acquired Chase Computer, which sells point-of-sale systems with OCR scanners to specialty retail chains and service bureaus.

New product introductions included two new data transmission devices and a new terminal designed to monitor and measure customer attitudes in consumer-oriented businesses, such as hotels/motels, restaurants, banking, airlines, and groceries. A new marketing program, Omega Generation, has been

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CIRCLE 107 ON READER CARD

ADAPSO SOFTWARE INDUSTRY ASSOCIATION

started to upgrade, via software packages, single application terminals to multiapplication, two-way communication terminals.

85 MANUFACTURING DATA SYSTEMS, INC.

4251 Plymouth Road
P.O. Box 986
Ann Arbor, MI 48106
(313) 995-6000

Manufacturing Data Systems (MDSI) is a computer service company for manufacturing environments. They have developed on-line software and turnkey systems to program numerically controlled (N/C) machine tools and to code parts numbers for manufactured products.

The software system used for the programming of N/C machine tools, Compact II, is offered on a time-sharing basis from MDSI centers or as a turnkey minicomputer-based system. Time-sharing revenues were 62% of total corporate revenues in 1979, down from 70% in the prior year because of a higher relative revenue growth in other product areas. Revenues from sales of minicomputer-based systems increased to 25% of total revenues.

Last year, MDSI's 43% increase in revenues to $45 million outstripped the 10% to 15% growth of its markets. Its customer base grew 24% to 3,100, and the number of N/C machine tools under contract (for programming) increased by 30% to 14,300. MDSI claims a 25% share of its markets.

MDSI management is confident of continued growth because it has been both active and prudent in its selection of development projects. A new generation of Compact II is being developed that will permit software development in PASCAL, which is an efficient high-level computer language and will make Compact II computer-independent. The other thrust is in the CAD/CAM markets. MDSI has been developing three-dimensional interactive graphic systems for computer-assisted design of mechanical products. Product announcements are expected in 1980.

86 VERBATIM CORPORATION

323 Soquel Way
Sunnyvale, CA 94086
(408) 245-4400

Verbatim, the leading manufacturer of flexible disk products (floppy disks), reported sales of $45 million in 1979, 63% more than the prior year. However, earnings took a beating, dropping 10% to $2 million. Severe production problems plagued Verbatim last year. First the firm, by expanding its plant too quickly, caused production scheduling problems and, in turn, high overtime and shipping expenses. Then in the fourth quarter, defective material, not discovered until after production runs, forced Verbatim to scrap finished products.

The rapid growth of Verbatim's markets gives it an opportunity to recoup in 1980. Of Verbatim's revenues, 70% are from floppy disk media (both single and double density) and 30% from data cassettes and cartridges and mag cards. The floppy market is growing at 40% per year overall, but the double density market is enjoying even higher growth rates. Verbatim is estimated to have 40% of the market for flexible media and 50% for data cassettes. The firm plans to enter another high growth market, rigid disks, this year.

Verbatim markets its products to both oem firms and distributors. The largest oem account, Burroughs Corporation, accounted for about 12% of sales. The competition is fierce in these disk media markets; 11 firms, led by IBM, compete in the floppy market. 3M dominates the market for data cartridges.

Manufacturing capacity doubled in 1979 to 300,000 sq. ft. A 40,000 sq. ft. plant was opened in Ireland in April 1979, and an 110,000 sq. ft. facility opened in Sunnyvale, Calif. Since capacity requirements have been met, new capital expenditures in 1980 will be for automated test and production equipment.

Another key event in 1979 was the first public stock offering, which raised $5.3 million in February.

87 CRAY RESEARCH, INC.

1440 Northland Drive
Mendota Heights, MN 55120
(612) 452-6650

Cray Research, founded by Seymour Cray in 1972, is a leading designer of large-scale scientific computers. Revenues and earnings have grown dramatically since the delivery of the first Cray-1 computer system in 1976. In 1979, revenues were up 149% to $42.7 million, and profits were up 200% to $7.8 million.

The original product line, the Cray-1, consists of three models ranging in price, without peripherals, from $4.8 million to $8 million. A new series was announced in 1979, the Cray-1S series, which will allow for field upgrading from earlier models. Configurations range from the 256K word model S/250 to the S/440, which has 4 million words of main memory and ranges in price from $4.8 million to $15 million. Future product development objectives include introduction within the next few years of a Cray-2 with a performance improvement four to six times that of the Cray-1.

Plant and equipment expenditures rose to $6.9 million in 1979, up from $2.2 million the prior year. Not only was production space expanded, but an in-house printed circuit board production facility was established at the Chippewa Falls, Wisc., plant site in 1979. Current production rate is at eight to 10 Cray-1 computer systems per year, with capacity expected to increase by one or two systems per year.

The company spent $6 million on research and development in 1979 (management has allocated 15% of revenues as a target expenditure), up 160% from 1978. This extraordinarily high R&D rate is directed toward Cray-2 and toward hardware and software development for the Cray-1 and Cray-1S to adapt the systems to commercial use. Cray Laboratories was established in 1979 as a wholly owned research and development subsidiary to ensure integrity with respect to technological innovation.

88 INTERACTIVE DATA CORPORATION

486 Totten Pond Road
Waltham, MA 02154
(617) 890-1234

Interactive Data Corporation (IDC), a wholly owned subsidiary of Chase Manhattan Bank, is a firm whose on-line dp services are primarily based on use of its massive financial and economic data bases. These services include econometric forecasting, financial modeling and simulation, and informational inquiries. Both domestic and international data bases are on-line.

By any measure, IDC had a very good year. Sales were up 50% to $42 million in 1979. This increase is attributed to the addition of more customers, higher usage by existing customers, and additional time-sharing services. To handle the higher data processing volumes, IDC added an Amdahl 470/V7 processor last summer. An IBM 370/168 is also on-line.

New products and services were introduced at a rapid pace in 1979. In the Dynamics Division, new products included a corporate planning model, a new financial and simulation model, and an automated Box-Jenkins forecasting model (named AUTOBJ). A new division, Cash Management Products Division, was started in 1979 to automate cash management functions for the user. A major new product, Bondspec, tracks statistics of international bond markets.

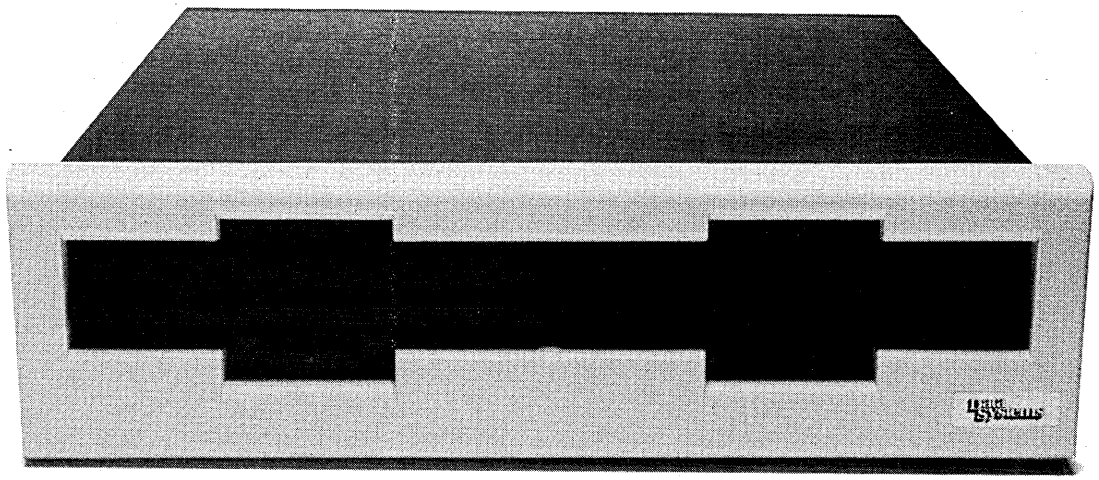
Marketing coverage was expanded considerably in 1979. Domestic marketing was expanded when Chase Econometrics, another wholly owned subsidiary of Chase Manhattan Bank, merged marketing forces with IDC. In Europe, offices were added in Frankfurt, Milan, London, and Brussels.

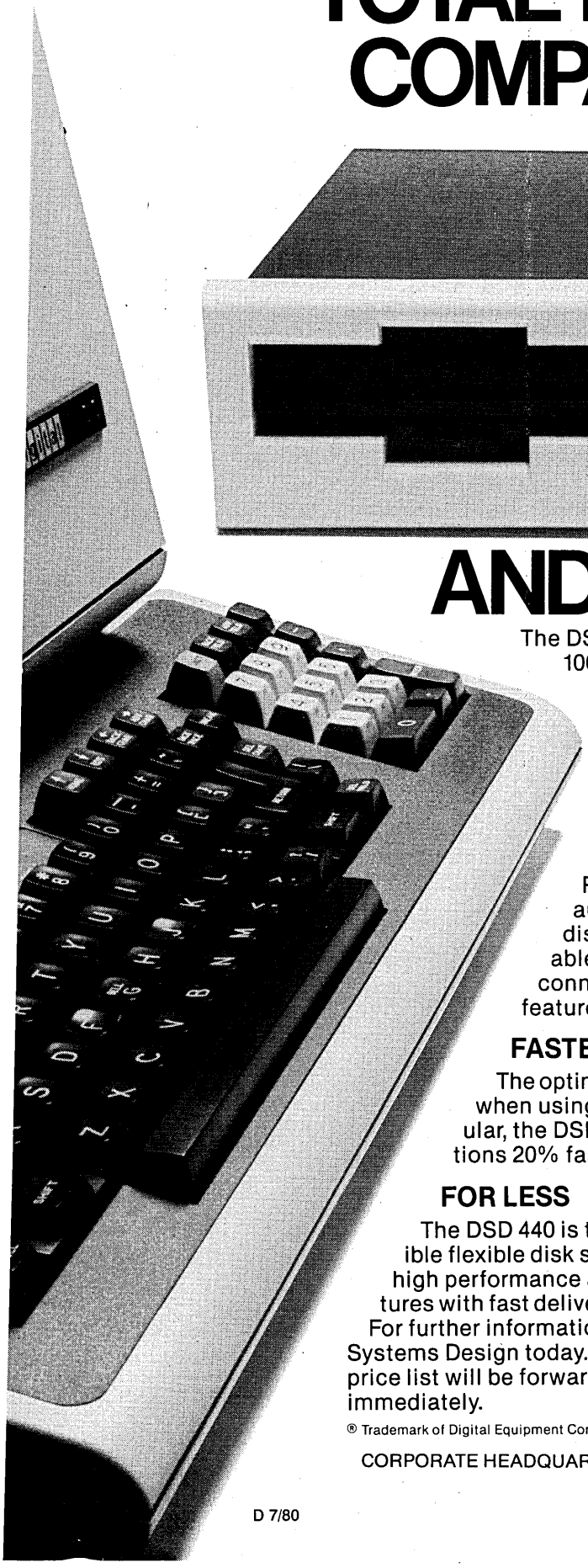
89 DECISION DATA COMPUTER CORPORATION

100 Witmer Road
Horsham, PA 19044
(215) 674-3300

Decision Data, a supplier of card handling equipment and printers, had a 74% earnings decline on a 1% sales increase. Management blamed the decline on losses from foreign operations, increased field expenditures fueled by inflation, delay in new product introductions resulting in a low margin product mix, and a nonrecurring profit realized from a sale of $7.7 million of Decision Data's

THE DSD 440. TOTAL DEC® RX02 COMPATIBILITY,





AND MORE.

The DSD 440 is the only alternative to the DEC RX02 that's 100% software, hardware and media compatible with LSI-11, PDP®-11 and PDP-8 computers, including those with extended memory. It can be configured as an RX02 for DEC double density or IBM 3740 single density recording, or as an RX01 for backward operating system compatibility.

MORE

A 512-byte hardware bootstrap is built into all PDP-11 and LSI-11 interfaces. It loads system software automatically from either single or double density diskettes. Extensive self-testing is DIP-switch selectable with the "Hyperdiagnostics" that run without being connected to a computer. The low profile 5¼-inch DSD 440 features write protection and diskette formatting.

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Data Systems Design, Inc.
51 Morgan Drive, Norwood, MA 02026
Tel: (617) 769-7620 TWX: 710-336-0120

WESTERN REGION SALES
Data Systems Design, Inc.
2560 Mission College Blvd., Suite 108
Santa Clara, CA 95051 Tel: (408) 727-3163

CORPORATE HEADQUARTERS: Data Systems Design, 3130 Coronado Drive, Santa Clara, CA 95051
Tel: (408) 727-9353 TWX: 910-338-0249

D 7/80

CIRCLE 110 ON READER CARD

lease base to a third-party leasing company in the third quarter of 1978.

Most of Decision Data's revenues, 69% in 1979, are generated by 80- and 96-column card handling equipment. Line printers, manufactured by Dataproducts, accounted for 27% of 1979 revenues. The printer business, with sales increasing by over 50% in 1979, was the one bright spot for Decision Data. Two plug-compatible models, a serial printer for the IBM 3270 display systems and a 750 lpm printer for the IBM system 34, were introduced in 1979.

The principal customers for Decision Data's products are end users, oems, and third-party leasing companies. Leased revenues, at 47%, were provided mostly by end users. Burroughs was Decision Data's largest customer at $1.1 million, down from $1.7 million in 1978.

Management changes took place during first quarter 1980 as Richard J. Schineller, former executive vice president of management assistance, was named president and chief executive officer, and Howard Bernard was appointed executive vice president and chief financial officer.

90 NASHUA CORPORATION

44 Franklin Street
Nashua, NH 03061
(603) 880-2323

Nashua Corporation, through its Computer Products Division, manufactures data modules, disk packs, disk cartridges, and single disks—sold variously to end users, oems, and distributors and dealers.

Nashua tightened its belt in 1978 to return the Computer Products Division to profitability after three years of pretax operating losses. Then, in 1979, constrained in production capacity, the firm jumped capital expenditures 300% to $2 million to expand capacity by 25%, adding approximately 140,000 sq. ft. With the increased capacity and the market demand for disk media growing, sales reached $39.5 million in 1979, a 56% increase over 1978. Head count was also increased substantially, reaching 450 worldwide employees, up more than 40%.

Nashua offers a full line of disk media products. The higher quality media, single plates, which are used in the most powerful disk drives, are marketed directly to the oems. (There is no distributor/end-user market for this type of media because it is nonremovable within the disk drive.) The lower quality media—data cartridges, disk packs, and data modules—are marketed primarily to distributors, dealers, and in some cases, end users.

Internationally, Nashua markets disk media through subsidiaries in the United Kingdom, Canada, Australia, Mexico, and Brazil. Approximately one-third of sales are generated outside the United States.

Management feels that prospects for 1980 remain good with industry demand and order backlog increasing.

91 DYSAN CORPORATION

5440 Patrick Henry Drive
Santa Clara, CA 95050
(408) 988-3472

Dysan Corporation, a leading disk media manufacturer, concentrates on marketing to the disk drive oems. Products include disk packs, flexible disks, and single-plate hard disks. Even though earnings declined 12%, 1979 was a very important and successful year for Dysan. Revenues, fueled by a supply-constrained market, grew 118%, but the real accomplishment was in expansion and investment for the future. Plant and equipment expenditures grew to $10.7 million from $6.9 million, and employment grew 141% to 1,146 in 1979. These high growth rates translate into increased plant capacity now and further sales growth for the years to come.

Dysan also was active in outside investment, buying a 75% interest in Dastek Corporation, a disk drive manufacturer. This investment, as well as the aggressive capital expansion program, was financed by increasing long-term debt by $7.9 million and by raising $9.3 million of equity capital by selling 791,404 shares of common stock, approximately 15% of outstanding shares. The debt/equity ratio is still a conservative 0.5.

Dysan currently sells its products only to the U.S. market and directs marketing efforts from its California location. The company is

The 12-inch diagonal screen can be swiveled and tilted to cut interference from overhead lighting. It displays a maximum of 1,920 characters in 24 lines. And there's a detachable contrast-enhancing filter.

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The prices for the display terminal start at $1,295 for the character transmission model, and $1,495 for the block model. Volume procurements are available. Prices and current schedules subject to change.

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privately held, and the principals have extensive dp experience with IBM, Memorex, and Honeywell.

92 GERBER SCIENTIFIC, INC.

83 Gerber Road
South Windsor, CT 06074
(203) 644-1551

Gerber Scientific participates in three markets involved in the automation of the engineering and design process. The largest sector, accounting for 38% of Gerber's $56 million in revenues, is Gerber Scientific Instruments. GSI manufactures computer-controlled drafting equipment, including photoplotters, general drafting pen plotters, and large area pen plotters. Gerber has focused on the high precision segment of this market and has gained a dominant position. Several new products were introduced in 1979: the 1434 laser-controlled photoplotter, which is up to 10 times more precise than available large area photoplotters; and the 4477P photoplotter, which provides cartographers with a single system for producing high precision color maps.

The next largest division, Gerber Garment Technology, manufactures computer-controlled material-cutting systems. This division has grown tremendously (250% in the past two years) since its System 91 was introduced in fiscal 1978. This cutter system, which ranges between $325,000 and $550,000, improves productivity by cutting material seven times as fast as manual cutters, reducing labor costs, and improving material yields. With the completion this fall of an 80,000 sq. ft. building for the Gerber Systems Technology Division, space is available to increase production from three to five cutter units per month. Although this division had sales of $22 million in 1979, $20 million was attributed to the mechanical cutters and was not included in the survey.

The Gerber Systems Technology Division manufactures and markets interactive graphic systems. These computer aided design/computer aided manufacturing (CAD/CAM) systems are sold on a turnkey basis with configurations ranging from $200,000 to $300,000. Gerber's market emphasis is for the design of three-dimensional mechanical parts, which is the fastest growing segment.

93 DATA TERMINAL SYSTEMS, INC.

124 Acton Street
Maynard, MA 01754
(617) 897-3221

Data Terminal Systems (DTS), a manufacturer of electronic cash registers (ECR) and point-of-sale (POS) terminals, increased corporate revenues by 54% to $96.3 million in 1979. Earnings, although up by 19% to $15.3 million, have been under margin pressure since summer because of losses in DTS's foreign subsidiaries. Dp revenues, which were defined to include only POS systems, increased to $36.3 million, up 81%.

ECR and POS terminals are sold primarily to supermarkets, fast food outlets, drug stores, discount stores, liquor stores, and other stores in retail environments. Domestically, products are marketed directly (43%) and through domestic dealers (57%). International sales are channeled exclusively through foreign distributors.

Capital spending more than doubled to over $8 million in 1979. In May, a new manufacturing and marketing facility opened in Dublin, Ireland, which will serve as headquarters for international operations. Additional new manufacturing facilities are also being constructed and are expected to be on-line by late spring. These additions will increase capacity by 60%. Concomitant with these expenditures is the costly increase in debt.

R&D expenditures have also been hefty as the company plans to announce a broad-based dp management system that will provide on-line interactive processing for order entry and processing, accounts payable, purchasing, general ledger, and material requirements planning.

Data Terminal has surely had an impressive growth record, with an uninterrupted string of increased sales and earnings since its inception in 1970. However, future growth may depend not only on management, but also on the aggressiveness of Japanese manufacturers and U.S. suppliers such as NCR.

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DIGITAL RESEARCH

94 ANACOMP, INC.

11550 North Meridan Street, Suite 600
Carmel, IN 46032
(317) 844-9666

Anacomp is one of the fastest growing computer services companies, having increased corporate revenues in the past five years to $50 million from under $8 million in 1974. Computer services revenues have increased to $35.6 million in 1979 from $8 million in 1975 (29% of 1979 revenues are in micrographic services and are not included as part of this dp survey).

This growth can be attributed to an aggressive acquisition strategy. Since June 1978, Anacomp has made seven acquisitions in the dp services business, with aggregate annual sales in excess of $17 million. These purchases were financed by operating earnings and by stock dilution, including a December 1979 offering which netted $12 million. Anacomp primarily services banks, credit unions, and government agencies. Its proprietary software system for commercial banks and thrift institutions is CI/RF (customers integrated reference file), which integrates a customer's banking activities, such as checking, savings, and loans, into a single customer record. This system, which currently utilizes a computer language designed for NCR computers, is being rewritten in COBOL for multivendor computer usage. Anacomp also offers time-sharing and batch services at six regional data centers located in Indiana, Michigan, Ohio, Arizona, and Colorado. They process 3.2 million accounts for more than 250 credit unions. In addition, Anacomp provides time-sharing services to government agencies for use in tax collection, property tax appraisals, voter registration, and law enforcement.

Anacomp also offers on-site facilities management services. It oversees the entire computer operation for clients, including acquisition, maintenance, and operation of hardware as well as operator training, programming, and systems analysis. Indiana's Department of Revenue and Bureau of Motor Vehicles are among the larger facilities management contracts.

Anacomp expects to be able to maintain the 1979 industry average growth rate from internal operations, and to exceed that rate through further acquisition.

95 OPTIMUM SYSTEMS INC.

2801 Northwestern Parkway
Santa Clara, CA 95051
(408) 987-4444

Optimum Systems Incorporated (OSI), which enjoyed a good growth in 1979 as sales moved up 20% to $35.5 million, is primarily a remote computer services vendor. Services are provided to government, commercial banks, equipment dealers, manufacturing firms, and health care organizations. The company markets its services through the East Coast Division, which handles dp contracts with the federal government; the Health Care Division, the Computer Services Division; Banking Systems, Inc. (BSI), a wholly owned subsidiary that offers on-line software systems for financial institutions; and E.B.S. Data Processing, Inc., a 90%-owned subsidiary that offers batch services and markets equipment dealer and in-store pharmacy systems.

OSI has data centers in Santa Clara, Calif. and Rockville, Md., with configurations consisting of two IBM 3033s and two 370 models, a 165 and 158. In addition, an IBM 4300 computer is expected to be added in 1980.

The Computer Services Division offers an on-line generalized municipal information system (GEMUNIS). In 1979, GEMUNIS became available as a turnkey system based on a Hewlett-Packard 3000 minicomputer.

The Health Care Division concentrates on claims processing for parts of Blue Cross/Blue Shield and for other insurance companies. Other services include medical and utilization review systems. This service is also offered as a turnkey system for $25,000, and is marketed jointly with E.B.S. Data Processing. Applications for this PHACTS Pharmacy System include invoicing, maintaining customer profiles, and printing of prescription labels.

BSI offers on-line bank processing via Tandem computers. Services include account

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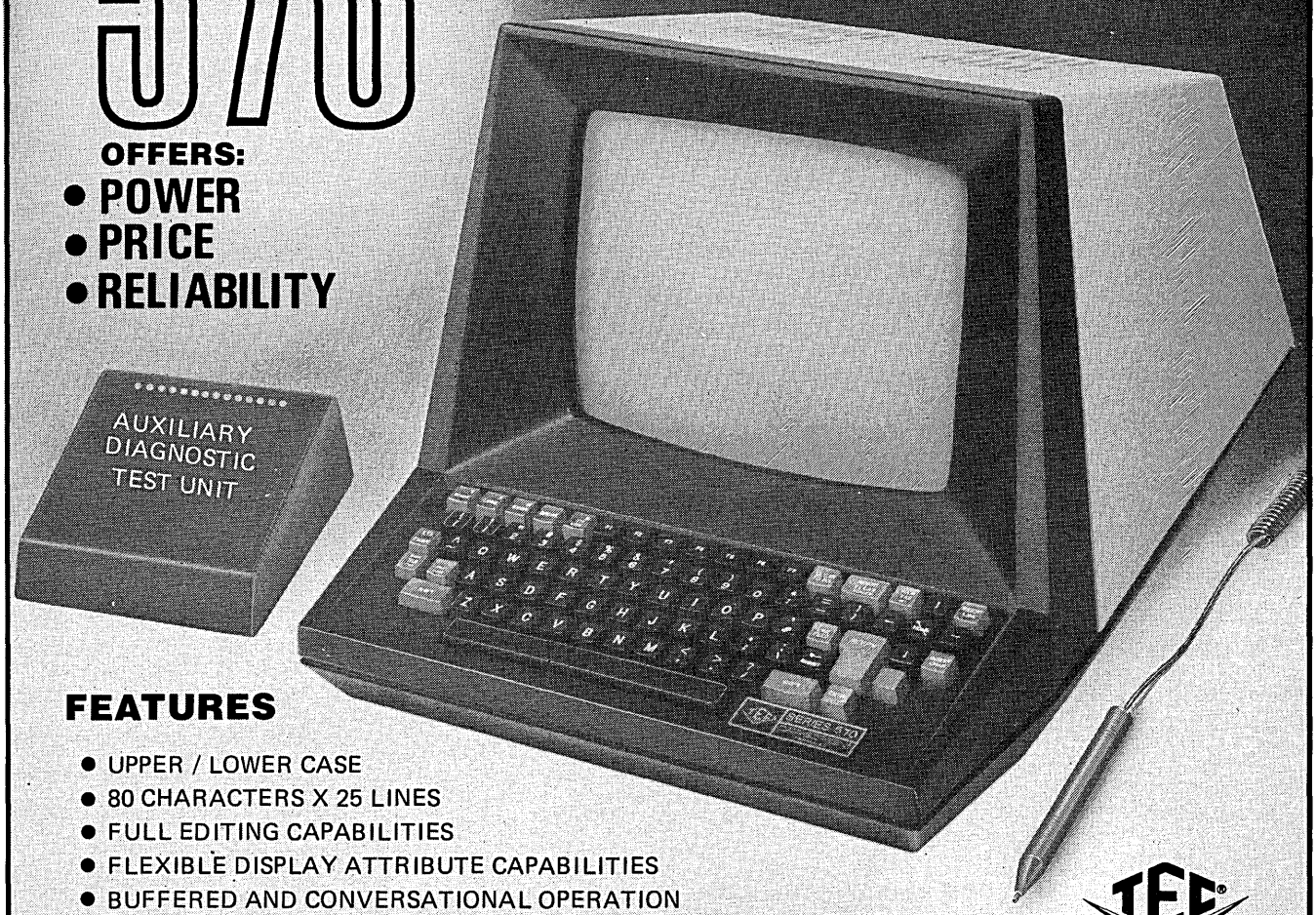

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96 OLIVETTI CORPORATION

155 White Plains Road
Tarrytown, NY 10591
(914) 631-8100

The Olivetti Corporation, the American subsidiary of the Olivetti Group which is headquartered in Ivrea, Italy, had dp revenues of $35 million in 1979.

Olivetti Corporation markets and services two basic product lines—financial terminals and small business systems. The TC 800 financial terminal system is a modular system with distributed intelligence. Modules include central units with a range of processing and computing power, printers, crts, and flexible disk drives. These terminals can be used as standalone units with direct communication to the central processor or as a master station that communicates with the central processor while controlling and interfacing satellite terminals. Olivetti's small business system, BCS 2030, is used as a turnkey system for accounting applications, including accounts receivable, accounts payable, and inventory control.

Products are sold directly in 38 district offices located in major markets. Remote markets are covered by dealers who are trained by Olivetti to service their products. The financial terminals are sold exclusively to end users in thrift institutions and insurance companies, while the turnkey accounting system is sold to wholesalers, distributors, and light manufacturers.

Productivity improvement was evidenced by its 17% increase in sales with a 41% reduction in employment to 270 dp employees.

97 GRUMMAN CORPORATION

1111 Stewart Avenue
Bethpage, NY 11714
(516) 575-6200

Grumman Data Systems (GDS), a wholly owned subsidiary of Grumman Corporation, had dp revenues from their commercial clients of $35.0 million, 17% greater than 1978. GDS, as a systems integrator, offers systems design, development, implementation, operation, and maintenance services. Emphasis has also been placed on converting batch systems to on-line data base systems. Service revenues account for 80% of its business, while its sales revenues are generated by turnkey systems.

Time-sharing services are offered for the accounting, financial, engineering, and retail disciplines. GDS has developed software packages for its Digital Equipment, Amdahl, Honeywell, and IBM computers. In 1979, processing capacity was expanded with the addition of an IBM 3033.

Many of its 1,600 system analysts, engineers, and programmers are grouped into specialized systems teams. One such team, Energy Data Systems, was formed to respond to needs of industry and the Department of Energy. This group does technical and econometric modeling, data base design, conservation data analysis, and financial data analysis. This Building Management Systems Group offers remote energy sensing, dynamic facilities management, and automated building maintenance systems.

In addition to computer services, GDS now offers hardware and software maintenance services, which emerged from an in-house operation.

98 Management Science America, Inc.

3445 Peachtree Road, NE
Atlanta, GA 30326
(404) 262-2376

Management Science America (MSA), a privately held financial applications software company, markets its proprietary programs to financial institutions, health service organizations, insurance firms, and government agencies. The company offers an integrated network of hardware-independent financial accounting, cash management, and human resource mangement systems.

Financial results in 1979 are indicative of the high growth rates that MSA has achieved

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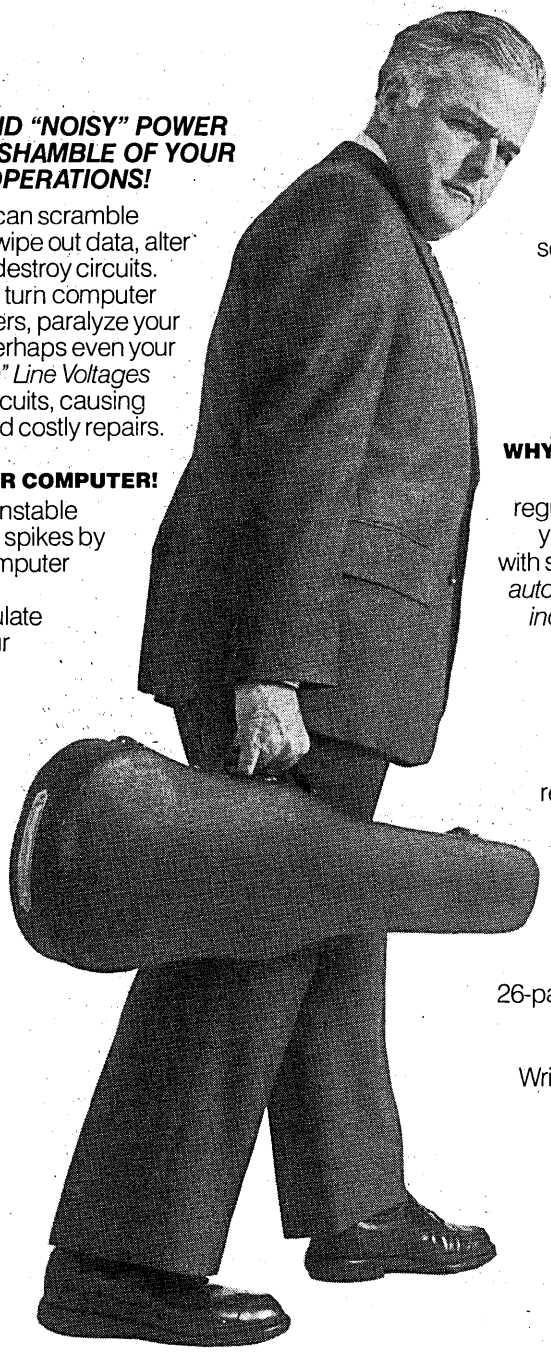

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Voltage Spikes can scramble computations, wipe out data, alter programs and destroy circuits. *Brown-outs* can turn computer runs into disasters, paralyze your equipment—perhaps even your business! *"High" Line Voltages* can burn out circuits, causing interruptions and costly repairs.

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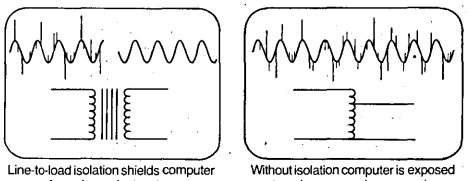
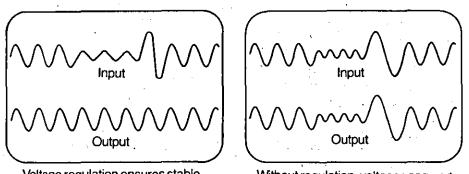


Line-to-load isolation shields computer from sharp, destructive voltage spikes.

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

WHY REGULATE?

A voltage regulator powers your computer with stable voltage *automatically* and *indefinitely* even when utility voltages droop to brown-out levels.



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

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DON'T SETTLE FOR HALF PROTECTION!

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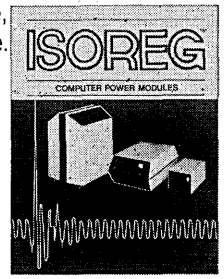

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CIRCLE 122 ON READER CARD

and expects to achieve in the years to come. Revenues, which were up 35% to $35 million in 1979, have grown consistently since 1973, when sales were $4.3 million. Profits were up 65% to $1.6 million.

MSA expects industry growth to be significant in the '80s, quoting a recent survey showing that only 5% of data processing installations are using proprietary software and asserting that this penetration should reach 95% by 1985. MSA's growth will come through maintenance of its market share, expanding international sales, offering new products, and making major enhancements to existing products. In 1979, MSA spent a whopping $8 million (23% of sales) for new products and major enhancements of existing products.

International operations, which expanded to $5.5 million from $2 million in 1978, are in Australia, Canada, and Europe; further expansion is expected in 1980. Management expects 1980 revenues to increase in excess of 30% with a pretax operating margin of 10%.

99 PRINTRONIX, INC.

17421 Derian Avenue
Irvine, CA 92713
(714) 549-8272

Printronix, Inc. continues to grow at impressive rates as 1979 revenues, at $32.8 million, were 92% higher than the prior year. The company began operations in 1974, but sales did not hit $1 million until after 1976, so this printer vendor has had an average annual growth rate of 139% for the past four years.

Printronix manufactures matrix line printers. Its first product, which still accounts for 80% to 90% of revenues, is a 300 lpm printer introduced in 1975. The product line has expanded with the introduction of a 150 lpm printer in 1978 and a 600 lpm in 1979. These matrix printers compete against band printers manufactured by Dataproducts, Data Printer, Centronics, and Control Data.

Oem sales, which account for 55% of revenues, are to Digital Equipment, Prime Computer, Microdata, and Management Assistance. The other marketing channel is through distributors and dealers who, in turn, sell to end users.

Plant and equipment expenditures increased to $2.5 million in 1979 from $700,000 in 1978. In April, a new 90,000 sq. ft. production facility came on-stream.

R&D expenses were up 64% to $2.1 million in 1979. Part of this increased effort is directed toward developing a 100 lpm to 125 lpm printer that can sell for under $2,000. This printer is being designed for small business applications and will compete against the high-end serial printer market.

With anticipated increased volumes, sales of the 600 lpm printers just beginning, and with backlog up 44%, management expects that sales over the next few years will grow at a 60% rate.

100 CINCOM SYSTEMS, INC.

2300 Montana Avenue
Cincinnati, OH 45211
(513) 662-2300

Cincom Systems, with sales of $30.9 million in 1979, claims to be the largest independent data base software house, surpassing competitors such as Cullinane, Applied Data Research, and Software AG.

Cincom initiated operations in 1969 with the introduction of Total, its first data base management product. In 1972, an on-line enhancement, Environ 1, was developed. Since then the software has gone through several iterations culminating in its Series 80 line of data base software, which includes 355 products.

In 1979, Cincom developed a directory driven data base concept for OS users called Total Information System (TIS). In addition, it entered a new market—applications programming. Initial offerings are directed toward manufacturing planning systems and financial applications. Management feels that by participating in the expanding applications software market, it has a more comprehensive base from which to grow.

Results for 1979 were clouded by a 43% earnings decrease caused in part by a shift in the lease/sales mix. However, management feels that because Cincom is a private firm, it is not obliged to optimize short-term results.

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DAT780

CIRCLE 130 ON READER CARD

HARDWARE

OFF-LINE

In the crowded,noisy environment of Lear Siegler's NCC hospitality suite, we had the opportunity to try out a dumb terminal equipped with a speech recognition device just introduced by Heuristics. After seeing a demo, we asked to try it ourselves. In an attempt to fool the machine, we trained it to recognize a four-word vocabulary: "our," "flower," "is," and "sour." Training took but a minute or so, and the only help we needed was for a Heuristics representative to supply the two-character mnemonics that put the device into training mode, and later into recognition mode. The machine successfully filtered out the noise of dozens of conversations in the suite, and recognized our nonsense sentence, "Our flower is sour." "Nice try," said one of our hosts. If you want to fool it," he continued, "try 'D' and 'B.' The difference is so slight that all systems have trouble distinguishing between the two; users generally wind up defining the two with words such as 'delta' and 'bravo.' In fact, a guy from another voice input vendor bet me $500 that we couldn't come up with an algorithm to distinguish between the two letters. He went so far as to say he'd accept a solution that didn't work in real-time."

We thought the rumor mongers lost a hot topic when Data General president Edson DeCastro and other company brass came to New York to introduce the firm's entry into the 32-bit market. But, at NCC, the rumor mill ground on, with predictions of the imminent release of a second 32-bitter. One impatient gossip asserted that the next machine would be out within a few months. Most, however, say "a few months" is overly optimistic.

TERMINAL CONTROL UNIT

The 1270 Model 8 Terminal Control Unit (TCU) is an eight-line addition to this vendor's 1270 line of TCUs. The Model 8 connects to an IBM mainframe byte multiplexor channel, and acts as a functional replacement for IBM 2701 Data Adaptor Units, 2702 and 2703 Transmission Controls, and 3704 and 3705 Communications Controllers (including the 4331 Communications Adaptor, in emulation mode). Compatible with 270X support software, the Model 8 provides automatic polling, synchronous transparency, automatic speed and protocol selection (for asynchronous lines), and support for ASCII and EBCDIC character codes. Model 8 is offered in three versions: model 81 handles eight lines (asynchronous or isochronous) at speeds to 9600bps; model 82 lets one of the eight lines operate as a wideband 56Kbps bisync line; and model 83, which can support two wideband lines. Models 82 and 83 can also function as model 81s. Options include built-in asynchronous modems, auto dialing, and code conversion. Purchase prices range from $14,500 for a Model 81 to $18,550 for the Model 83. Leases also are offered. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 301 ON READER CARD

HARDWARE SPOTLIGHT

PERSONAL COMPUTER

Over the past few years, this vendor has demonstrated that there is a good market for a sophisticated, relatively expensive personal computer like the Apple II. With the long-awaited introduction of the more potent Apple III, the company seems to be posing a related but different question: how appealing are personal computer features such as color graphics, sound generation, and other Apple niceties when the entry-level price tag hits the $4,400 mark and more direct competition can be found in the low-end product offerings of major minicomputer makers?

Marketing aside, Apple III also raises the nasty question of compatibility. PASCAL can move up to the Apple III, at both the source and P code levels, according to the company, but BASIC users will find syntax differences between the two machines. Indeed, the 2MHz 6502A-based machine can run programs developed for the 1MHz 6502-based Apple II, but in an emulation mode that reduces the Apple III to the performance level of an Apple II. This is done by cutting the clock back to 1MHz (some Apple II programs use timing loops) and reducing the Apple III's 128KB address space down to the 48KB maximum for user memory in the earlier machine. And, once the new machine enters emulation mode, the only way to get back to Apple III mode is through rebooting the system.

Apple III is physically larger than its predecessor, and it includes 96KB of RAM (expandable to 128KB), a built-in 5¼-inch floppy drive with a controller capable of supporting three additional drives, two printer interfaces (one RS232 and one for the vendor's Silentype thermal printer), and an integral clock and calendar with battery backup. Eighty-column output is now supported, but users now are required to use video monitors instead of their household television. The operating environment is provided by a new operating system, dubbed the Sophisticated Operating System, or SOS for short. Apple III software offerings include business BASIC, word processing (including a training course), Visicalc III (a new version of the Visicalc II spreadsheet package), and a mailing list manager. Of course, users can resort to Apple II emulation to take advantage of the variety of existing software on the market.

Apple III is initially offered in two configurations, both including 96KB of RAM, and a 12-inch monochrome video monitor. The Information Analyst configuration includes Visicalc III, business BASIC, and the mailing list manager; this configuration has a base price of $4,400. The word processing configuration includes a second minifloppy drive, word processing software, and a choice of thermal or letter-quality printers; with a Silentype printer, the system prices out to $5,400. A word processing Apple III with letter-quality printer goes for $7,800. APPLE COMPUTER, INC., Cupertino, Calif.

FOR DATA CIRCLE 300 ON READER CARD

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SOFTWARE AND SERVICES

UPDATES

Personal computer retailers are talking about a move by Apple Computer to up the dealers' cost by $100 per machine. The idea seems to be another example of Apple's savvy in consumer marketing: the dealer gets his $100 back after the customer mails Apple a signed statement that the dealer has set up the machine for the customer. "This ought to fix that cut-rate shop that opened in my neighborhood," said one dealer. "They sell the machine for less than I can, but when a customer comes back with a question, they send him to my store. And, if I ship a system to someone across the country, he can call a local Apple retailer and request setup; that retailer can get the rebate for his work."

Systems Applications, Inc. (950 Northgate Drive, San Rafael, CA 94903) "found that an otherwise superb File Management System in the Prime operating system (PRIMOS) is unnecessarily compute bound when exercised by standard FORTRAN or by direct entrance calls to PRIMOS." So the firm's programmers came up with a buffering scheme managed by the user program. Replacing FORTRAN READ and WRITE statements with calls to the homegrown I/O routines shaved 8,000 seconds from a large numerical simulation taking 29,900 cpu seconds. Director of computing Mitch Modeski and software specialist Jody Ames have written a paper, "Accelerating FORTRAN Binary I/O on Prime Computers," that is being distributed to a number of Prime users. Its second page states that "reproduction of this document is encouraged."

WORD PROCESSING

Another minicomputer vendor has joined the ranks of those increasing the utility of their small business systems with the addition of word processing software. Operating on the vendor's DS990 systems (models 4 through 30), TIPE-990 software provides a multiterminal environment for word processing while still allowing concurrent data processing. The menu-driven software supports form-letter generation; horizontal scrolling allows preparation of documents as wide as 132 characters. Data processing files can be preprocessed into TIPE-990 format for insertion into form letters and documents. Optional DS990 communications capabilities allow documents created with TIPE-990 to be sent to other computer systems. TIPE-990 licenses for $3,500 to $4,300, depending on distribution media. A self-instruction guide and a set of key labels for use on the vendor's model 911 crt terminals are included. For printing draft copies of documents, the user can route output to an Omni 800 Model 810 printer; letter-quality printing is possible with the concurrently announced LQ45 daisywheel printer. The LQ45 prints up to 132 columns at 45cps and sells for $5,950 (a pinfeed forms tractor is an additional $280). TEXAS INSTRUMENTS INC., Houston, Texas.

FOR DATA CIRCLE 327 ON READER CARD

VSAM UTILITY

Listcat Plus prints an analysis of VSAM catalogs. The program, which sells for $99, prints a report in data set name sequence along with information on allocated space, CI/CA splits, percentage full, unused tracks, total records, and free space. Data sets that are nearly full, or have too many splits, or are over allocated are flagged; the user specifies the limits for flagging. For each volume, a summary listing shows space utilization. The vendor says that Listcat Plus provides a paper savings ratio of 30:1 over the IDCAMS utility. Listcat Plus is distributed as COBOL source code. MAC KINNEY SYSTEMS, Springfield, Mo.

FOR DATA CIRCLE 331 ON READER CARD

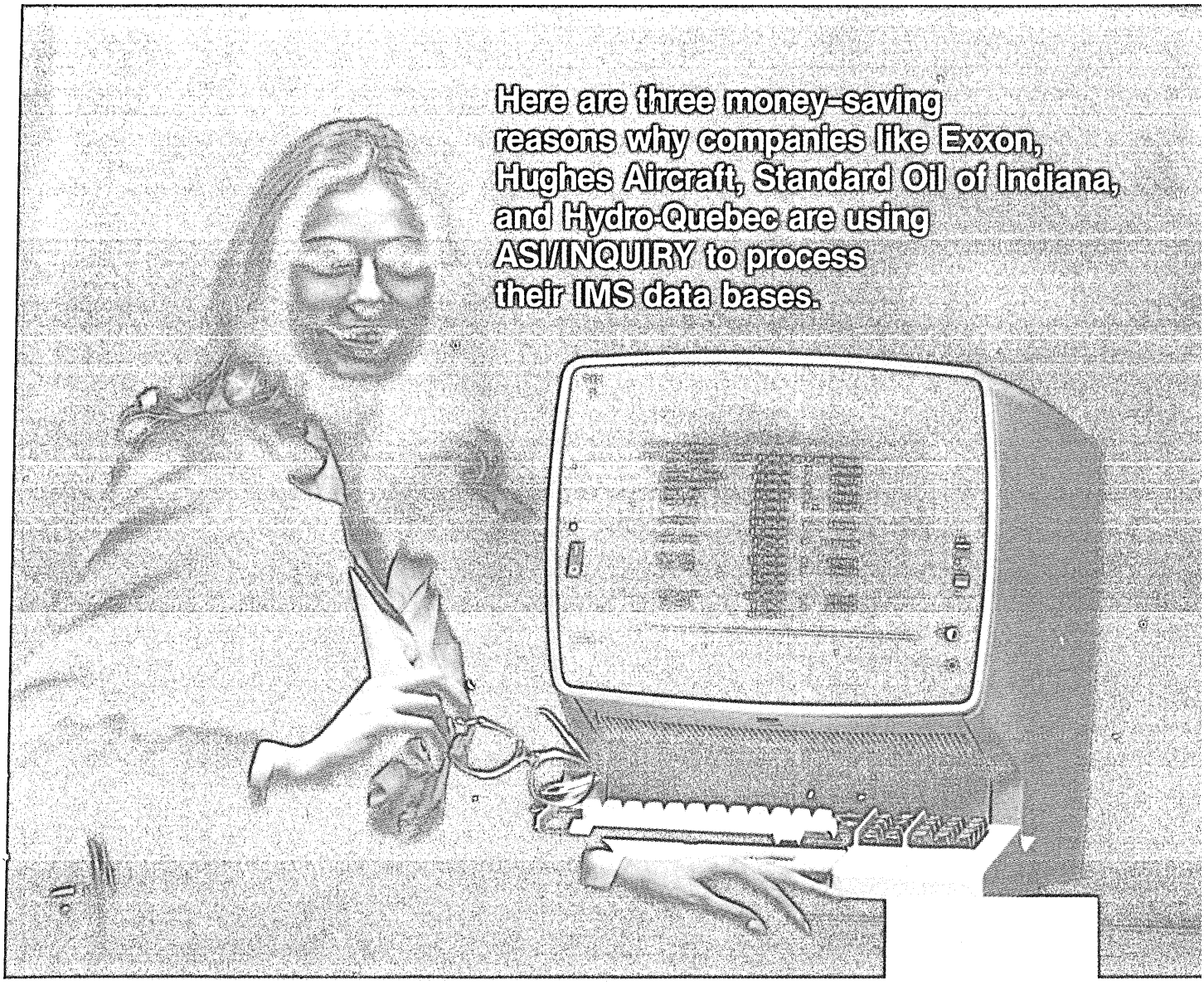
SOFTWARE SPOTLIGHT

DISTRIBUTED DATA MANAGEMENT

Encompass, this vendor's data management system for its NonStop systems, supports geographically distributed data bases, and provides the applications programmer with transaction processing and distributed data base control. Addressing the thorny problem of protecting data integrity in a distributed environment, the package provides extensive transaction back-out capabilities that protect the data in the event of a failure at a local or more remote site. Built upon the vendor's previous data base and transaction processing packages, and using the Guardian/Expand networking software, Encompass is said to simplify the coding of sophisticated distributed transaction processing applications to the level of developing a batch system.

A system-level utility, the Transaction Monitoring Facility (TMF), helps maintain data base consistency during concurrent transaction processing, regardless of whether the data base resides at a single node or at multiple nodes in a network. TMF is said to ensure data integrity in the event of problems ranging from a program failure, single component failure, or total loss of communications between nodes. Audit trails, record locking, and a two-phase commit method allow the TMF to protect data. Applications initiate data base transactions with a BEGIN TRANSACTION statement, followed by the data base transaction codes, and concluded with an END TRANSACTION statement. A failure detected before execution of the END TRANSACTION causes the entire transaction to be backed out. The Encompass Distributed Data Management System software licenses for $31,500, plus a $8,500 per processor microcode change; deliveries are slated for December. TANDEM COMPUTERS INC., Cupertino, Calif.

FOR DATA CIRCLE 325 ON READER CARD



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Built-in safeguards protect data at the system, terminal, and data base levels. Data base administrators define the data bases users can access, their passwords, and the terminals from which individual data bases can be accessed.

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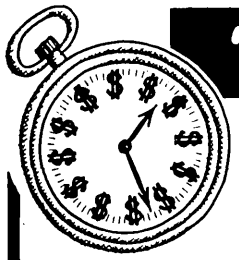

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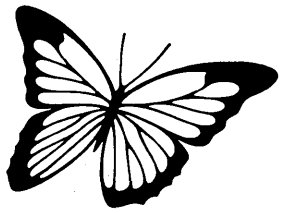

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JOB MARKETPLACE

DATA SWITCHING INSTRUCTOR

It Takes A Strong Dedication To Meet A Pressing Challenge.

At NEC America, Inc., the dedication is to meeting the world's telecommunications challenges. We do it with our "C&C" Philosophy, a combination of Computer and Communications technology, and we do it with dynamic professionals willing to accept these demanding challenges.

As Data Switching Instructor, you'll work on a NEDIX 510F Packet Switching System, providing technical assistance to customers. You'll train for this position in Tokyo, Japan and then return to Dallas, Texas to assume your duties.

Three to five years of data consulting or switching operation experience and, preferably, an EE Degree are required. At NEC America, you'll find an excellent salary and many superb benefits waiting for you. For further information, send resume in confidence to: Terry C. Boles, Personnel Manager, NEC AMERICA, INC., TELECO DIVISION, 1499 Regal Row, Dallas, TX 75247.

NEC

An Equal Opportunity Employer M/F

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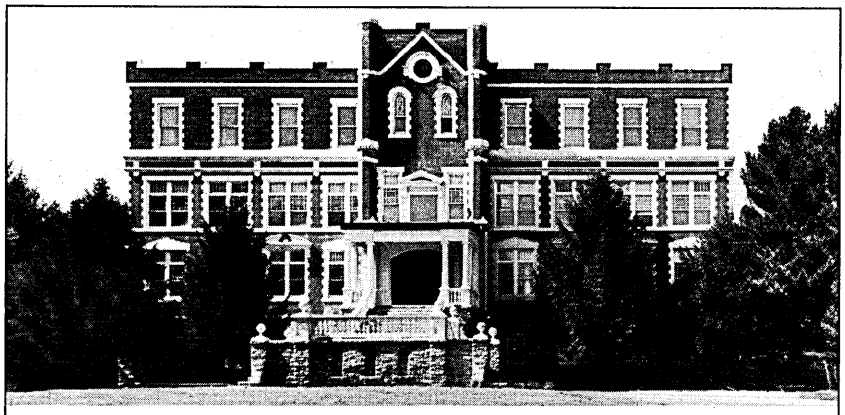
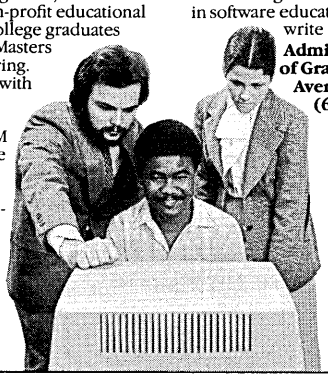


Master of Software Engineering at the Wang Institute.

The Wang Institute in Tyngsboro, Massachusetts, is an independent, non-profit educational organization which offers college graduates a unique opportunity for a Masters degree in software engineering.

The Institute is equipped with VAX 11/780, Prime 750, and Wang VS computers on site, with remote access to an IBM 3033. Every student will have his or her own terminal in a laboratory office.

Every member of the Institute faculty has background in both academia and industry. And our high faculty/student ratio ensures strong personal interaction within the learning environment.



The Wang Institute. We're mastering new ideas in software education. For additional information, write to or call:

Admissions Office, Wang Institute of Graduate Studies, One Industrial Avenue, Lowell, MA 01851, (617) 459-5000, ext. 4009.

Semester Timetable
Fall: September-December
Spring: January-April
Summer: May-August

The Wang Institute does not discriminate on the basis of sex, race, color, national origin, handicap or religion.

CIRCLE 128 ON READER CARD

EDP SPECIALISTS
career search opportunities
$18,000-$55,000+

DIRECTOR R&D, SOFTWARE/HARDWARE to $55,000+. Attractively located Mid-Atl corp, most advanced & largest in growing field, seeks exec for KEY Tech Group of 35+ pros dvlp'ng on-line mini-based systems w/multiple custom I/O's. Req's achievements managing software/hardware systems product dvlpmt. Refer HG.
MANAGER – MIS to $42,000. Growing Central NJ mfr seeks take-charge mgr to revamp D.P. dept. Present hardware is 360/OS-Tso & a 34 CPU. Deg +, 5-10 yrs mgmt exp in a mfg environment req'd. Refer JD.
DIRECTOR – MIS to $40,000. Growing NJ co seeks top-notch leader for its #1 D.P. spot. Bkgd in RPG-type systems req'd. Intelligent terminal bkgd also desirable. Refer JD.
SYSTEMS MGR. to $35,000. Small IBM DOS shop seeks individual to groom for higher levels. Diversified responsibilities in this medium-sized Central NJ consumer products co. Refer JD.
SYSTEMS ANALYST QUALITY ASSURANCE, $30,000. State-of-the-art Central NJ co seeks applications or technical exp w/quantitative bkgd & education. Break into this exciting leading-edge field. Refer JD.
MGMT. SOFTWARE DVLPMT. to $30,000. "Fortune 500" systems control div seeks supervisory candidate to direct dvlpmt of distributed computer systems. Real-time process control environment. Ideal metro location. High visibility position. Refer AT.
ANALYST to $30,000. We currently have numerous oppty's for Analyst & Programmers at most levels of exp. Financial & Mfg Systems preferred. All costs paid by client companies. Refer JS.
PROGRAMMER/ANALYST to $26,000. Diversify & grow in this Central NJ DOS shop. Will train in CICS. Refer JD.

CONTACT OUR NEAREST OFFICE ABOUT THESE AND OTHER FEE-PAID OPPORTUNITIES.
OUR UNIQUE, COMPANY-OWNED OFFICE SYSTEM ASSURES PERSONAL, CONFIDENTIAL SERVICE.

PHILADELPHIA, PA 19102—S. Burns, 1500 Chestnut St., 215/561-6300
ATLANTA, GA 30346—R. Spang, 47 Perimeter Center, 404/393-0933
BALTIMORE, MD 21204—R. Nelson, 409 Washington Ave., 301/296-4500
CHARLOTTE, NC 28202—J. Schwab, 1742 Southern Nat'l Ctr., 704/375-0600
CLEVELAND, OH 44131—A. Thomas, 5755 Granger Road, 216/749-6030
McLEAN, VA 22102—D. Miller, 1710 Goodridge Drive, 703/790-1335
NEW YORK, NY 10036—N. Shanahan, 1211 Ave. of the Americas, 212/840-6930
PITTSBURGH, PA 15222—B. Sayers, 4 Gateway Center, 412/232-0410
PRINCETON, NJ 08540—J. Dean, 3490 U.S. Rt. 1, 609/452-8135
WILMINGTON, DE 19810—H. Greene, 3411 Silverside Rd., 302/478-5150
HOUSTON, TX 77098—G. Smith, 3000 Richmond Ave., 713/523-5504
LOS ANGELES, CA 90017—W. McNichols, 707 Wilshire Boulevard, 213/623-3001
SAN FRANCISCO, CA 94111—W. McNichols, 601 Montgomery St., 415/392-4353

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STATE OF KUWAIT
KUWAIT UNIVERSITY COMPUTER SERVICES

We are developing a new kind of system architecture at the University of Kuwait. We are seeking experienced dedicated Computer Science professionals to join us for a successful implementation of numerous projects in hardware and software and communications.

THE EQUIPMENT

A dual processor UNIVAC 1100/62 with 2 Mega Words of memory which will support Kuwait University's Centralized data processing functions in Administration and Academic areas.

THE ENVIRONMENT

The Computer Center is newly built and located in the Center of Kuwait City.
The Kuwait University is the only institution of higher education in a country of continuous development.

THE JOBS

Various jobs in:

☐Management of Computer Center Division: (3)
☐Senior System Analysts and Project Leaders: (2)
☐Communication Experts and Operating System Analysts (UNIVAC EXEC. OP SYSTEMS) (3)
☐System Analysts and Programmer Analysts: (5)
☐Senior Programmers: (5)

THE CANDIDATE

The successful applicant will:
☐Have a thorough understanding of UNIVAC 1100 Systems,
☐Have at least 5 to 10 years of experience dependent on the category of job,
☐Be able to sign a two year minimum contract with Kuwait University.

THE SALARY

The salary will vary according to job designation and qualifications. Attractive salary and other benefits such as: free air fares, free air conditioned accommodation, one month paid holiday with air fare.

Please apply with brief resume and a photograph to:

Director of Computer Services
Kuwait University
P. O. Box 34251
Adeliyah
Kuwait

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Our national software service in Colorado Springs can provide remote diagnosis and technical consultation to our customers throughout the U.S. and Canada. It's staffed by top-caliber teams of software professionals who are aided by state-of-the-art analytic computer systems. And it's been so successful in improving customer satisfaction and maximizing system availability and productivity that we plan to increase significantly the size of our staff.

Now you can share in our dramatic growth.

We're looking for people with at least 2 years of software experience, good interpersonal skills, and a background in a time-sharing, real-time, or distributed processing environment. As a key member of our winning team, you'll be able to consult directly with our customers at the applications or systems programming level—researching, structuring, and communicating solutions to complex and varied software problems.

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We'll provide you with a fully competitive salary/benefits package and relocation assistance to Colorado Springs, an area with clean mountain air and a reasonable cost of living. You'll also experience all the growth your success deserves.

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Our lines will be open

from 8am-6pm, Monday-Friday. Dial (303) 599-4111, ext. 2470. Ask for Bo Beal, Recruiter, Software Telephone Service Center.

Or send your resume

to Bo Beal, TSC/DDC Personnel, Digital Equipment Corporation, 301 Rockrimmon Blvd. So., Colorado Springs, CO 80919.

We are an equal opportunity employer, m/f.

digital

Wang 2200 Development Group

2200 Systems Software and I/O Firmware Development

The Wang 2200 development group provides a unique opportunity to participate in and actively contribute to the overall product development of the very popular 2200 series minicomputer. One very interactive team of systems programmers and microprogrammers is responsible for the systems specification, design, and development of the system software and CPU and peripheral firmware. The net result is one of the most powerful and interactive small computers available today, (and one of the most popular, over 40,000 installed). Many opportunities are now available to participate in the development of operating systems, COBOL and BASIC languages, file management, data base management, I/O controller firmware, systems interface firmware on one of the most exciting minicomputers on the market.

Systems I/O Designer/ Programmers

We have several positions open in a group which designs and implements firmware for new I/O devices and interfaces. These interfaces will be progressively more intelligent, distributing the burden of a multiprogramming operating system, and providing more high level features than ever before on our powerful small business computer. These people will work in a small interactive group with vertical systems responsibility. Coding will be at a number of levels, including high level language, interpreter microcode, operating system microcode, microprocessor code, and hardware sequencer instructions. Responsibility will range from language definition through hardware specification. All phases of design, coding, and debugging are included; we provide a good opportunity to understand an entire product.

An entry level candidate should have a degree in either engineering, computer science, or math, with adequate course work in operating systems principles. A senior level candidate should have several years in either operating systems or in microprocessor firmware design, preferably both. Some hardware background is very helpful, but direct digital design experience is not a prerequisite.

Systems Support Programmers/ Firmware Programmers

We are looking for people who wish to become involved in a software support capacity with a minicomputer development group. Positions are available in the design and coding of systems utilities in upper level languages. Candidates should have a working knowledge of BASIC or FORTRAN. Positions are also open in the design and coding of firmware for a variety of microprocessors (8080, Z80, etc.). Some experience with coding in a low level mnemonic assembly language is necessary, and a basic familiarity with hardware would be helpful.

Candidates would be working on a variety of projects involving both upper and lower level languages. The relatively small size of the support groups affords an excellent opportunity for individual project responsibility with a successful, growing company.

Candidates should have a degree in Computer Science or one to two years relevant experience.

Language Development

Openings exist at both the entry and senior levels in the design, development, and support of microprogrammed language interpreters for Wang 2200 minicomputers. Functional enhancements are currently being made on an advanced BASIC, and development of a COBOL processor is just beginning. Emphasis is on developing a high performance interactive system for the small business and distributed processing markets.

The small group environment is emphasized providing the opportunity for a high level of individual responsibility and visibility. Interaction with all 2200 development groups is encouraged.

The candidate should have a technical degree; 1-5 years assembly or microprogramming experience; knowledge of BASIC, COBOL, and interpreter design; and an understanding of Operating Systems.

Systems Diagnostic Programmer

The successful candidate will join a small group whose responsibilities include Performance Analysis, Internal Quality Assurance, Special Testing, and Systems Diagnostics.

The candidate will have responsibility for evaluating existing and defining/coding new diagnostics in such areas as Remote, CPU and selected Peripheral diagnostics.

This opportunity exists in a small department with good communication between all functions enabling one to broaden their awareness and horizons.

The ideal candidate should have a technical degree (BSCS, BSEE), assembly and some higher level language, some experience with micro-processor based software and some prior diagnostic experience with CPU and peripheral devices (e.g. intelligent controllers, terminals, disks).

We offer excellent salary and benefits including profit sharing, stock purchase plan, stock bonus plan, medical and dental insurance and relocation benefits. Please send resume including salary history, to Tom Bahlo, Professional Recruiter, Wang Laboratories, Inc., Dept. DM7, One Industrial Avenue, Lowell, MA 01851.

We are an affirmative action employer

WANG

Making the world more productive.

CIRCLE 135 ON READER CARD

HEWLETT-PACKARD TAPE SPEED BARRIER BROKEN BY DATUM

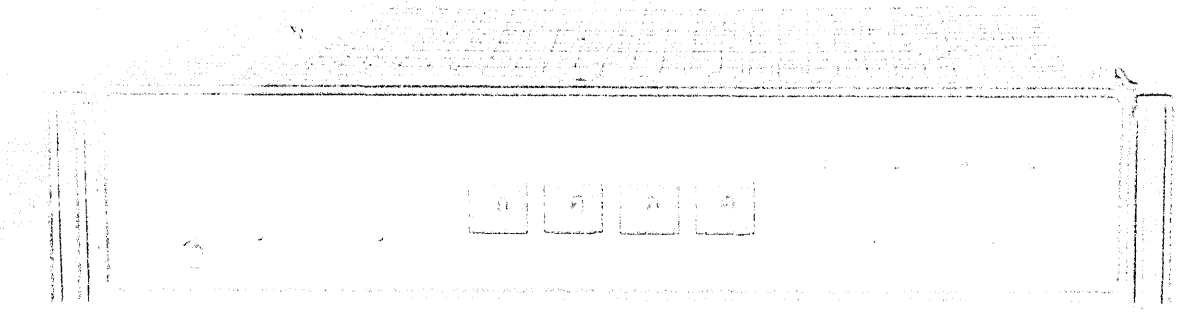
Need more speed than 45 ips for your Hewlett-Packard system? Datum breaks the speed barrier with compatible vacuum column tape systems operating at 75 and 125 ips, as well as 45 ips. Dual density is standard in all 3 speed configurations.

A new concept in tape subsystems, the 1045 Series is compatible with Hewlett-Packard Models 1000, 2100, 2114, 2116, 2116 and 2100 MX minicomputers. A single DA card-mounted external controller is the heart of the Datum system.

Along with increased system throughput, Datum's Series 1045 offers von multi-transport operation using NRZI and/or PE formats. Up to four tape transports may be driven by each controller.

And we've software transparent to all Hewlett-Packard operating systems.

See Datum break the Hewlett-Packard tape speed barrier for yourself. Contact your local Datum sales representative or manufacturer today. And Datum gives you the most for your money.



See Datum at INTERFACE Booth 2445

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WE FOUND A HOLE IN THE OBSOLESCENCE THEORY

The business community is paying a high price for the rapid pace of developments in data communications. Because new equipment has a nasty habit of rendering current models obsolete.

Teletype Corporation is doing something about it. In our industry we're one of the few companies manufacturing its own customized MOS Chips. And it's helping us build future flexibility into our data terminals.

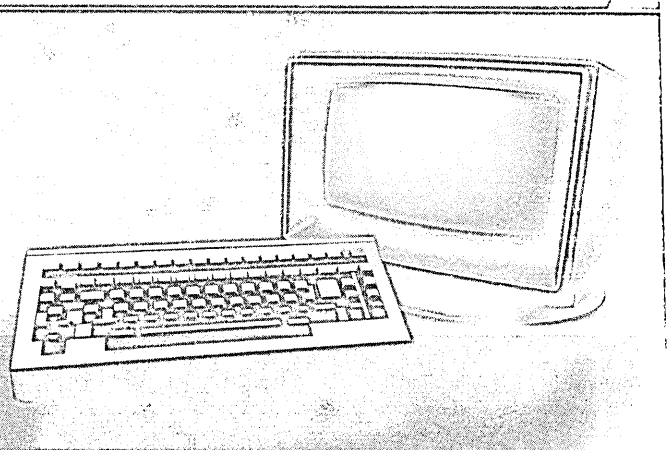
Modular design and built-in electronic adaptability let us redefine and enhance our equipment long after it's gone on line.

So our customers can have the newest features. Without absorbing losses in the form of prematurely obsolete equipment. Or paying for brand-new terminals. Or disrupting their entire system.

In business, keeping pace with data has become crucial. The distance between managers and critical information has widened to alarming proportions.

Teletype Corporation is helping bridge that gap. As a member of the Bell System, we're coupling their communications knowledge with our own research and development.

And it's working. We're making early obsolescence a thing of the past. So you won't have to fear the future.



TELETYPE
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