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

CIRCLE 1 ON READER CARD
The AM Jacquard 121 entry level computer system does two things for your office. Word and data processing.

And it does a whole lot more. It interfaces to AM Varityper phototypesetters, can easily communicate with mainframes, and can handle electronic mail and a multitude of tasks that other systems can’t. And all for about $13,500 per screen.

This efficient office automation system can grow with your business, too. Buy it now with only two workstations and add more, for under $5,000 per screen, as you need them. The J121 offers ease of operation, expandable on-line storage, high speed throughput, and comes with a choice of two letter-quality printers.

The AM Jacquard J121 is designed to boost your office’s productivity and profitability. No one, but no one, offers so much versatility and flexibility for the money. And we know what we’re talking about. Our parent company, AM International, Inc., has been designing products to modernize offices for more than 90 years.

If you want to know more—and you should—about our Datapro award-winning J121, contact AM Jacquard Systems, the Informationists, a division of AM International, Inc., Dept. 777, 3340 Ocean Park Blvd., Santa Monica, CA 90405. (213) 450-1242, Ext. 777.
Before you tell me how well they treat you here, let me tell you about the great service I get from National Advanced Systems.
FEATURES

33
IN FOCUS
The DATAMATION staff takes a look at the many facets of the National Computer Conference, held last month in Chicago's McCormick Place. Reporting on exhibits, attendees, color, and commentators are Becky Barna, Jan Johnson, John Kirkley, Ken Klee, Bill Musgrave, Deborah Sojka, and John Verity.

82
CHANGING PATTERNS OF COMPETITION
Frederic G. Withington
An examination of the measures the dp industry has taken to avoid profitless prosperity.

102
THE TOP 100 RANKING
A tabular listing of the leading U.S. companies in the industry, ranked according to their estimated 1980 dp revenues. The chart also shows the firms' 1979 rank, 1980 dp and total revenues, percent dp growth rate, 1980 dp employment, and fiscal year. Detailed information about each company begins on p. 104.

198
FUNDING THE COMPUTER INDUSTRY
Hesh Wiener
Business opportunities and money are more abundant than ever, but putting them together is a challenge.

211
GROWING UP COMPUTING
A panel of youthful experts discusses hardware, software, and certain aspects of educational policy. Participants: Corey Kosak, Jonathan Muskin, John Pencsak, and Roger Shimada.

NEWS IN PERSPECTIVE

40 MAINFRAMES
The next systems supplier?

42 COMMUNICATIONS
Arndah's front-end fever. Faxpak plays catch-up.

50 ANTITRUST
Judge joins the chorus.

55 SUPERCOMPUTERS
Highbrow hardware.

63 APPLICATIONS
Teletex to the rescue. Wanted: public opinion.

71 MANAGEMENT
The Feds discover IRM.

77 BANKING
ATM nets go national.

78 BENCHMARKS
Refresh your memory; Big buy; Potential for profits; Kids and computers; Joining the crowd; More work per worker?: Take your pick; We're number two.

DEPARTMENTS

8 LOOKING BACK
13 LOOK AHEAD
18 CALENDAR
21 LETTERS
33 EDITOR'S READOUT
The Associative File Processor.

A Special Purpose Hardware System for Retrieving Textual Information.

Full Text Retrieval. Finds relevant information in large free text files (typically 300 million characters or more) that match queries.

Unrestricted Queries. Unrestricted query vocabulary with boolean AND, OR, NOT and proximity key word logic.

Simple Configuration. AXP® runs on a PDP11 host minicomputer and includes all necessary user software.

Real Time Data Input. New data may be input and searched as it is received, if necessary.

Special Associative Hardware. The processing power is made possible by the special AXP® hardware effectively having the capability of 1200 cpu's.

Affordable. Now you can afford full text retrieval costing only a few pennies per search.

Available in Three Configurations. The AXP100 attaches to an existing PDP11 computer; the AXP200 is self contained with a communication interface to a network or another host computer; the AXP300 is a turn key system including CRT terminals and a line printer.

Application Areas Include:

Military and Intelligence
Law Enforcement
Library Search
Word Processing Support
Abstract Search
Title and Property Search
Trial Transcripts
Patent Search
Litigation Support

Technical Report Retrieval
Generic Record Keeping
Current Awareness Bulletin
Laboratory Testing and Retrieval
Journal Abstracting and Control
Pharmaceutical Literature Retrieval
Product Bibliographies
Chemical Compound Retrieval
Historical Records and Archives

Call (213) 887-9523 or write for a detailed brochure.

Datafusion Corporation
5115 Douglas Fir Road, Calabasas, California 91302

Call (213) 887-9523 or write for a detailed brochure.

Datafusion Corporation
5115 Douglas Fir Road, Calabasas, California 91302
At Waterloo, Intel's FAST-3805 won.

The FAST-3805 saves the University of Waterloo thousands of dollars each month while it increases both user and system productivity. Waterloo's Associate Director-Systems, Romney White, explains how . . .

“Compared to any other DASD, the FAST-3805 in Native Mode* is the fastest thing going. It has a large enough capacity to satisfy the biggest users around, and it’s a cost-effective solution. In other words, the FAST-3805 is really an ideal paging device.

“The FAST-3805 reduces paging overhead and increases paging capacity. It’s an economical solution for extending current CPU resources.”

Increases productivity
“We discovered that our 4341 by itself supported only 25 active users. With the FAST-3805 we were able to double the number of active users at less than half the cost of a new processor. And those users got more consistent and faster response times.

“We found the FAST-3805 eliminated page wait and the page wait that masquerades as I/O wait, as well as reduced device, controller and channel contention. The result was more users who are more satisfied.”

Fast paging saves dollars
“On our 3031 we had a page wait of about three percent with two 2305s. However, when we switched to a FAST-3805—which brought in pages about two and a half times faster than the 2305s—the page wait went to zero. In our situation, switching to the FAST-3805 saved us a couple of thousand dollars a month in system and people time. But a user who has a 3033 with a 15 percent page wait could save $15,000 to $20,000 a month.

“Not only did the FAST-3805 take the place of two 2305s and a 2835 controller at Waterloo, but it helped us avoid the purchase of another 2305/2835 system. With the FAST-3805’s increased capacity, we were able to stay within our budget . . . and still meet the increased needs of our users.

“Because we wanted to get the most out of our current system, we saw the FAST-3805 as a good investment. We looked at the available paging devices and determined that the FAST-3805, because of its micro-coding, offered the most flexibility.

“The installation was a breeze. Service has been good—and the unit is essentially self-diagnosing. The FAST-3805 is much more reliable than our previous disks.

“In summary, Waterloo got more capacity, better performance and better reliability for less money with Intel's FAST-3805 semiconductor disk.”

If you are interested in learning how the FAST-3805 can unleash your system resources and increase your personnel and system productivity, contact Intel's Marketing Information Office at 512/258-5171. Or clip and mail the coupon below.

---

Name __________________________
Company Name ___________________
Address ___________________________
City/State/Zip _______________________
Phone _____________________________

Return to: Intel Marketing Information Office
P.O. Box 9968, Austin, TX 78766

Europe: Intel International, Commercial Systems Division, Rue du Moulin a Papier 51, Boite 1, B-1160 Brussels, Belgium 02/660-30-10, TXL 24614
Canada: Intel Semiconductor of Canada, Ltd., Willowdale, Ontario

CIRCLE 7 ON READER CARD

*Native Mode and 2305-emulation are two personalities of the FAST-3805 currently available.
You can define from one to sixteen viewports on the 4112’s 15-inch raster display. You can use local zoom-and-pan capability to select and magnify any portion of the 4096 x 4096 addressable points screen. Return to the full picture, and the terminal will automatically bracket the detail section last displayed.
Zoom and pan. Overlays and gray scale. Retained segments and panel flooding.

What it does locally is international news.

The new 4112 not only reduces host connect charges and transmission traffic. It does things no raster terminal has ever done before. Zoom in on most other terminals, and all you see is the same information—only less of it. But with the 4112's 16 million point addressability, you can zoom in off-line to see many times more detail!

Or, pan at any magnification across the entire display. At any time, define a scrollable dialog area anywhere on screen, to keep alphanumeric commands from interfering with workspace.

Local multiple bit plane capability is unprecedented, even by terminals under host control. You can build and store displays in as many as three layers, so you can recall the same outline, for example, for several displays. Or, you can enhance displays by easily incorporating up to eight shades of gray!

Powerful local intelligence lets you retain picture segments, or design symbols and character sets, locally. You can create, then store and manipulate picture elements off-line. Store segments on expandable RAM or on optional integral flexible disk. Shade polygons quickly with an easy-to-use panel flooding feature.

Leave it to the graphics leader to offer the first raster terminal designed for high resolution graphics. Of course, Tektronix made the 4112 compatible with its entire family of terminals, including the new, intelligent 4114, so project teams can share software—such as the modular Tektronix Interactive Graphics Library—storage disks and peripherals, while building systems around individual needs.

Let your local Tektronix sales engineer show you the whole story. Or call toll-free, 1-800-547-6711 (in Oregon, 1-800-452-6773) for product information or OEM quotations.

Tektronix, Inc.
Information Display Division
P.O. Box 4282
Portland, OR 97208

Tektronix
International, Inc.
European Marketing Centre
Postbox 827
1180 AV Amstelveen
The Netherlands

THE GRAPHICS STANDARD
TOMASH ON MEMORY

Ampex and Telemeter Magnetics merged in 1961, prompting a DATAMATION interview with the then Ampex vp Erwin Tomash. Tomash concentrated his comments on Ampex’s future, but digressed occasionally to discuss the direction of the memory industry. He believed that memory would become multilevel and associative, similar to human memory. Tomash said that humans have limited direct access memory, but “great memory capacity once we trigger the various levels.” He also predicted “the computer of the future is going to have, in addition to direct access storage, a small arithmetic organ, a large read-only memory storing function tables, and a number of levels of memory storing function tables, and a number of levels of memory of various characteristics.” On the topic of storage elements, Tomash claimed magnetic cores rose in popularity only because there was no effective competitor, and that thin films were not currently advanced enough to present real competition; they were too expensive and too slow. The potentially most successful storage device would have to be small, fast, and inexpensive—a tall order, and a goal for Ampex’s research and development labs.

REPORTEDLY, THERE WAS A REPORT...

Frost & Sullivan, New York-based research firm, completed a report on terminals, forecasting terminal sales out to 1980. The report found that remote batch terminals were expected to account for one-quarter of terminal sales by 1975, and for one-third of the sales by 1980. Six terminal categories were cited in the report: teletypewriters, alphanumeric data display, graphic data display, audio response, remote batch, and “miscellaneous.” The report predicted that, collectively, these terminals would reach a sales peak of $3 billion by 1980. Remote batch terminals—both satellite computers and specialized batch terminals—were estimated to account for $1 billion in sales by 1980. Audio response terminals were listed as the second fastest growing segment of the terminals market.

UNISIST EXISTS

“A worldwide science information system which would eliminate duplication in research and put vital scientific data at the fingertips of scientists in both developing and developed countries may be on its way.” After three years of feasibility studies by a committee from the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the General Assembly of the International Council of Scientific Unions (ICSU), such a system moved into the blueprint stage. The three-year study and its ensuing report were called UNISIST. UNISIST results showed that “a world scientific information system...is not only feasible but desirable and necessary if the information needs of the world’s scientists are to be met...” The UNISIST report made 22 recommendations under six general headings: tools of system interconnection, effectiveness of information services, responsibilities of professional groups, institutional environment, international assistance to developing countries, and the organization of UNISIST. As a preliminary step, the UNESCO and ICSU committees recommended establishment of a computer-based international registry of scientific journals. To help set up the registry, the French government offered 1 million francs, and negotiations were held to speed up the development. Implementation discussions were to occur at an Intergovernmental Conference for the Establishment of a World Science Information System in October of ‘71, in Paris. (In January 1981, UNESCO released its latest UNISIST report. The program is based in Paris and has a total membership of 154 countries. UNISIST focuses on educational and training needs of international scientific and technological communities.)

—Deborah Sojka
Birth of a new concept in letter-quality output.

NEC's new Spinwriter™ 3500 series is the first comprehensive printing system in the letter-quality office printer/terminal market. The Spinwriter 3500 series includes eight new models.

Starting with a new medium-speed 35 CPS print mechanism, the Spinwriter 3500 printer family adds five pioneering dimensions to letter-quality printers.

One: simple, elegant design. Each new Spinwriter 3500 is 30% smaller and lighter, uses 60% fewer parts, single-board electronics, a one-piece universal power supply and digital controls that replace many mechanical functions. It's the size of an office typewriter.

Two: integral forms handlers. Ten of them, designed with the mechanism. All are user changeable. Some are user upgradeable; like a single-bin sheet feeder that can add a second bin or envelope feeder. There's also a cut-sheet guide, bi-directional tractor, push tractor with tear bar and copy separator, manual inserter and bottom feed.

Three: new uptime standards. The Spinwriter 3500 has a 3,000-hour MTBF, which means about two years between failures.

And no preventive maintenance or routine lubrication. Ever. With only three major spares, MTTR is reduced to 15 minutes!

Four: word processing assist. Lets the terminal perform WP systems tasks like automatic bi-directional printing, auto PS printing, auto underlining, shadowing and bold printing. Using all the Spinwriter type styles of up to 128-character thimble print elements.

Five: immediate attachability. The Spinwriter 3500 comes in eight printer or terminal models with Qume, Diablo, Centronics, RS-232C interfaces, and is functionally compatible with Spinwriter 7700 and 5500 Series.

Find out more about the light, quiet, compact, reliable Spinwriter 3500 series. Superior in every way.

NEC Information Systems, Inc.
Home Office: 5 Militia Drive, Lexington, MA 02173, (617) 862-3120
Eastern Office: 36 Washington Street, Wellesley, MA 02181, (617) 431-1140
Central Office: 551C Tollgate Road, Elgin, IL 60120, (312) 931-1850
West Coast Office: 8923 S. Sepulveda Blvd., Los Angeles, CA 90045, (213) 670-7346

NEC. Going after the perfect printer.
The rewrite arrived from New York at 729 times the speed of sound.
You've just changed the last act in Manhattan. But the cameras and dollar signs are rolling in Hollywood. Enter the 3M "9600" Digital Facsimile Transceiver. In just twenty seconds, this remarkable transceiver can send an exact duplicate anywhere in the world.

When 3M heard about this need for speed, and accuracy, we put our years of copier experience to work. Because at 3M, we're in the business of hearing. By listening to people's needs, we've been able to solve all sorts of problems with new ideas and innovative products like our "9600" Digital Facsimile Transceiver.

In fact, 3M has entered the voice, video and data communications field with over 600 products.

If you think you might have an application for our technologies and products, write us today for a free 3M Voice, Video and Data Communication Brochure: Department 053206/3M, P.O. Box 4039, St. Paul, MN 55104.

Or better yet, let us hear from you right now. Call toll-free: 1-800-323-1718, Operator 365. (Illinois residents call 1-800-942-8881)

3M hears you...
With one BTI 8000, you use up to 200 terminals simultaneously running programs in COBOL, FORTRAN, BASIC and PASCAL. What's more, you can run interactive and batch jobs at the same time — in any mix.

The key is BTI's exclusive Variable Resource Architecture. Starting with an entry level system, you can increase processing power by a factor of ten, by just plugging in modules—up to 8 CPUs, up to 16 Mbytes of memory and up to 8 Gbytes of mass storage. All without rewriting any software.

The BTI 8000 also features a virtual memory environment, fail-soft architecture, built-in security and privacy, and remote diagnostics. And, if all that's not enough, consider this: the base system price for the BTI 8000 is 30% lower than that for comparable systems from other "supermini" manufacturers.

As for reliability and support, they're an established BTI tradition, thanks to more than 10 years' experience with service via remote diagnostics. BTI currently supports over 3000 systems in the U.S., Canada and the United Kingdom. For even more reasons to buy the BTI 8000, contact your nearest BTI sales office.

---

**200 reasons to buy the BTI 8000**

**BTI 8000 32-bit multiprocessor system**

---

With one BTI 8000, you use up to 200 terminals simultaneously running programs in COBOL, FORTRAN, BASIC and PASCAL. What's more, you can run interactive and batch jobs at the same time — in any mix! The key is BTI's exclusive Variable Resource Architecture. Starting with an entry level system, you can increase processing power by a factor of ten, by just plugging in modules—up to 8 CPUs, up to 16 Mbytes of memory and up to 8 Gbytes of mass storage. All without rewriting any software.

The BTI 8000 also features a virtual memory environment, fail-soft architecture, built-in security and privacy, and remote diagnostics. And, if all that's not enough, consider this: the base system price for the BTI 8000 is 30% lower than that for comparable systems from other "supermini" manufacturers.

As for reliability and support, they're an established BTI tradition, thanks to more than 10 years' experience with service via remote diagnostics. BTI currently supports over 3000 systems in the U.S., Canada and the United Kingdom. For even more reasons to buy the BTI 8000, contact your nearest BTI sales office.

---

**BTI COMPUTER SYSTEMS**

Corporate Offices: 870 West Maude Avenue, Sunnyvale, CA (408) 733-1122 Regional Offices: Piscataway, NJ (201) 457-0600; Palatine, IL (312) 397-9190; Atlanta, GA (404) 396-1630; Sunnyvale, CA (408) 733-1122. Sales Offices in major U.S. cities. In the United Kingdom: Birmingham (021)-477-3846

BTI is a registered trademark of BTI Computer Systems
| WRITE ON, DISPLAYWRITER | IBM is readying dp upgrades for its Displaywriter word processor. A BASIC language processor has been developed to support user programming and applications packages from IBM and third parties. Following the unveiling of BASIC -- which IBM documents indicate may come as early as this month, the Grey Giant plans the introduction of more than a score of applications by year-end. IBM also has contracted Personal Software, the microcomputer software house, to offer the popular VisiCalc electronic spreadsheet package to Displaywriter users.

Adding BASIC to the Displaywriter brings Office Products Div. into the dp realm for the first time. Franklin Lakes may become another Atlanta on IBM's map of the world, and OPD's sales and support forces will have to face their most complex product to date. Several weeks ago, the division was still in the throes of its decision-making processes, trying to define exactly the degree of support it will be able to provide for Displaywriter BASIC users. The vast majority are expected to be first-time computer users. OPD, previously involved with essentially inert products such as typewriters and factory-programmed word processors, will find itself dealing with training new users in dp concepts and methods, tailoring tailor user programs, and helping first-timers move records from paper to magnetic media. It's a large task, and will likely draw much attention from competitors who will be forced to reconcile their policies with IBM's. |
<p>| TELEMATIQUE | FRAPPE | France, Inc. may be in for a big shake-up if moderates lose out to the doctrinaire left in the new Mitterand government. Nationalization of the leading dp and telecommunications firms (including ITT, but letting IBM off the hook) are but one part of the official plan. Elimination of competition between French firms in various markets -- mainframes, communications, terminals, etc. -- also is under debate. Private sector observers fear this would cripple French industry in export markets, rather than foster technical and marketing expertise. |
| A WORM IN THE APPLE? | Furthering its aggressive moves in office automation, Xerox plans shortly to introduce its answer to the Apple. Nicknamed &quot;Worm,&quot; the microcomputer is expected to fit into Ethernet local networks. It seems likely the machine's architecture will be an 8080 or 8086 derivative: plans |</p>
<table>
<thead>
<tr>
<th>SECTION</th>
<th>TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN EARLY START ON SECURITY</td>
<td>Call for using outside software, including the popular CP/M operating system from Digital Research. Using CP/M will allow Worm to make use of the vast library of applications extant for that operating system, and it may give Xerox a leg up on IBM's planned 8086-based machine, which insiders say has been delayed from its original June introduction target date. In Los Angeles, Atlantic Richfield Co. has contracted with a consultant to design a password system that an ARCO spokesman says &quot;will be the answer to every auditor's dream.&quot; It will eliminate the need for password changes. The spokesman's enthusiasm is not the least bit tempered by the fact that the consultant is a 13-year-old, Eugene Volokh. In addition to being a sophomore at UCLA, Eugene operates VESOFT Consultants in Los Angeles with his father, Vladimir.</td>
</tr>
<tr>
<td>THE ECONOMICS OF ERGONOMICS</td>
<td>U.S. terminal vendors are beginning to feel the effect of the crazy-quilt of ergonomic regulations covering display terminals sold in the various European markets. Unlike the relatively simple problem of slipping in a new pc card for differing communications interfaces, standards demanding black-on-white or green phosphor screens, differing keyboard depths and layouts, and the like will cost manufacturers big bucks, according to one mini maker used to selling a standard line of products worldwide.</td>
</tr>
<tr>
<td>RUMORS AND RAW RANDOM DATA</td>
<td>We hear IBM chairman Frank Cary stopped by the Xerox booth at NCC and stayed to view a complete demonstration of Xerox's new Star professional workstation, which led to a phone call from Cary to Xerox president David Kearns. Could the two giants be putting their heads together?...General Electric, as a large computer user, is converting from Honeywell (nee GE) mainframes to IBM gear. Word has it GE has 100 IBM 3081s on order....One of our spies recently discovered antique IBM EAM equipment -- strange grey boxes bearing numbers like 088 and 519 -- in the New York City jury selection department. With a scrap value that might cover a subway ride, it would seem to be a wide-open situation for an aggressive sales campaign. Maybe they could switch to a slightly-used 1401 or a TRS-80....AM Jacquard Systems is beta testing an electronic mail software package for its J 500 and J 100 small business systems at Johns Manville in Denver.</td>
</tr>
</tbody>
</table>
It's like multiplying your CICS programming staff by ten.

TRANS IV lets you increase programming productivity ten times or more—without adding CICS programmers. This solution-oriented application development system performs CICS/VS functions automatically.

With it, programmers can write on-line application programs interactively, without referring to CICS macros or internals.

Features For Productivity. With TRANS IV, you can define files and display formats in real time—also procedures unique to your applications (like edit and range checks).

TRANS IV gives you on-line error correction and test/debug capabilities—without cards, batch processing, or programming.

TRANS IV operates under all releases of CICS/VS.

With our Informatics classes and learning aids, programmers are fully productive with TRANS IV within a week.

The Problem Solver. If you've got a scarcity of CICS expertise and a growing demand for on-line applications, find out the details of TRANS IV.

It's an impressive system that can help you go a long way toward maximizing your CICS investment. In a very short time.

TRANS IV is one more way Implementation Systems from Informatics help you manage human energy problems.

Call or fill out the coupon for more information. Or attach your business card to the coupon.

Implementation Systems Product Management
21050 Vanowen Street, Canoga Park, California 91304—(213) 687-9121
Telex: 69-8715 Cable: INFORMATICS

☐ Send me more information about TRANS IV.
☐ Send me a salesman with an order form.

Name__________________________Title:________
Company________________________
Address________________________
City________________State____Zip____
Telephone_____________________

CPU________________Operating System____________________

TRANS IV for DOS/VSE by Informatics.

CIRCLE 13 ON READER CARD
TMS9995

The fastest 8/16-bit processor available anywhere. From anyone. 16x16-bit multiply in 767 µs.

All you have to do is compare and you'll see that the biggest choice in 16-bits just got bigger. Faster. More powerful.

TMS9995 joins the industry's most complete 16-bit family of microprocessors, microcomputers, microcomputer modules, peripherals, software, and software and hardware development systems.

Now you have an easy upgrade to 16 bits, while retaining the economy of 8 bits. And, you'll get all the benefits of TI's all-pervasive family compatibility that lets you move from one product level to another — from single-chips to multi-chips to modules to systems — protecting your software investment and development systems as you go — no translators, no code converters, no extras.

And now there's TMS9995 — with all the inherent advantages of memory-to-memory architecture, plus 256 bytes of on-chip RAM.

And now there's TMS9995 — for all those tough tasks that demand 16-bit speed and processing power.

And now there's TMS9995 — with on-chip clock, 16-bit timer/event counter and 8-bit data bus for interfacing to everything from a minimum 3-chip system to a 16-megabyte memory system (just add the 99610 memory mapper).

TMS9995. Shrinking chip count and program size. Ready for VLSI.

Logical link

TI's TMS9940 was the first single-chip 16-bit microcomputer — and the first to transcend the limitations of high-speed and high-resolution. TMS9995 adds the ability to address off-chip memory to the TMS9940 — up to 64K bytes. Together they fill the requirements from small microcomputer-based systems to medium-sized systems, using on-board RAM and off-board ROM, to larger systems needing off-board RAM and ROM.

TMS9995 — Key features

- 16-bit CPU
- 12 MHz clock with on-chip clock generator
- 256-byte on-chip RAM
- 16-bit on-chip interval timer/event counter
- 7 levels of vectored interrupts
- instruction prefetch
- automatic first wait-state generation
- MID — macro-instruction detect interrupt
- single 5-V power supply

Performance plus

Three times faster than the TMS9900, TMS9995 executes a 16x16-bit multiply in just 7.67 µs. A 32-bit number divided by a 16-bit number in just 9.33 µs. TMS9995 can run with currently available fast memories of 120-ns access times, or by using automatically generated wait states, 450-ns access time memories.

256-bytes of fast on-chip RAM is organized as 128 x 16-bit words, allowing a full 16-bit word access in one clock cycle.

And, TMS9995 uses an intelligent pipelined architecture where the opcode of the next instruction to be performed is prefetched. For example, the microcode for Branch and Jump instructions direct TMS9995 processors to prefetch the true next instruction instead of blindly prefetching from the next sequential memory location.

And now, a word about memory-to-memory architecture

The innovative architecture at the very heart of the 9900 Family reaches its performance peak in the TMS9995 thanks to on-chip RAM. Comparison of execution speed benchmarks clearly show the advantages:

Support, support, support.

Necessary for any microcomputer family. TI's 9900 Family is supported by Pascal, Basic and Fortran software and software and hardware development systems, including a low-cost Evaluation Module, TAMM6095, for $800.* TI also offers training, documentation and expert field assistance. Training, service and design assistance are available at Distributor System Centers, and TI's Regional Technology Centers.

Commitment to 16-bit leadership

The continuing introduction of new, advanced, high-performance 9900 Family CPUs, with TI's state-of-the-art technology and production-proven resources, clearly demonstrates a commitment to leadership. A commitment to choice. A commitment to the future.

For more information about the new TMS9995, or any other 9900 Family member, contact the TI distributor or field sales office nearest you, or write to Texas Instruments Incorporated, P.O. Box 1443, M/S 6404, Houston, Texas 77001.

---

*U.S. price, quantity one
© 1981 Texas Instruments Incorporated

TEXAS INSTRUMENTS
INCORPORATED

CIRCLE 14 ON READER CARD

8569C
JUNE

COMDEX/Spring '81, June 23-25, New York.
“Where vendors and ISOs (independent sales organizations) get together.” Contact The Interface Group, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Eighteenth Design Automation Conference, June 29-July 1, Nashville.
The major topic will be computer-aided design of digital systems. Contact Dave Hightower, Texas Instruments, Box 225621, Dallas, TX 75265.

Syntopic IX, June 29-July 2, Atlanta.
Presented by the International Word Processing Association, conference will feature panels, sessions, and workshops on information processing topics. Contact Conference Services Dept., 160 Speen St., Framingham, MA 01701, (617) 879-4502.

JULY

ICALP '81, July 13-17, Haifa, Israel.
This is the 8th International Colloquium on Automata, Languages, and Programming. Contact Dr. Oded Karp, ICALP '81, Computer Science Dept., Technion-Israel Institute of Technology, Technion City, Haifa, Israel.


The IEEE Computer Society presents this symposium. Contact Marie S. Hrhea, LRDC Bldg., University of Pittsburgh, Pittsburgh, PA 15260, (412) 624-4908.

OCR Users Association's Summer Conference, July 26-29, Minneapolis.
The conference theme is "Managing Data Entry Productivity in Turbulent Times," held in conjunction with EXPO '81. Contact OCR Users Assn., 10 Banta Pl., Hackensack, NJ 07601, (201) 343-4935.

Software Products Business Seminar, July 8, Arlington, Virginia.
A seminar for software product execs, the ADAPSO conference covers marketing, financial controls, development costs, personnel, capital formation, etc. Contact ADAPSO, 1300 N. 17th St., Arlington, VA 22209, (703) 522-5055.

Summer Computer Simulation Conference, July 15-17, Washington, D.C.
Cosponsored by the Society for Computer Simulation and the Instrumentation Society of America plus nine affiliated societies, over 40 sessions on simulation technology and applications will be presented. Contact William E. Buchanan, Applied Physics Lab, Johns Hopkins Rd., Laurel, MD 20810.

AUGUST

1981 ACM SIGGRAPH Conference and Exposition, August 3-7, Dallas.

Seventh International Joint Conference on Artificial Intelligence, August 24-28, Vancouver, B.C., Canada.
Computer applications for medical diagnosis, computer-aided design, robotics, programmable automation, speech understanding, and vision are some of the topics to be discussed in this five-day conference. Contact Richard Rosenberg, Computer Science Dept., U.B.C., Vancouver, B.C., Canada V6T 1W5, (604) 228-3061.

National Small Computer Show, August 26-29, New York City.
Free lectures are presented daily, and this year there will be a five-hour seminar on the understanding, acquisition, and use of small computers in business. Contact National Small Computer Show, 110 Charlotte Place, Englewood Cliffs, NJ 07632, (201) 569-8542.

SEPTEMBER

This is the third in the international Soft '81 series; each conference concentrates on the software market of the country in which it is held. Previous conferences were held in Paris and Munich, and the fourth (and last) in the series is scheduled for Stockholm in November. Contact Soft '81, Acorn Studios, Barnes, London SW13 9HP, United Kingdom, (01)748-0287.

Compcon Fall, September 14-17, Washington, D.C.
The IEEE's Computer Society has selected "Productivity—An Urgent Priority" as the theme for this year's conference. Contact Compcon Fall '81, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

1981 International Micrographic Congress, September 21-24, Mexico City.
"Technologies Today and Tomorrow" is the theme of the congress. Contact IMC Public Relations Committee, P.O. Box 33600, St. Paul, MN 55144, (612)735-9534.

The fourth annual conference providing a forum for information by Federal AFP users. Contact Federal Education Programs, P.O. Box 568, Wayland, MA 01778, (617)358-5181.
Fact. C. Itoh is a recognized leader in small printers throughout the world. And we offer one of the most complete selections of small printers in the industry. So while others do a lot of drum beating, ours is still the drum to beat. Reason?

C. Itoh's compact, ultra-reliable drum printers are designed to take the punishment of real-world environments. So you get years of dependable service with an absolute minimum of downtime.

Take our Model 102 18-column digital unit, for example. It weighs a mere 3.3 pounds and prints 2.5 lines per second, yet it delivers the proven dependability of units costing far more. It's the perfect choice for today's ever shrinking data loggers.

There's our EP-101, the 21-column, 2.8 line-per-second compact with a thirteen year track record of field-proven reliability. It's built extra tough for your most demanding applications.

And, for maximum versatility, there's the AN-101F. OEM's use it for everything from computer output to label printers. Data loggers too.

C. Itoh's proven performers feature two-color printing, power-saving 15-17VDC operation and a compact design for easy bench-top or rack panel mounting. So if you're looking for a compact drum printer you can count on, get the drum to beat. Contact C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066; Tel. (213) 306-6700. New York office: 666 Third Ave., New York, NY 10017; Tel. (212) 682-0420.

C. ITOH ELECTRONICS, INC. 
One World of Quality

CIRCLE 15 ON READER CARD
IBM System/38
It will make you re-think your concept of price/performance.
When managers compare the cost of computers, they often leave out the biggest factor—"people cost."

That's why standards like price/performance only begin to measure the potential productivity of IBM's System/38. This innovative system can help programmers generate more programs, sales reps generate more sales, and management generate more decisions.

But what traditional price/performance ratios can't tell you about System/38, its users can. Here's what they're saying:

"Our programmers are excited about System/38's data base capability. Their productivity has greatly increased. Complex programs that used to take three weeks to write, we now do in three or four days. And System/38's Remote Testing Service let us test our programs before delivery, which made conversion easier."

Dave Bye, DP Manager
Border States Electric Supply Co.
Fargo, ND

"We've found that both the hardware and software of System/38 are remarkably comprehensive and powerful. And with the Remote Testing Service, we were able to train our programmers, system operators and terminal users on the 38 before it was even delivered."

Patrick A. Doman, VP
Chas. A. Strand Company
Detroit, MI

"With the System/38, we can do applications we'd never have dreamed of doing before. For instance, we've come up with coaching reports in just minutes that previously would have cost a lot of time and money. It gives both our coaches and management information they never thought possible."

Charles Reckenberg
Director of Data Processing
St. Louis Football Cardinals
St. Louis, MO

What makes System/38 so versatile and so productive? It offers large computer features integrated into a compact, easy-to-use system. Plus new features rarely found in any computer, large or small.

For a better idea of what the System/38 can do for your business, call your IBM General Systems Division representative, or write us at P.O. Box 2068, Atlanta, GA 30055.
Introducing the most powerful minicomputer ever.

The new Prime 850 multi-stream processor is the most powerful mini system ever made for multi-user environments. It sets a new standard of technological leadership for our family of high performance 32-bit systems.

The Prime 850 has ultra high density MOS memory that stores 64K on a single chip. This new system supports up to 128 interactive user terminals for outstanding cost effectiveness. And it's right at home working simultaneously on such diverse applications as energy development, product analysis, and general business computing.

Like all 50 Series systems, the Prime 850 combines power with ease of use. It has 32-bit architecture and virtual memory for speed, efficiency, and economy. Industry standard software for convenient program development and data management. Networking that can extend your system across the office or around the world. And the PRIMOS® operating system that makes the entire 50 Series totally compatible.

In addition to introducing the Prime 850, we've also enhanced the price/performance capabilities of other 50 Series members, including the Prime 250-II and 550-II. To meet the leader, contact the nearest Prime office or write Prime Park, MS 15-60, Natick, Massachusetts 01760. In Europe, write Prime Europe, 6 Lampton Road, Hounslow, Middlesex, TW31JL, England. Tel: 01-570-8555.

PRIME Computer
BREAKING UP IBM
Re: "A Separate IBM Software Company" (March, p. 275), I would like to state my strong objection to certain statements made by Martin A. Goetz. Pansophic Systems has been an active member of ADAPSO and a leading independent software products firm since 1969. For the record, Pansophic does not support Mr. Goetz's position that IBM be structurally broken up into six separate companies, including an IBM software company.

I strongly feel that "maximum separation" of IBM would prove disastrous to thousands of computer users worldwide. Worldwide dominance of computer technology by the U.S. would be set back irreversibly; our superior position in world trade would be lost. The costs for software products would be certain to rise dramatically (since Mr. Goetz believes IBM software is underpriced). There has yet to be a clear court decision against IBM to advocate structural relief, and a breakup of IBM in advance of a lawful judgment against IBM would only serve to heavily penalize many innocent computer users. Mr. Goetz even concedes that "the typical IBM user would probably be opposed to such a separation."

Pansophic and other ADAPSO members prefer to represent the more important long-range interests of our customers on this issue, rather than take a self-serving but short-lived position against IBM's competition in the free marketplace.

JOSEPH A. PISCOPO
Pansophic Systems, Inc.
Oakbrook, Illinois

Marty Goetz's proposal suffers from at least two fallacies.

The fully separate subsidiary idea in the FCC's Second Computer Inquiry ruling is appropriate in that context because AT&T and its operating subsidiaries enjoy a monopoly position in basic telecommunications services, protected by federal and local government regulation. IBM, on the other hand, derives little revenues from regulated activities. Forcing it to spin off maximally separated subsidiaries may serve the interests of ADR and other competitors, but it cannot be justified on the same grounds as the AT&T case.

Furthermore, it is difficult to see how the elimination of "cross-subsidy" in the IBM context ("averaging" is a more accurate term) will lead to lower prices to the end user. ADR competitors have been notably successful in recent years in forcing it to abandon the principle of averaging, under which costly services can be offered to the public at affordable rates because they are subsidized by income from more lucrative parts of the business. As a result, we are witnessing the demise of Telpak and WATS and will soon see phone installation costs and local telephone service skyrocket. The immediate beneficiaries are the "interconnects" and the would-be "long distance telephone companies."

Whether the public at large also benefits eventually is problematical. The 1969 IBM unbundling, which created the independent software industry, has clearly been beneficial to that industry. The end user, however, now pays for software that used to be free.

A second IBM unbundling, which in effect made all DIO operating system chargeable items, began in January 1979 and is now virtually complete. Thus it seems that the main objective of the proposed breakup of IBM has already been achieved.

OMRI SERLIN
President
ITOM International Co.
Los Altos, California

Mr. Goetz replies: I never intended to justify a separate IBM software company on the same grounds that the FCC has taken regarding AT&T. And I do not agree with Serlin's observations about IBM for the following reasons:

First, a "fully separate subsidiary" is as appropriate for IBM as it is for AT&T but for perhaps other reasons. The purpose of a separate IBM subsidiary would be to prevent that company from again monopolizing the software products industry. IBM currently has about a 50% share of the software products market, and its share is getting larger each year. The effects of an IBM software monopoly in the 1960s—when the company virtually controlled 100% of the market—is well known; there were no alternative sources for software, the software quality was poor, the types of software was limited and pricing ultimately was high for the bundled hardware/software.

Second, the elimination of IBM's "cross-subsidy" would certainly benefit the user, although not necessarily in the short run. Let me give you a real example where it could have had devastating results. In 1979, when IBM announced the IBM software product ICCF for the IBM 4300s and 370s, the company introduced the product at $50 per month. Many in the industry believe that the software was actually subsidized by higher-priced, more successful products, such as CICS and DLI. No other company could have introduced a product for such a low price.

It had the effect of driving out a great number of potential competitors. As it turns out, ICCF remains very inefficient and difficult to use. ADR and several other companies are very successfully competing against IBM's product in spite of its being subsidized. If, however, IBM had produced a successful product, the user could have had no alternative but to use that product, and IBM would have had a virtual monopoly on the on-line program development market for the IBM 4300 and DOS/VSE market.

This situation, I contend, would certainly not be beneficial to the user public at large. Cross-subsidization has the potential of driving out, or preventing, the development of a competitive environment. Thus, if a monopoly of the market were achieved by cross-subsidization, the end result would be very costly to the user in the long run.

The unbundling of the 1970s reduced IBM's hardware monopoly (there are now cpu PCMS) and did indeed create the independent software industry. But, my proposal for a separate IBM software company is to ensure that IBM does not again monopolize the software products market.

Unbundling was a good first step for the 1970s and eliminated the tie-ins of hardware and software. For the 1980s, the principle of maximum separation should be applied to IBM's software business to prevent its monopoly of the software products business, which is forecast to be one of the fastest growing industries of the decade.
NO TURNOVER
Re: Letters (April, p. 24), Mr. Mathieson’s letter rang a bell that we have been ringing at ABA for five years. In 1975 we shifted from a COBOL/Assembler environment (OLIVER, On-Line Systems, Inc.). Since changing our environment, we have increased the ABA’s use of the computer resource by a factor of 10 with no increase in staff. I think it is more important to note that we have had no professional (programmers, analysts, managers) turnover in five years. In a time of escalating labor costs and high turnover in the dp field, we have found that our environment has more than paid for itself.

FRANK W. SCHLIER
Director, Information Systems
American Bankers Assn.
Washington, D.C.

TAKEN TO TASK
Re: “Look Ahead” (Feb., p. 14), the story on ICL ME29 computer sales was grossly inaccurate. The majority of ME29s are not being sold as replacements for 1903/4 computers. ICL is not writing off inventories full of ME29s as sales and is not offering discounts.

K.G. HOWE
Chief Media Officer
International Computers Ltd.
London, England

DP Managers:
Solve 100% of Your Power Quality Problems—Or Your Money Back.

Protect your computer’s power quality. New computer-room quiet WhisperPac™ motorgenerator reduces errors and loss of information at 25% of UPS cost.

CPP’s 60Hz WhisperPac power conditioner rides through —100% of input voltage reduction up to 500 msee — 50% input reduction for up to two minutes — 25-30% of continuous input voltage reduction (worst case brownout). In fact, WhisperPac gets rid of sags, surges and transients that cause extremely costly computer downtime and reruns — not to mention expensive equipment damage.

CPP means next-to-nothing maintenance, motor and generator windings guaranteed for 5 years — one year on all other parts.

Best of all, CPP’s very quiet motorgenerator is priced 20-25% lower than others — plus it’s delivered in under 8 weeks.

Call today (213) 264-1521 for more information.

Compare For Yourself

<table>
<thead>
<tr>
<th>Power Problem Types</th>
<th>Motorgenerator</th>
<th>UPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undervoltage (brownouts)</td>
<td>100%</td>
<td>99.8%</td>
</tr>
<tr>
<td>Overvoltage</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Transients-common</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Transients-normal</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Sags and surges</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Power protection offered</td>
<td>100%</td>
<td>99.96%</td>
</tr>
<tr>
<td>Relative cost</td>
<td>25%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Computer Power Products Motor Generators Available to 500 KVA

On the contrary, ME29 is a highly profitable product with deliveries direct from factory output now running at 20 a week. Furthermore, ICL has not been writing off 2903/4 systems from rental assets.

Over 750 ME29 systems have been ordered since its launch in March 1980. About 35% of those have come from new customers and 10% will be used to replace competitors’ equipment. Another 30% are ordered by existing customers for new applications, while only 35% replace older ICL equipment.

K.G. HOWE
Chief Media Officer
International Computers Ltd.
London, England

COOL IT
Re: “Hot and Cold Data Centers,” (March, p. 176), I will concede Mr. Hassett’s point that not all specialists in the field of building systems design will design the best system, but those who remain in the field for any length of time can generally design adequate systems, given the proper encouragement. Do-it-yourself building systems designs, like self-performed appendectomies, have a way of not being satisfactory.

The reference to sources of “free advice” kinda bugged me. As a professional engineer in independent practice, I have given much advice on computer room air conditioning. I like to think most of it was competent, and I can guarantee you it wasn’t free. Anyone who designs building systems from free advice is placing his future on a slender reed.

Advice given in the article on technical topics was in large part accurate. It was, of course, not possible to tell where any particular piece of advice was applicable to any specific system under all conditions. Care to take a guess? Just spin the chamber and pull the trigger.

Yes, equipment suppliers will run efficiency comparisons, load calculations, and all sorts of other helpful data, mostly for “free.” You may find, however, that these reports are as comprehensible to you as a core dump would be to the A/C equipment salesman. And remember, he is trying to sell you his equipment. The professional engineer or the engineering contractor will likely be involved in more computer room constructions in a year than you will see in your whole career. He can advise you that a properly designed computer room will cost you a great deal of money. The only thing more expensive is an inadequate facility.

Dp managers who want the best, or even the second best, facility are well advised to consider the following recommendations (free to you, but gained at substantial expense by me):

1. Hire professional engineers and architects to generate the design and assist you in selection of acceptable contractors.
2. Provide the design team with as
PERQ. High Resolution.
And all the power you need.

That's what you get with PERQ, Three Rivers' revolutionary, complete single-user computer system.

PERQ gives you an 8½" x 11" vertically oriented screen that's flicker-free. The display isn't interlaced — all 1024 lines are refreshed 60 times per second. So PERQ can display multiple fonts, proportional spaced text and graphics in a black-on-white, high-resolution presentation.

PERQ is all the power you need.
PERQ provides you with a complete single-user system — all the processor, display, disk and memory one person needs, sitting right at his desk. And because PERQ workstations provide complete computing resources on a per-person basis, installations can be expanded incrementally. PERQ's Packet Stream Local Network interconnects PERQ systems in a distributed processing environment, allowing processor-to-processor communication at 10 megabits per second over a single coaxial cable.

PERQ is more powerful than any current microprocessor-based system
PERQ's CPU is a Three Rivers-designed, sophisticated, microprogrammed minicomputer which directly executes Pascal P-Code at up to 1 million P-Codes per second. A 32-bit virtual address means that very large programs can execute with ease. Even PERQ's operating system is written in Pascal, the front-runner in high-level languages for structured programming.

PERQ is leading the revolution against the mainframe.
Across America, PERQ is revolutionizing the way work gets done — because it provides all the benefits of a time-shared mainframe without any of the drawbacks.

OEMs who need low-cost, highly flexible computing systems are choosing PERQ for CAD/CAM workstations, phototypeset applications, business systems and office automation applications.

Engineers and scientists are using PERQ to provide all the facilities of a good timesharing system, plus uniform response time, incremental expandability and high reliability which a timesharing system cannot provide.

Government agencies see PERQ as an ideal way to provide computing resources in command and control situations, analysis and in R&D.

Join the revolution. And find out more about what PERQ can do for you.
much and as accurate information as is available about equipment to be installed and operating requirements of that equipment. Remember, you can get control of temperature and humidity within fractions of a percent, but the cost of such close control can be a doubling or tripling of system cost. Don't ask for more than you have to have.

3. Establish a realistic budget for your facility. As a rule of thumb, about two or three times what you expected to pay will be just about right.

4. Give your consultants time and money enough to do the job right, and try not to dictate methods too much. Just tell them what results you want and skin them alive if you don't get them.

5. Absolutely vital: never attempt to weed your computer facility air conditioning to the general building system. The system requirements are too different to make it ever work satisfactorily.

6. Pay the engineer when you get his bill.

WALTER E. WALLIS
Wallis Engineering
Mountain View, California

---

**LETTERS**

**Dictionary Details**

Re: “A Survey of Data Dictionaries” (March, p. 135), the article is both concise and informative. It fails, however, to bring out a rather important consideration in the evaluation of dictionary packages. Several of these packages (DBDC Dictionary, IDD, UCC TEN, ADABAS Dictionary) require their respective DBMS software to be installed. “Interface only with DBMS” and “Requires DBMS” mean quite different things. The wall chart suffers from the same omission. The diagrams’ usefulness will be enhanced if this aspect is clearly brought out. This is especially crucial for small- to medium-size installations which do not have a DBMS and/or do not plan to acquire one in the near future. Finally, a minor correction: on p. 158 (UCC TEN) under “INTERFACES,” “Preliminary ADL Support” is mentioned. Shouldn’t this rather be “Preliminary ADE Support” as mentioned in the chart?

V. VENKATAKRISHNAN
Software Advisor, CDP Support
Aetna Life & Casualty
Hartford, Connecticut

The author’s reply: The implementation aspects of these systems were omitted from the article due to space restrictions. However, this information is supplied on the full wall chart, including which data dictionaries are dependent on a DBMS.

---

**STANDARDS BEARERS**

Re: “A Standard Squabble” (March, p. 72), standing on the sidelines, it appears to me that some companies don’t like to have the government exhibit enough expertise to tell the companies to conform to its standards. The courts are not going to tell the government agencies what they must do, from a technical point of view, to operate and carry out their functions. The issuance of the standards apparently was long overdue.

As competition among suppliers grows, the cost to the government will decrease. As a taxpayer, I hope that the purpose of the standard will be accomplished, and that mainframe suppliers will see that it is to their benefit as well.

Suppliers have for too long told their customers and the government what they will and will not supply. Competition would even be good for suppliers of dp equipment after they learn to live with it.

EMANUEL KINTISCH
Alexandria, Virginia

---

**With our new TC-5 Terminal Concentrator**

The advanced, easy to use statistical multiplexer for up to 16 asynchronous terminals, over a single telephone line

- **Statistical Multiplexing**
  - Efficiencies to 400%
- **Completely Transparent**
  - No hardware or software changes
- **Enhanced Standard Features**
  - Fully supports dial-up modem, Break, Autobaud, ECHOPLEX, and auto-restart
- **Exceptional Flexibility**
  - Configure each port separately to ANY popular baud rate, character format, flow control, etc., while other ports are active!
- **Proven Reliability**
  - TC-5s are in use world-wide

For further information and the sales office for your area, call toll-free (800) 235-6955 or in Calif. (805) 964-9852

ComDesign, Inc.
340 South Kellogg Avenue
Goleta, California 93117
"Our On-Line Computer Output Microfilm Recorder is extremely fast, inexpensive to use and simple to operate."

DatagraphiX recently spoke with Mr. John E. Dye, Senior Director of Information Services, Blue Cross and Blue Shield of North Carolina, about his company's decision to install an on-line COM system.

DatagraphiX: What prompted you to consider an on-line microfilm recorder?
Dye: There were basically two major reasons. Faster turnaround and operational convenience. With on-line COM we could eliminate all of the tape handling. It doesn't require extra people and there is no throughput delay. We can get microfiche duplicates to the users much more quickly than paper reports.

DatagraphiX: Previously, you used a service bureau. Why did you decide to purchase your own unit?
Dye: We did a cost justification study and found that the money we were spending on a service bureau was just about what we would have to spend for our own COM recorder. Initially, our present needs would utilize only 20% of the machine's capabilities, so we could grow without additional equipment costs. Economically, it made sense.

DatagraphiX: Why did you choose a DatagraphiX on-line COM?
Dye: I've used DatagraphiX equipment for about 15 years. I have found DatagraphiX to be a good, solid company that supports their equipment and provides reliable service.

DatagraphiX: Did you encounter any difficulties in the transition to on-line?
Dye: We were impressed with how easy it was. Our technical librarian was able to perform most of the conversions. And DatagraphiX supplied very thorough training in hardware operation and the use of its on-line software.

DatagraphiX: So you are satisfied with the reliability of the AutoCOM II®?
Dye: Very much so. Uptime is better than 95%.

DatagraphiX: What is your overall reaction to the AutoCOM II?
Dye: It meets our most demanding data processing requirements. It saves time, material, space, and money, just to mention a few advantages. Also, we believe microfiche has great advantages over paper in cost and availability. If we experience another paper shortage, we have the secure feeling that we have a backup. Like Blue Cross and Blue Shield protection, it's reassuring to know we're covered against emergencies.

For further information on how DatagraphiX' COM systems can help, call or write for our free brochure. P.O. Box 82449, San Diego, CA 92138, (714) 291-9960, Ext. 581, TWX (910) 335-2058.

DatagraphiX®
a General Dynamics subsidiary
CIRCLE 21 ON READER CARD
Heat. It makes life and life in your high impossible.

There's enough heat, up to 400° F, inside your Xerox 9700 to actually scorch ordinary bond paper. That's why, when the first generation of two-copies-per-second copiers came on the market, Champion realized they would need a new breed of paper. We also realized the computer printout room was about to become as common as the typing pool.

To meet these requirements and this demand we developed Champion Xerocopy Bond.
on earth possible. speed copier nearly

A new kind of paper to serve a new kind of machine in a new kind of office. Champion Xerocopy Bond meets the exacting performance requirements demanded by the equipment. And it's backed by a national network of merchants and Champion representatives.

People who know your needs as well as your high-speed machines and how to serve them both.

At Champion we're not only growing trees to make paper. We're also growing ideas to meet the future.

Champion
Champion International Corporation
Paper Division

Planting seeds for the future
CIRCLE 22 ON READER CARD
Apollo Computer has finally put an end to the computer compromise.

With the introduction of Apollo's DOMAIN, you can now get both the resource and data sharing capabilities of today's best timesharing systems with all the performance and responsiveness of a dedicated mini—all in one cost-effective system.

DOMAIN (Distributed Operating Multi-Access Interactive Network) processing is a new and dramatically different approach to computing. It is a high performance local network of dedicated computers in a distributed environment. Its unique architecture is designed to allow each user maximum autonomy within the network, while retaining the vital communications and resource sharing capability among every user.

The principal advantages of DOMAIN are greater system productivity and total system cost-effectiveness. The key to these advantages are:

- A high level of predictable performance, including a VLSI CPU (with 32-bit architecture) dedicated to each user on the network, executing in a 16 megabyte demand paged virtual memory.
- A new mode of user machine interactivity, including a high-resolution bit map display permitting each user to run multiple programs simultaneously.
- A network level modularity, providing a system with a very high performance level, a wide range of growth capability, and a vast improvement in system reliability and availability.

DOMAIN is designed to accommodate a wide range of application environments, including scientific, engineering, research, finance, CAD/CAM, text processing and transaction processing. The system is capable of running very large, single program applications, as well as multiple program applications.

By configuring dedicated CPUs in a network architecture, Apollo's DOMAIN really does let you have your cake and eat it too.

For more information on DOMAIN processing and Apollo Computers simply fill out and return the coupon below.

Now you can have your cake and eat it too.
THE LONG MARCH TO NOWHERE

The IBM antitrust trial has been a model of justice gone awry.

Back in January, 1969, the Johnson Administration was sputtering to a close. As is the custom in the waning days of a presidential administration, those who were departing left a few souvenirs behind . . . a little something to remember them by.

One of the Johnson Administration’s more memorable parting gifts to the people and business community of America was the IBM antitrust trial, now in its 12th year.

Tom Barr, the folks from Cravath, Swaine, and Moore, and Judge Edelstein are growing old together. Dust gathers in the corners of the Foley Square courthouse. Whole forests have been decimated to provide paper to record the endless depositions. It's all slightly surreal; inside the court the case plods on, dealing with issues and actions which became moot years ago; outside the world relentlessly changes.

As this is being written, Justice and IBM are meeting outside the courtroom and rumors of a settlement are flying. At the same time, we’re packing up to leave for the NCC in Chicago. And DATAMATION’s editors are putting the final touches on this issue’s Top 100 feature. These are not unrelated events.

At the NCC, those of us who are a bit long in the tooth, will be donning black tie to attend the Pioneer’s Day dinner. As we fray and nibble survivors sip our wine and eye each other’s receding hairline, we may take some solace in the fact that we were around before the trial and the long march to nowhere began.

But more to the point, this year’s NCC will showcase how drastically the industry has changed since those days. Who would have dreamed in 1969 that something called a “personal computer” would invade the exhibit floor a dozen years later? Or that voice, word processing, communications, data processing, electronic mail, and fax would all begin to converge into a massive discipline called information processing?

This huge NCC and this year’s Top 100 both indicate the healthy growth of the dp industry despite IBM’s alleged machinations.

Peter Wright, in the introduction to the Top 100, says, “The dp industry had an exceptionally strong year in 1980, especially considering recessions that hit both the U.S. and European economies.”

And, in this issue’s lead article, Ted Withington talks about new trends in competition and concludes “Now some of the new patterns are emerging, and it is already clear that they will be radically different from the patterns of the past.”

What is also clear is that the computer industry of the ’80s bears little resemblance to the industry of the ’60s and the ’70s. The threads of the past are there, but technology and the new economics of global competition have so changed the face of our industry that one must ask what fundamental purpose the IBM antitrust trial serves.

If, by the time this editorial appears in print, the miraculous has happened and there is a settlement, we will raise a chorus of hosannas, breathe a sigh of relief, and stop flogging this nearly comatose horse.

But if, as we suspect, the hamster cage is still revolving, we can only call again for an end to this wasteful and meaningless trial.

It is obvious that IBM’s competitive efforts have not throttled the U.S. computer industry. On the contrary, it is thriving and robust. Its major threat comes not from IBM’s dominance but from vigorous competitive efforts of countries such as France and Japan, whose governments heartily support, rather than attempt to hinder, national industry.
THE FOUR-MINUTE MILE

The National Computer Conference has become so big that you couldn’t possibly spend more than four minutes per exhibit and still see it all.

Another year, another NCC. More than 500 exhibitors, thankfully under one roof. Booth-helping temporaries clad in tank tops and running shorts, or in whatever style that might have occurred to the booth manager. And 30 hours of exhibition time, leaving less than four minutes per exhibitor for the adventurous visitor trying to see it all.

For the first time, AFIPS acknowledged the legitimacy of personal computing by merging the erstwhile separate personal computing exhibition with the mainstream vendors traditionally found on the floor proper. As might have been expected, many of these vendors drew large crowds, with the booths of Atari and Apple Computer virtually a sea of attendees. Personal Software, developers of the widely successful VisiCalc electronic spreadsheet package, did good business off at the fringes of the main floor. The software house showed a number of new packages, including an enhanced version of VisiCalc for the Apple, companion VisiCalc packages, and Visi-Dex, an information storage and retrieval system.

Both IBM and Fairchild brought color to the main floor of exhibits. In addition to showing 4331 and 5280 systems, the grey giant showcased color terminals and color printers. Fairchild devoted one segment of its booth space to an F8-controlled videodisk player; when we last passed the booth, the current show was of a rock concert. (Someone in the crowd said it was the Scandinavian band ABBA, but that’s outside our realm of expertise.)

The people gathered at least six deep to see demonstrations of the Star 8010 professional workstation at the Xerox booth. Ethernet also found its place in the sun at the Xerox display.

Siemens, the German giant, highlighted printing with a laser page printer and other printers using ink-jet technology. Across the floor, Honeywell announced that its page printing system controller, a Level 6 minicomputer, need no longer be dedicated to servicing a high-speed page printer. The vendor acknowledged that the controller has enough horsepower to drive additional locally connected printers and handle communications, turning the PPS into a centralized printing station for many local and remote users.

In addition, a block of stands from Great Britain showed further international influence. It was in this block that Quest demonstrated its signature verification system, an enhancement to its extant line of handprint input devices.

The Japanese also made their presence felt, though it seemed that many of their booths wound up on the lower level of the exhibition. Panasonic managed to get space on the upstairs floor, where it showed off monitors, small business systems, and its component-level multiple-overlay keyboards (described in our preshow product preview). Sony and Fujitsu wound up downstairs. Sony showed both end-user products, such as its recently announced word processing equipment (the Typecorder and the Model 35 word processor) and oem equipment—its 3 ½-inch floppyettes (with nearly 0.5MB capacity) and color monitors. Fujitsu again showed its Word 1000—a word processing system combined with host-based filing and retrieval. The firm also displayed bubble memory systems, with 256 KB removable bubble modules.

Sonny Monosson, seemingly naked without his sandwich boards, made do with a fair-sized booth in the middle of the main exhibition. American Computer Group, Monosson’s umbrella for marketing (via sales or lease) new terminals and used equipment from the American Used Computer Co. division, had a variety of DEC equipment on display, including one of the first PDP-8s. When asked about the absence of his sandwich boards, Monosson, who was hassled at last year’s NCC for carrying his message to the streets, said that he’d leave them home until NCC visited a city more receptive to civil liberties.

SOME KEYNOTES

It wouldn’t be an NCC without keynote speeches. Highlighting the speaker lineup at this year’s conference was Michael Blumenthal, former Secretary of the Treasury during the Carter Administration and now chairman of the board of Burroughs Corp. Blumenthal discussed the reasons underlying the growing wave of protectionism in foreign countries, particularly regarding the information handling industries, and the threat this protectionism poses to U.S. companies.

In addition, Marisa Bellisario, co-general manager of Italtel, Milan, Italy, spoke on the age of telematics, the coming together of computers and communications. Bellisario, who started her career as a program analyst at Olivetti Divisions Electronica, is now credited with being the highest ranking female line executive in the entire computer industry.

With the wide distribution of tele-
TERMINAL RAILWAY was Lear Siegler's haunt, which drew a constant crowd of terminal enthusiasts.

Richard S. Beal, special assistant to President Reagan and director of the Office of Planning and Evaluation in the White House, gave the other keynote address. He focused on the need to improve the decision-making process within government by making better use of computers and information databases.

"There have been few if any major system improvements in the federal government in the 1970s. There is a lot of catching up to do in the 1980s," said Beal. The reason behind this situation, he said, is that federal agencies have "limited" allocations for system purchases to about a 10% growth per year. The result is that the average age of federal dp equipment is about seven years.

"Unless we do something about the procurement strategy, our obsolescence problem is likely to worsen," he said.

After opening with a humorous quip about his stunted stint in the Carter Administration and an axiom called Blumenthal's Law—which, he said, states that when the curve depicting the prime rate intersects the curve depicting the President's popularity, then it is time for the Secretary of the Treasury to go—Blumenthal quickly retraced the rapid growth of the computer industry and its concurrent dramatic drop in price and increase in performance.

"In 1974," he said, "the total number of computer systems in use was something over a quarter million. There are about 2 million systems currently in use, and by 1984 that figure should rise to more than 7 million."

As a result, he said, the "functional equivalent of a computer that cost $30,000 in the early '70s and cost $4,000 in 1977, will cost less than $100 in 1985." To illustrate just how dramatic the price/performance effect has been, Blumenthal pointed out that had technology affected the car industry in the same manner, "Americans would now own half-pound cars costing less than $2.50 and getting a million and a half miles per gallon."

But the rapid proliferation of computers has brought with it confusion and fear about the effects of computerized information handling on privacy and freedom. Some countries fear "electronic colonization" or "electronic imperialism" from the more advanced countries, said Blumenthal.

While he agreed that data flow restrictions across borders may have begun with privacy issues, he believes they have taken on much wider ramifications.

"Transborder data flow restrictions can be viewed frequently as simple protectionist strategies whose purpose is to facilitate the growth of a nation's domestic information processing industry." In short, what that means for U.S. computer companies, he said, is that overseas sales may be severely limited.

Politically, he conceded, countries feel vulnerable in terms of national defense as a result of sensitive national information being collected, processed, and stored abroad. Economically, he said, countries worry about the impact of foreign data processing centers on their balance of payments, the loss of domestic jobs, and the "brain drain" that can occur without an indigenous industry.

"Additionally," he added, "it is apparent that some nations see information as another commodity that can be taxed to the benefit of that country's treasury."

But such restrictions have their negative side, too, according to Blumenthal.
IN FOCUS

“They necessitate increased installations of data processing equipment within the individual countries,” even though many jobs could be done cheaper and more efficiently through distributed networks flowing out from a central center.

What can U.S. companies do to foster a free exchange of information between countries? First, he suggested, America should temper its frustration with cooperation, such as creating partnerships in developed nations or establishing technology transfers in less developed countries.

Blumenthal cautioned the U.S. that it is courting disaster if companies do not act more directly to break the fall into protectionism. He urged the government to ease antitrust regulations so that companies can pool their strengths and compete effectively in overseas markets.

The next step for the establishment of an intraindustry clearinghouse to monitor, compile, and disseminate information proposed and enacted TDF legislation throughout the world.

And he urged companies to work toward the establishment of a comprehensive national communications and information policy.

“Let us use the tools of our trade to inform, to communicate, and to freely exchange the wondrous products of our new technology,” he said. “In this direction lies the best hope for the future. Let us begin to establish that future.”

THE PERSONAL TOUCH

McCormick Place resembles a great black aircraft carrier run aground at the edge of Lake Michigan. During NCC '81 the spacious upper deck, suitable for storing fighter planes or welcoming astronauts, was the province of the IBM, the NC's, and the Apples—companies with the wherewithal to construct sleek chrome exhibits and fill them with products and salespeople. Way aft those exhibits and a deck down, where the ship's laundry might be found, was the Personal Computing Festival, a varied group of people in a couple of smallish, windowless rooms that yards of gold curtains failed to brighten.

Leah O'Connor of Chicago sat beneath a sign that read "The Electric Window." She and her husband had come to demonstrate a program that allows one to draw, on a TRS-80, a picture that's larger than the crt itself, and to shift the picture around to look at a particular part of it.

O'Connor said her husband used the system to design circuit boards, and she demonstrated this capability by putting a few schematic symbols on the flickering screen and hitting the G key, which caused the "ground" symbol to appear. The system included a printer, and on the table beside it were samples of lettering and the machine's masterful picture of Mickey Mouse.

Terry Jackson of Lombard, Ill., was there to show that "you can do voice recognition very simply and cheaply." He had assembled an eight-channel band pass filter, an eight-channel analog-to-digital converter, and a Motorola 6802 microprocessor onto some wooden slabs, creating a speech recognition system with 3.75K of memory and a vocabulary consisting of the numbers one to six. The system is speaker dependent and has a learning mode, but Jackson said that a Swede who'd stopped by and tried to teach it Swedish numbers had been disappointed. Jackson started work on the system in the middle of March and had hoped to demonstrate it by operating a small crane, but showtime came before the crane was functional and he had to content himself with causing these numbers to appear on a crt. During demonstrations he was having some trouble with background noise; he said it was a problem easily remedied with a muting switch, "but that's not something that occurs to you when you're putting it together on the kitchen table, where it's quiet." One possible application for the system, he said, would be to enable handicapped people to play computer games.

Beneath a sign that said "Conferencing Management," Gloria Smith was exhibiting a system that prevents garrulous people from interrupting shy ones. The system was devised by D. S. Stodolsky of Stanford University. Each speaker at a conference enters his name into the machine and presses a button while he speaks; a crt displays chosen speakers and allotted speaking times, rendering all participants equal. Smith said the system was fairer and more mannerly than permitting people to pipe up whenever they want. "How can someone get mad at you," she asked, "when the machine is choosing the speaker?" She said the system would be especially useful in classrooms.

Ron Borta of Rosemont, Ill., had a complaint. He was demonstrating Edugrammer, an interactive video training program that uses an Atari 800 and videotapes. He had wanted to bring a video camera and other equipment into the hall but was annoyed to learn that McCormick Place rules required that anything more than he could carry in a single trip be transported, for a fee, by Teamsters.

"The most important demonstration at the show" was the way S. M. Radosavljevic of Purdue University characterized his exhibit, entitled "First Direct and Exact Solution of Traveling Salesman Tour Problems." The problem consists of finding the shortest route for a salesman who must depart from a base city, visit a number of other cities, and return to his base. Mathemati- cians have been seeking a solution since the 19th century; a young Soviet mathematician, Leonid Khachian, was reported in 1979 to have found one, but it proved not to be general. A general solution would have extremely broad ramifications for linear programming, and Radosavljevic said that the program he and his son were running on an ALTOS minicomputer was just such a solution.

Our experts are still busy checking out that claim.

A BIT OF NOSTALGIA TOO

"Three things happen when you get older," said Univac's Ted Bonn as he rose to speak at the Pioneer Day banquet. The gala affair was hosted by Sperry Univac to commemorate the 30th anniversary of the dedication of the Univac I at the Bureau of the Census.

"The first thing that happens," Bonn said, "is that you lose your memory. . . . I can't remember the other two."

And then Bonn, like the other business and industry notables who were part of the program marking the introduction of the first commercial computer, vividly recalled anecdote after anecdote associated with those early days in 1951.

The over 250 invited guests, many of whom had also worked on the first Univac I, gathered in Chicago's spectacular Museum of Sciences and Industry for the black tie event. Dr. Carl Hamme, Univac's director of research, hosted the program.

After reading a message from President Ronald Reagan, Hammer introduced Robert E. McDonald, retired chairman of Sperry Univac, who received standing applause.

McDonald quoted the Marshall McLuhan comment that computers were the LSD of the business world, transforming its business and objectives. He said that the impact of the computer had gone even beyond McLuhan's vision, creating a whole new information-based society. "We are no longer considered the oddballs of 30 years ago," he said. "We've made our mark with management at all levels."

CBS commentator Charles Collingwood recalled using the Univac I to forecast the 1952 election results. Not everyone was impressed, he said, remembering Eric Sev- erid's comment that the computer took all the fun out of the guessing game that used to mark the all-night vigil as the results trickled in.

Univac was the generic name for a computer in the '50s, and Collingwood quoted Arthur Godfrey's description of what a Univac really was: "Just a box with a vice president inside."

Pioneer Steve Wright recalled an interesting technical problem that plagued early systems when the switch was made from air to water cooling. The water was pumped in from Lake Michigan, which in those days was teaming with fish. They
Stop apologizing for inadequate computing capacity and get a system that will grow with your needs.

Before you trade your overloaded 370 for a 4331, consider how soon it will be before you're forced to move up to a 4331-2. And then migrate to a 4341. And on and on. Every time you change systems, you lose time and money. Not to mention productivity.

Magnuson puts an end to this costly process with a 4300-compatible mainframe that is field-upgradable.

Magnuson's M80/31 gives you more throughput for less cost.

The Magnuson M80/31 provides up to 20% more throughput than the 4331-2, for as much as 20% less cost. And the M80/32 offers up to 50% more performance than the 4331-2 for about the same cost.

As your system requirements expand, Magnuson simply adds or swaps circuit boards on-site to increase your system's CPU capacity, channels or memory. There's no time-consuming conversion process, so your DP productivity continues without interruption.

There's no need for your people to learn a new system.

And there's no waiting. Your system can be upgraded as soon as you decide you need more power.

Magnuson's microcoding capability provides continuous compatibility.

Magnuson uses microcode to emulate all the IBM target instructions and features offered by IBM or third-party vendors. We even provide special productivity enhancements for popular packages such as Cullinane's IDMS.

And we support more operating system releases than IBM supports on the 4331-2. That means that all of your existing 370 applications software will run on an M80, so you don't lose the time and money you've already invested.

Magnuson does more to support your system.

At Magnuson, we know we're not the biggest, but we give you more of the day-to-day support you need. We're more responsive when you call us, more helpful in solving problems, more flexible in our financing.

In short, you can count on Magnuson to help keep your DP operation more productive and more cost-effective for your company.

To find out more—please call us toll-free at 800-538-7909, ext. 312.
GIMMICKS, GEAR & GADGETRY

If gladiators, chewing-gum twins, tall Texan cowboy hats, robots, and talking terminals are reasons for delight, this year's NCC exhibit floor was the place (McCormick Place, that is) to be.

As more fun than the Chicago Cubs, Commodore's (scantly clad) Cuties added local color to the floor and won for their employers the dubious distinction of having the Gauchest Exhibit at the show, now an annual DATAMATION award. The much more modest Microdata Twins went away with a new award—"Dippy Display" (actually a comment made by an unsuspecting spectator).

In all fairness, we must admit to finding a few flaws in our own exhibit as well. DATAMATION's trusty robot Argon took time off to help out friends from Control Data, which occupied a nearby booth. Actually, radio-controlled Argon began picking up signals from a cordless microphone in use by a CDC spokesman. We knew things had run amok when Argon began echoing the CDC spiel, but with much less pizzazz. The big blow came when the interference affected Argon's motor controls—at one point he unexpectedly took a sharp left and headed into the crowd, bumping into a preoccupied passersby. That's when Argon was put in the corner and asked to keep quiet.

Lear Siegler's "Terminal Railway" and Verbatim's foam rubber cowboy hats complemented each other perfectly, flaunting Texas enthusiasm a year early for NCCers. (Next year's haunt will be Houston.)

One complaint left over from last year's show was the "personal computer/hobbyist problem." This syndrome manifests itself in such comments from exhibitors as "please, no more Looky Lou's"; "too many students"; and "no, this is not a personal computer." Many firms were so disgruntled with last year's "parade of pilgrims," as one company rep described the hobbyists, that they decided against exhibiting in this year's show, as in the case of Ramtek. But a booth rep for one exhibitor, Digital Communications Corp., remarked that "if your location is good—not near any personal computer company booths—you can't help but get valid sales leads because of the sheer size of the show."

Indeed, sales leads is the name of the game for exhibiting vendors, and company spokesmen characterized this year's interest level as "good," "better than last year's," and "better than ever." In fact, a spot survey of vendor opinions about the show attendees indicated an overwhelming belief that the '81 audience was of a higher caliber, comprised of many vps and other executives from management, engineering, and R&D disciplines.

As was noted last year, many exhibitors again commented on the large numbers of visitors from other countries. "International interest has expanded and these people are ready to buy," commented an exec from Wespacific. And a Telex vp added that international response to this year's show was "great, and many good international contacts and sales leads were made."

QUANTITY VERSUS QUALITY

For the first time in recent years, the annual National Computer Conference couldn't be called the biggest show ever—at least not by the number of attendees. While the number of exhibiting companies was up by more than 100 over last year's 400-plus, attendance at the show was down from the more than 80,000 at the Anaheim (Calif.) Convention Center to slightly more than 73,500 at this year's McCormick Place in Chicago.

"That's preferred," commented Larry Jennings, manager of exhibit sales and operations for AFIPS (the American Federation of Information Processing Societies, Inc.), the show's sponsor. "When you decrease the attendance, you increase the quality," he claimed.

There is another aspect of the show that's growing, however—the so-called "camp followers," those companies that set up product demos and hold press conferences in the NCC host city, but that don't lease exhibit space at the show proper.

"We dislike it; we discourage it; we'd like to prohibit it," AFIPS' Jennings said. "When we're able to reserve a large hotel block, we have better control over that situation."

Next year's confab will be housed in the Houston Astrodome. According to Jennings, there will be about the same number of exhibiting companies, but there will be more exhibit space (256,000 net square feet compared to this year's 230,000). There are other promised improvements as well. Texas is a right-to-work state, meaning that exhibitors won't have to contend with the mandatory use of unionized carpenters, electricians, and setup crews that many vendors complained about in Chicago. AFIPS also plans to make sure there are adequate eating facilities at the conference center to avoid the astronomically long lines that formed around lunchtime in Chicago ("The catering service at McCormick Place had had that contract less than one month," Jennings explained. "That alone caused problems."

And there should be enough hotel facilities for show-goers in Houston ("They may be more spread out, but then you can't really say McCormick Place has a host of hotels adjoining the conference center either," Jennings commented.).

But before AFIPS starts looking ahead to next year's big event, it plans to sit back and bask in the glory of a successful show in '81. Only one week after the show closed, an AFIPS staffer said, "It's nap time for us."

Contributing to this story were Becky Barna, Jan Johnson, John Kirkley, Ken Klee, Bill Musgrave, Deborah Soljak, and John Verty.
We eat datacomm problems for breakfast!

We have the finest diagnostic instruments available to solve your datacomm problems. We have bit and byte oriented monitors. We have the top data tape recorder in the industry that will capture data in any format. There is a hard-copy printer, Tech Control for network management, even a simple, portable instrument that checks out both the analog and digital portions of your system and is ideal for field service use.

So don't let datacomm problems spoil your dinner. Bring them to EPICOM - we'll eat them for breakfast. If your problems require custom design capability we may have to save them for lunch.

EPICOM, Inc.

592 North Douglas Ave. / Altamonte Springs, FL 32701
Telephone 305/869-5000

Okay EPICOM, have breakfast on my datacomm system! I need □ a demonstration □ additional information on:
□ data monitors □ data recorders □ Tech Control
□ field diagnostic instruments
□ solutions to unique problems

Name ___________________________ Title ___________________________
Company ___________________________
Address ___________________________ City ___________________________
State ______ Zip ______ Phone ___________________________
"I'm Bob Sharkey. I'm in Manufacturing Operations at Inmac, and I am not crazy. We've built a big business on a very simple premise: Giving you what you need, when you need it.

"Need disks, tapes or floppies? We have them compatible with almost every mini and micro computer made. You need ribbons? We have ribbons compatible with 753 different printers. You need cables and connectors? We have 538 different kinds—in stock, ready to ship.

"We'll custom build cables to your specs. We'll give you any length you want. We can help you connect your CPU to virtually any peripheral you choose.

"And those are just a fraction of the more than 1000 computer-related products we stock and sell. I might get an ulcer trying to keep track of all that stuff, but I don't think I'll have to
"If we don't have the computer supplies you need, I will eat this catalog."

Bob Sharkey
General Manager, Manufacturing Operations

eat a catalog sandwich.
"Call my bluff. Next time you have a problem getting what you need, call Inmac. We give you a sure-fire guarantee on anything you buy from us. You have 45 days to decide that you're fully satisfied. If you're not, we'll give you a replacement, refund or credit. And no hassle.
"We'll give you fast delivery. We have regional distribution centers, so we can deliver to over 90% of the computer sites in the U.S. within two days—by regular surface transportation. Or if you need it tomorrow, we'll get it to you tomorrow.
"Call us. Ask for our free catalog. Better yet, give us an order. All we need is your company P.O. number. Our hotline numbers are listed below:"

Inmac


CIRCLE 26 ON READER CARD

Detroit (313) 961-6865 • Los Angeles (213) 852-0973 • Wash. D.C. (202) 362-8214 • Boston (617) 536-9141 • Manchester, U.K. 92-35-67551
THE NEXT SYSTEMS SUPPLIER?

Storage Technology plans to push the limits of that very precarious business—selling IBM look-alikes in competition with Big Blue.

One would be hard put to name a manufacturer of high-performance computer tape drives other than IBM and Storage Technology Corp. There’s Fujitsu Ltd., the Japanese mainframe maker whose drives are sold in the U.S. by Memorex Corp. And Control Data Corp. possesses the technology. But it is STC that accounts for 55% of the U.S. installed base of 6250bpi drives, more even than IBM has.

As recently as 1976, tape drives were all STC shipped. And yet this maker of IBM-compatible peripherals, now second to IBM in shipments of disk drives, stands to profit handsomely from IBM’s slippage in initial shipments of the new 3380 drives, and, of all things, has begun designing a line of large scale IBM-compatible mainframes.

The Louisville, Colo., company, now in its 12th year, has succeeded in a very precarious business, selling IBM look-alike peripherals in competition with Big Blue. All the products STC is now making will soon be completely obsolete and the firm will, perforce, have a new product line three years from now.

"That’s high risk, because you’re operating completely under the IBM umbrella," says consultant James N. Porter. He observes that STC had made it with tape drives first, then with disks, and now is shooting for PCM mainframes. "Very high risk," he adds. "But if there’s any organization around that has a good shot at pulling it off, it’s STC."

Storage Tech, your friendly vendor at the upper end of IBM-compatible tape and disk drive markets, is going full bore. "We are working towards becoming a full systems supplier," says chairman and president Jesse I. Aweida. From his vantage point, he sees the industry becoming an IBM world. "We believe that IBM operating systems have become (an) industry standard," he adds. At the user level, the inventory of applications programs written to run on IBM 370 hardware is so large that even IBM can not do anything that would obsolete it. "It’s no longer really IBM software. It’s become the users’ software. And that’s what we’re going to be compatible with."

The current line of thinking, the "main line strategy," according to Lee A. Hargrave Jr., STC’s vice president for strategic planning and development, is to compete with IBM in the high-performance dp systems market with a line of mainframes having from 2mips to 40mips. But with first shipments slated for the 1984 time frame, this is subject to change; by that time, the way this industry is going, the smallest processor could well be an 8mips machine, but totally IBM code-compatible.

He sees the need for a full-line, total systems offering at the high end, meaning above the IBM 4300 series. That includes tapes, magnetic disks, whatever nonmagnetic (such as optical) storage technology follows, plus impact printers (offered by STC’s new acquisition, Documation Inc.) and nonimpact line printers of the laser variety, and even a front-end processor to interface with a network. But, Hargrave emphasizes, there’s no interest in terminals like the 3270 family ("That’s a heck of a commodity business"), nor would he recommend that STC become a communications company or a common carrier ("That’s just too much to bite off").

The strategist also sees the need to offer worldwide sales and service, at least in the developed and very advanced developing countries. Ironically, this has been one of STC’s weak points. The company’s principal markets have been the U.S., Canada, Japan, and Europe, and yet revenues from...
outside the U.S. comprise a mere 14% of the total. It has a ways to go.

Also considered imperative over the long haul is vertical integration, backwards into the critical components, if only to avoid becoming dependent on a sole-source supplier. Accordingly, the company several years ago acquired a small semiconductor house, invested in the last two years some $35 million in that operation, and sees it as a source not only for proprietary circuits but also for thin-film heads. STC’s 3370-equivalent disk drive, scheduled for first shipments later this year, will feature these new heads.

Later this year, too, initial production of disk platters is expected from STC Media Technology Corp. The substrate maker is viewed as a secondary, not primary, source of media.

"Unless you have control of your critical components, in terms of costs and delivery schedule, you’re going to be whipsawed in a dynamic market," says Hargrave.

This year the company will also be spending $6 million to $7 million for research in the technology of optical disks, which is considered to be the strongest candidate to replace magnetic recording. Some 65 people are working on this program.

Says Aweida, "We feel we can build a machine like our disk drives with a capacity of 4 billion bytes of storage, and get it to the market in late '83 or early '84." That’s equal to 40 reels of mag tape. And the expectation is they’ll be able to get it up to 10 billion bytes the following year, just by implementing new coding schemes. And although that’s comparable to 100 reels of tape, Aweida says the optical disk is not meant to replace tapes but rather to operate like disks today.

"But the fact that it’s removable is exciting," he adds. The initial product will have a read and write capability but it won’t erase. "That by itself will not make it the technology for the future. We think, though, that in the late '80s it’s very possible you’ll be able to erase and rewrite."

The company last year spent $40 million for R&D, 7% of total revenues. This year it will be closer to $55 million or $59 million, perhaps still at the 7% level, not counting $9 million or so for the mainframe program.

This latter sum comes out of the $50 million raised earlier this year from a limited, or tax shelter, partnership to fund the new STC Computer Systems Corp., a creative way of keeping the R&D costs off STC’s balance sheet.

Under Fred K. Buelow, an early engineering vp at Amdahl Corp., the mainframe development effort already has some 75 people on board, including the eight managers who will be responsible for the architecture, design, and technology. In sharp contrast to the eCL bipolar technology used in all current high-speed mainframes, Buelow’s group is staking its future on the use of CMOS circuits, which are not as fast. It is thought that some of that speed disadvantage can be reclaimed by denser packaging, CMOS being a technology that consumes less power and thus gives off less heat. Having less heat (lower power dissipation) to draw away, it’s possible to crowd the chips more, and that means an electrical signal doesn’t have to travel as far.

In the last fiscal year, STC realized revenues of only some $90 million from the oem business, a market that accounts for more than a billion dollars for Control Data. But to STC’s credit, all this business has been in tape drives, shipped to such customers as Burroughs, NCR, Univac, Siemens, and ICL, and most of the minicomputer makers. But, alas, none of it is in disk drives. A 200MB drive for this market, complete with intelligence, was dropped, reportedly be-
cause of problems in manufacturing. But a possibility for this market is the IBM 3370-equivalent drive. The oem market could become a significant contributor to revenues and profits.

In the past, STC has managed to learn quickly from its mistakes. Such was the case with its first disk drive, the Super Disk. It was a flop, but as Jim Porter says, “With it, they paid their dues.” And when it was necessary to develop a look-alike for the IBM 3350, the company did a superb job. “If they had not done the Super Disk,” says Porter, “they would not be a hero today on 3350 drives. They learned what Winchester technology was all about by doing the other program first, even though it was not a commercial success.” Had they not gone through that experience, he adds, “they would not be the company they are today.”

Some in the industry question STC’s decision to plunge into battle with IBM across the entire systems line. There’s not only IBM but also Gene Amdahl to cope with in that same marketplace, right? Wrong, says Lee Hargrave. The distinction he makes is that STC will have a total systems offering and worldwide coverage.

“I daresay,” he asserts, “that you can count on the fingers of one hand the number of companies that will be able to compete in that market by the end of the decade of the 1980s.”

Who might they be? IBM, of course. And, from the so-called bunch (Burroughs, Univac, NCR, Control Data, and Honeywell), possibly one will switch and offer IBM-compatible systems. Of the three remaining slots, says Hargrave, two will be filled by Japanese—Fujitsu and Hitachi. And the fifth participant? “That’s where my mind boggles. That company is Storage Technology.”

He dismisses Amdahl Corp. as not being a systems supplier, as lacking worldwide coverage, and not being vertically integrated backwards.

This, of course, still fails to explain why Storage Tech should make mainframes at all. Why not stick with what you know best—peripherals? As seen by Hargrave, the company is approaching the limits of its market share in IBM-compatible tape drives, some 55%. After that, unable to acquire a larger market share, it will be able to grow only as the market grows. In disks, he foresees a similar happening, perhaps two or three years out. In printers, where IBM is said to have about a 95% share of market, STC (Documation, actually) is in second place in a market smaller than tapes or disks. The front-end processor market, should STC enter that fray, is not terribly large either.

“If we want to expand,” says Hargrave, “we’ll have to look into other markets. And the one obvious area is that very big mainframe market, which is the next big challenge we see before us. If we want to keep up the growth we’ve had over the first 12 years of our existence, I think we have to get into mainframes.”

—Edward K. Yasaki

COMMUNICATIONS

AMDAHL’S FRONT-END FEVER

The PCM vendor is now doing with front-ends what it earlier did with mainframes—but with much less publicity.

Some years ago there was widespread interest when a relatively new plug-compatible supplier called Amdahl Corp. began to install its first mainframes. The skeptical dp community wanted to determine whether the glowing claims of full compatibility with IBM software, together with certain operating advantages, were more than just marketing hype. After careful comparisons, users found that price/performance advantages really were achievable, and a mark of validity was established for the pcm concept.

These days, the Amdahl 4705 front-end seems to be repeating the earlier scenario—but with little publicity. The Fujitsu-made replacement for the 10-year-old IBM 3705 was first installed last Fall, primarily at sites that already had Amdahl mainframes. By concentrating on existing Amdahl installations, it was reasoned that service would be close-by if needed.

Apparently those safeguards did not reckon with the reliability of the 4705. Out of a reported 25 installations, there have been only two failures and those were believed to be minor, the company claims.

Even though the 4705 is a direct replacement for the IBM front-end, it has some significant advantages due mainly to its newer technology. Because it is a faster processor, the 4705 has improved through-

Amdahl may draw on the networking expertise of its new subsidiary, Tran, to develop front-end software enhancements.

put, with Amdahl marketing representatives claiming an 80% increase in direct comparisons.

While that sounds like a startling improvement, it appears to be accurate. “It is exactly 1.8 times faster (than the 3705),” is the way Albert Bacon, vice president and manager of dp services at Union Planters Bank in Memphis, Tenn., describes the 4705 which he has had since February. Bacon also verified the cost savings claimed by Amdahl, stating that when his two-year lease ran out on the 3705, he saved about $7,000 by installing the Amdahl replacement.

Bacon also praises the ease with which the 4705 was introduced into his 600-terminal, 24-hour on-line network. “The only time we can bring the system down is midnight Saturday. They put the 4705 on the channel at that time and ran diagnostics to check out the interface. When that was completed, we switched all of the tp lines from the 3705 to the 4705 and brought the system back up. We were down about two hours,” he relates matter of factly, “and it has been running ever since.”

At The Southland Corp., 1,600 Seven Eleven stores around the country are interfaced to an Amdahl 470 and an IBM 3033, relates Rulon R. Brough, vice president of management information services. Southland was a Beta test site last Oct. for the Amdahl front-end, and Brough liked what he saw so much that he installed a second 4705. Both mainframes and front-ends are running with the same software they had when the site was equipped with IBM 3705s. And if anything, the maintenance of the 4705 is better now than it was when IBM was taking care of its 3705s, Brough says.

Despite the low-key marketing of the 4705, there is already a six-month delivery schedule, says Jim Baker, product manager for the front-end at Amdahl. But he adds that this is still better than the current one-year wait which he claims users now have for an IBM 3705.

While Amdahl is concentrating on direct 3705 replacements for now, Baker
When you want $1,000,000 in value from a $1,000,000 investment

Your computer hardware and data are worth millions. T-Bar's 3925/26 DASD (Direct Access Storage Device) matrix switch can make them worth millions more. How?

First, by assuring system availability. You replace the chaos of disconnecting and reconnecting cables with simple, 3925/26 pushbutton control, making DASD string or controller substitution fast and easy.

Second, by letting you back up several DASD strings with a single spare controller, instead of inefficient and expensive one-to-one backup. That saves you money that you can use for other critical needs.

Third, by giving you an alternate head of string path without adding more controllers.

And you get more from the DASD devices you have. T-Bar's 3925/26 DASD switches let any of your controllers access any disk string. That gives you the flexibility usually associated with disk packs with the economy and capacity of fixed disks.

If you want your 3925/26 to operate under intelligent matrix control, you can have it now. If you want to wait, you can add it later with no cost penalty.

We'd like to tell you more about our 3925/26 DASD matrix switch. For more information, write or call us.
It’s no coincidence that Colgate-Palmolive and Lever Brothers both chose the same financial software company.
Colgate-Palmolive and Lever Brothers agree on at least one thing. McCormack & Dodge.

They may have different ideas about how consumers should maintain a healthy complexion. But when it comes to how companies should maintain a healthy financial condition, both Colgate-Palmolive and Lever Brothers will tell you the same thing. Make sure your financial controls are second to none. It goes without saying that both companies use financial software packages from McCormack & Dodge.

**It's no coincidence that Anaconda, Encyclopaedia Britannica, Manufacturers Hanover and Marriott chose us, too.**

Colgate-Palmolive and Lever Brothers are related by virtue of the products they make and the markets they sell. But Anaconda, Encyclopaedia Britannica, Manufacturers Hanover and Marriott are not. They're related in a different way. Through their attainment of leadership positions in their respective industries. It goes without saying that they also use financial software by McCormack & Dodge. So do over 1,000 other top companies in banking, consumer products, food and beverage, health care, insurance, manufacturing, natural resources, paper products, publishing, retailing, and transportation.

**Why do we keep changing the system that manages more fixed asset accounting than any other package in the world?**

Manufacturers Hanover, Colgate-Palmolive and Lever Brothers all have a McCormack & Dodge fixed asset system. They use it to achieve unparalleled scope in property accounting and tax reporting.

More than 600 other leading companies use the same package, called FA Plus. We introduced it eleven years ago, with a promise printed on every user contract. It said we would never allow our fixed asset system to get out of date. And we haven't. We've just introduced the fifth major rewrite of FA Plus, bringing the package up to date with the very latest changes in tax law and accounting practices.

And now that we've made FA Plus as current as we possibly can, we've already assigned an R&D team to the next rewrite. Because R&D is the heart and soul of McCormack & Dodge. Just this year; our researchers came up with another breakthrough. Big news for minicomputer users.

**The most advanced general ledger and accounts payable software ever to run on the IBM 370. Now available for the IBM System 34, HP 3000 and the whole Prime line.**

Our general ledger and accounts payable packages, GL Plus and AP Plus, are well known to Fortune 500 executives. For unparalleled reporting flexibility. Until recently, these programs were only for big-computer use. But we've just succeeded in adapting them to the IBM System 34, HP 3000 and the Prime 200-850, several minicomputers that fall comfortably within the budgets of companies with sales of $18 million to $50 million a year. Not to mention the countless divisions of giant companies with their distributed data processing needs.

**The best hands-on training in the industry. Hands down.**

When you call McCormack & Dodge and ask us to send a sales rep, we might well send a CPA. Our entire company is staffed by people who know accounting software from the client side, because they've been accountants, data processing managers and controllers. They apply this inside knowledge to create exceptionally thorough (and successful) user training programs. Our training programs make sure your system is up and running quickly. Because your people learn in a practical, hands-on environment. Errors are worked out in our classrooms, not your offices.

**It's no coincidence that Canadian General Electric chose McCormack & Dodge, too.**

McCormack & Dodge is a world company. Our systems are in operation from Minneapolis to Melbourne, and so are our offices. We've traditionally offered coast-to-coast service in the U.S. And now we offer it in Canada, too, with offices in Montreal, Toronto and Vancouver. On both sides of the Canadian border, prospects who sit down and talk to us do more than just talk. They become customers.

We'd like to show you why.
NEWS IN PERSPECTIVE

makes it clear that there is a strong possibility added features such as X.25 compatibility may well be added in the near future. Taking note of IBM's expected 3705 upgrades, Baker said the 4705 would probably not be enhanced to include the capabilities of the new IBM front-end. While the existing 4705 will get additional features some of which are not available on the IBM box, Baker notes that a new Amdahl front-end is also under development (presumably by Fujitsu) to match the IBM upgrades.

Amdahl may also draw on the networking expertise of its new subsidiary, Tran, to develop front-end software enhancements, although this is only one of several sources that may contribute to the 4705 upgrades, Baker indicates.

Following the pattern first established in the mainframe area, direct replacement of IBM hardware is only a first step, Baker points out. Beyond that, Amdahl has many software improvements that could be added to take advantage of the 4705's faster technology.

The front-end business may not be as interesting as CPUs from a plug-compatible standpoint, but Amdahl seems to be working to assure that history repeats itself—even if it is on a somewhat smaller scale.

—Ronald A. Frank

FAXPAK PLAYS CATCH-UP

Faxpak's managers are hoping to reposition the network from left field into the batter's box.

It was supposed to be just what typical high volume facsimile users needed. When ITT first began operating its Faxpak service late in 1979, the concept was innovative and seemed to fill an important need. As originally described by ITT's Domestic Transmission Systems DTS, Faxpak would add a store-and-forward capability to the transmission of facsimile messages to give users a value-added network that could be accessed from any point in the U.S.

Many of the facsimile machines at user sites could not communicate with each other because they operated at different speeds, used different protocols, or had other incompatibilities. Thus Faxpak was designed to add computer switching and intelligence so that ultimately most fax devices could send messages to other fax devices.

Well, a funny thing happened on the road to this facsimile heaven. Apparently the usage of facsimile machines progressed much faster than the ITT DTS marketing staff expected. While the network service slowly phased into support for the slower so-called Group I, or four to six minute machines, high volume users were shifting rapidly to faster, all-digital, Group III units which typically send a normal size business document in less than one minute. In addition, many users were migrating from Group I to the faster two to three minute Group II machines which Faxpak could not handle. The group designations are a reference to efforts within the Consultative Committee for International Telegraph and Telephone (CCITT) to bring standards to the facsimile scene.

So during 1980, Faxpak concentrated on serving users of the slower four to six minute machines while the demand was shifting to higher speeds. By early 1981, seven network nodes were in operation offering dial-in service for early generation facsimile machines that users were quickly leaving behind.

"The problem was getting the network aligned with where the market was going and where the users were," comments John Mallone, national sales manager for Faxpak.

BARCO introduces 32 kHz horizontal scanning color data displays

BARCO now extends its range of CDCT 3 color data displays, which features 15 kHz and 22 kHz versions, with a 32 kHz horizontal scanning model.

- Screen sizes: 15" or 20".
- Phosphors: standard persistence, long persistence RGW or RGB.
- Construction: cabinet or rack.
- Frontpanel controls for contrast and brightness.
- RGBS inputs with low return loss loop through filter.

For more information contact:

BARCO

B-8720 Kuurne, Belgium
When you can't get your price lists fast enough—call International Graphics.

International Graphics converts your computer tapes into printed and bound price lists—quickly, professionally and economically.

Join the growing number of companies who keep their price lists, parts lists, catalogs, manuals and other printed materials up-to-date the quick, efficient way through the computerized composition and printing services of International Graphics.

Here's why:

1. **Speed.** International Graphics saves you time by formatting and typesetting directly from your data base computer tapes! Then we print your material and deliver it. We're also close to you with 5 plants coast to coast.

2. **Quality.** Phototypeset pages are easier to read than computer printed pages. And International Graphics has the latest state of the art computer driven phototypesetting equipment to give you a wide variety of typestyles and sizes to make your pages look neat and professional.

   We offer complete design services.

3. **Security.** Because your work is produced under one roof data remains secure and confidential.

4. **Economy.** When the job calls for many pages and large quantities, the cost is surprisingly low. We format and print directly from your data. You save both time and money. You'll also save on paper and shipping costs because typeset pages require up to 40% less space than computer printed pages.

For full information on how International Graphics can save you time, money and give your price list a professional look, call 800/328-7172, ext. 1024 or send the coupon below to: Computer Directed Services, International Graphics, 1660 S. Highway 100, Minneapolis, MN 55416.

---

Please indicate:

_______ Number of copies
_______ Number of pages
_______ Number of printings per year

Name __________________________ Title __________________
Telephone __________________________

Company __________________________
Address __________________________

City __________________________ State __________ Zip __________

---

CIRCLE 33 ON READER CARD
In order to shift the service toward the greater revenue that seemed apparent in the faster machines, DDS closed five network nodes, laid off or shifted about 65 network employees to other jobs, and consolidated the existing two nodes in Washington, D.C., to handle current traffic requirements.

Despite this upheaval and reorientation from its original slow-paced plans, Mallone feels Faxpak is still a network that can meet user needs, although he admits that "we continue to play catch-up ball." Mallone estimates that 4,000 facsimile machines are now active on the network. About 25% of these are the Rapifax 100, which represents the latest generation of subminute digital machines. These faster digital machines are supported by one of the two nodes or specialized processors that remain in Washington. In the fourth quarter of this year, DTS intends to add support for the 3M 9600, which Mallone says is another of the subminute Group III machines becoming popular with high volume users.

Meanwhile, a second Washington processor is handling traffic from Group I and Group II machines. The Group II machines comprise an area only recently supported by the network, and Mallone concedes that this was a marketing flaw; the company simply missed the target in anticipating the needs of users. Actually, the five nodes that closed were all designed to support the slower Group I analog machines and they represented a network capacity that never matched up with user requirements.

Faxpak's new focus is on higher speeds. Last year, Faxpak focused on serving users of the slower four to six minute machines while the demand was shifting to higher speeds. Now with only the consolidated node in Washington, the original Faxpak concept to have direct local dial-in facilities in major cities has been cut back to the use of higher cost phone lines. Whether the network again expands to have nodes in other cities will depend on demand. Right now efforts are being channeled into software development that will allow other subminute digital machines to be supported.

There are now about 60 different machine types supported on the network, and in most cases users are able to send messages between incompatible machines since all transmissions are sent through the special processors at the network node.

Rates are based on a two-tier structure with either 15 minute or two hour delivery being available. Initially an overnight delivery had also been planned but this has now been dropped, Mallone point out. The faster 15 minute delivery costs 16 cents per minute during the day and 10 cents per minute at night, while the two hour priority is 10 cents per minute during the day and six

NEWS IN PERSPECTIVE

In Europe
ADV/ORGA F.A. Meyer GmbH
D 29400 Wilhelmshaven,
Kurt-Schumacher-Strasse 241
West Germany
(04121) 8021
D 62 Wiesbaden
Blumenstr. 6
West Germany
(06121) 377076
ADV/ORG (Schweiz) GmbH
Mainaustrasse 17
CH-8069 Zuerich, Switzerland
(01) 251270
Cullinane Benelux N.V.
Boulevard du Souverain 348
Bolte 15
1160 Bruxelles, Belgium
(32) (2) 660-09-28
Van Gentstraat 6-1
1055 PE Amsterdam
Netherlands
(020) 867352
Cullinane (UK) Ltd.
Premier House
150 Southampton Row
London WC1B 5AL, England
(44) (1) 837-9565
Finnsystems O/Y
Akiokatu 15 A
SF-00100 Helsinki 10
Finland
(358) (0) 177901

For information,

Including seminar schedules worldwide on IDMS, the integrated, dictionary-driven DBMS that meets the six key factors for success in database systems.

Contact the Cullinane representative nearest you.

M-Data Ltd.
El Venzel o 46, Kollihe
Athens, Greece
(30) (1) 9590-631
Praxis Calcolo
20122 Milano
via Viscardi di Modrone 32, Italy
(39) (2) 799601

00184 Roma
via Firenze 43, Italy
(39) (6) 840470

Scand-Systems
Box 235
S-133 02 Soltsjobaden, Sweden
(46) (8) 717777

SEMA Informatique
16-18 rue Barbès
92126 Montouge, France
(33) (1) 6571300

T & G Ibérica, S.A.
Avenida de America, 37
P - N° 20 (Torres Blancas)
Madrid-2, Spain
(34) (1) 413 6114

In the Middle East
Computer Power Limited
O & G International
Consultancy Centre
P.O. Box 519
Bahrain Island, Gulf
(993) 231-082

Contahal Limited
54 Ibn Qwair Street
Tel Aviv, Israel 64364
(972) (3) 269379

In North America
Cullinane Canada Ltd.
100 Yonge Street, Suite 410
Toronto, Ontario M4W 3C7
(416) 928-0988

Saskatoon, Canada

In South America
Cullinane do Brasil Ltd.
Rua Jeronimo de Lemos 162
Giaiau, 20, 560
Rio de Janeiro R.J., Brasil
(55) (21) 268-8799

Av. Angelica 501-Gt. 301
01277-2 San Paulo, Brasil
(55) (11) 826-4757

Messing y Asociados
Ceml 512 Piso 7 of. 3°
1010 Buenos Aires, Argentina
(54) (1) 37-8898

T & G Internacional S.A.
Edificio La Linea
Penthouse Torre "A"
Av. Libertador
Córdoba Postal 1050
Apartado 21008
Caracas 1020 A. Venezuela
(58) (2) 782 42 22

Database: Cullinane

...
Want to ask IBM a database question they can’t answer?

Ask them to explain to you how their database software works together.

IBM's big problem is that most of their database software was developed by users. As a result, it doesn't work well together, if at all. This often comes as a big surprise to top management.

Cullinane's database software was designed and developed to work together in an elegant way with the data dictionary as the driving facility.

So if you are considering IBM database software vs. Cullinane, ask IBM to show you how their database software works together, particularly with an integrated data dictionary, and yes, also include an online query, a report generator, an application development system and an online program development facility. When it becomes obvious to everyone, including your Vice President of Finance (or whoever signs the contract), that Cullinane has this integration and IBM doesn't, he will approve your recommendation to acquire IDMS.

Then call us with the good news!
Hewlett-Packard MTS 3000 users...

Agile’s LC-3000 interface lets you attach ANY RS232 peripherals YOU want to HP’s MTS 3000 synchronous communication line.

AGILE 800/538-1634
In California, phone 408/735-9904

AGILE CORPORATION • 1050 Stewart Drive • Sunnyvale, CA 94086
TWX 910-339-9399
CIRCLE 35 ON READER CARD

RELATIONAL DBMS IS A FOUR-LETTER WORD.

INFO. It’s the high productivity language with a powerful relational DBMS capability.
INFO. It has other capabilities too. Built-in screen painter, data entry/data update, query language, report generator and application development language.
INFO. Its simple English commands make computers easier to use for everyone—Managers and Secretaries alike.
INFO. It is so efficient it improves programmer productivity by 10 times over COBOL in application program development.
More than 400 operating installations – on DEC VAX, Prime, Honeywell DPS/6, IBM 4300, 303X and 370 systems – prove INFO capabilities.
INFO. It’s more productive. For details write or call.
Henco, Inc., 35 Walnut St., Wellesley, MA 02181.
(617) 237-4156
(TWX 710 383 7529)

INFO. FOR GREATER PRODUCTIVITY.

CIRCLE 36 ON READER CARD

NEWS IN PERSPECTIVE

FAXPak processors include a Modcomp cpu and a special front-end developed in-house by ITT. The computer control with specialized software provides the ability to automatically retry a receiving machine if a busy signal was encountered earlier.

Despite its computerized features, FAXPak will have to prove that it is now in step with the needs of users. Instead of simply making a phone call to dial a distant fax machine, a user must remember to dial the FAXPak number to take advantage of the extra cost value-added services that the network provides. Such features as the ability to send one message in “broadcast mode” to many receiving machines is available as part of the store-and-forward network.

Whether Mallone and his sales crew have found the right formula of network offerings this time around will obviously be determined by the level of FAXPak usage in the coming months.

—Ronald A. Frank

ANTITRUST

JUDGE JOINS THE CHORUS

The latest plea for an end to the U.S. vs. IBM case came from none other than Judge Edelstein.

An apparent light at the end of that long tunnel, the Justice Department’s antitrust case against IBM, emerged from the gloom in April when the presiding judge offered his help in achieving an out-of-court settlement and told both sides he wanted the six-year-old trial brought to a conclusion by the end of May.

As the month of May began, court observers seemed optimistic that a settlement would be achieved, but neither side would comment officially as to whether out-of-court talks were under way.

The trial, filed in January 1969, was not without highlights during its final days. IBM, in a move seen as preparing it for a split into smaller entities, has announced plans to sell the service to a Japanese firm. This action has been criticized by both industry leaders and government officials.
Our CIT-101 video terminals are upstaging all other competitive models. For one, you can count on immediate shipment. And secondly, you can expect truly outstanding performance.

Here are just some of the features that make this CRT the star of today's video scene: Plug compatibility with the DEC® VT 100, and DEC® VT 52, and other 132-column models. A 16-megahertz Monitor and non-glare screen, coupled with matted non-glare key caps, make for a design that is optically engineered to reduce eye fatigue. Variable speed smooth scrolling for more convenient data display. Easy change from 80 to 132 columns without memory loss, made possible by our standard 3200 character buffer (132 columns x 24 lines). Better reading double-height characters, available in single and double width formats. A monitor mode that displays the control codes you need in program debugging instead of an expensive line analyzer. A set-up mode "C" that offers you full VT 52 mode, "form-feed" to clear the screen, half and full duplex selection, as well as window erase and screen dimmer capability.

You also get special operator-oriented features, such as a "no-scroll" key status indicator, a set-up mode dictionary display, repeat key, home/clear key and "time of day" in set-up mode. Besides unrestricted 9600 BAUD transmission, the CIT-101 offers an optional independent bi-directional serial port that provides you with a link to a variety of other peripherals. All this is accomplished without the use of custom LSI.

As you can see, the CIT-101 by C. Itoh steals the show from all other CRTs. And it's miles ahead when you want your show to go on, as quickly as possible. Contact our exclusive representative for an exclusive preview. ACRO Corporation, 18003-L Skypark South, Irvine, CA 92714, (714) 557-5118, Houston, TX, (713) 777-1640, Cherry Hill, NJ, (609) 667-4114; Chicago, IL, (312) 992-2346.

**C. ITOH ELECTRONICS, INC.**
One world of quality.
It's easy to add the competitive power of Voice Recognition to your product line. The cost is low and the return on the investment is very attractive. Whether you are an OEM or an end user, Interstate has a Voice Recognition product to suit your needs; terminals and boards for system integration and chips to create your own sub-systems.

**Terminals.** Interstate standalone Voice Recognition terminals perform voice controlled data and word processing with a vocabulary up to 100 words and 99%+ accuracy. You unpack them, power them, and immediately begin talking to your system. You can develop and execute resident application software using voice data input without going through expensive, time consuming integration.

**Boards.** Interstate Voice Recognition Q-Bus,** Multibus,** and Lear Siegler Dumb Terminal® compatible boards are capable of recognizing up to 100 words or short phrases in any language. They perform all training, updating, word recognition and communication for your selected vocabulary. Accuracy is 99%+.

And if you need voice response we also offer a Multibus board with a 1500 word vocabulary.

**Chips.** Three separate chip products from Interstate provide Voice Recognition capabilities with 100, 25, and 8 word vocabularies and accuracies up to 99%+ for your commercial, industrial and consumer applications.

Discover the world of voice. Data entry via direct human to computer communication makes voice recognition ideal for a broad range of application areas including office and factory automation, word processing, small business data processing, computer-aided design, building security and many more. Whatever your application, the benefits of voice are virtually unlimited.

**Talk to the experts.** We listen just as well as our computers. Tell us your voice recognition needs. We've got the terminals, the boards, and the chips to meet them. And we've got them now.

Write to: Manager, Marketing, Voice Recognition Products, Interstate Electronics Corporation, 1001 East Ball Road, P.O. Box 3117, Anaheim, California 92803.
(714) 635-7210 or call toll free (800) 854-6979.

**INTERSTATE ELECTRONICS CORPORATION**

CIRCLE 38 ON READER CARD

Call to attend our nationwide voice seminars.

Q-Bus is a trademark of Digital Equipment Corporation.
Multibus is a trademark of Intel Corporation. Dumb Terminal® is a trademark of Lear Siegler, Inc.
NEWS IN PERSPECTIVE

formed a new customer engineering division for its General Systems and Office Products operations. The move may mean, industry observers say, that the industry leader will spin out a separate marketing operation to handle low-end, non-370-type computers.

On April 17, Judge David N. Edelstein ordered IBM and the Justice Department to wind up the trial by June 1, commenting, "I don't care if you get more help, I don't care if you work morning, noon, and night. This is in effect my ruling: May 30." He noted also that he would offer all his services for an out-of-court settlement, even to fly to Washington "as often as I have to."

"Maybe we can sort of use Washington and New York. I will do whatever I can do in order to produce a settlement of this case," he said.

IBM's lead counsel, Thomas D. Barr, responded, "I think my client would agree to any kind of negotiations at any time at any place." He added, apparently in reference to previous attempts to reach an out-of-court settlement over the past few years, that the Justice Department is "simply unwilling to negotiate at any time under any circumstances."

At press time, both sides continued to decline comment when asked if out-of-court talks were underway or by what means.

Shortly before the judge's setting of May 30 as the last day of the trial, IBM had asked for a dismissal of the case or declaration of a mistrial on grounds that its attorney-client privileges had been abused. It was the third time IBM had made such a motion, although the most recent motion was based on a Supreme Court ruling last January that expanded the privilege of confidentiality for communications between lawyers and clients.

In its latest motion, IBM had argued that the judge's rulings against IBM on privilege claims involving more than 20,000 documents "were plainly erroneous."

IBM lost on that motion, however, with Judge Edelstein saying, "I take a very dim view of this motion at this juncture to declare a mistrial or dismiss the complaint. The motion is denied. It may be renewed together with other motions to dismiss when this trial is concluded."

IBM has also tried to force Judge Edelstein down from the trial on charges that he was prejudiced against IBM witnesses and lawyers and had taken the government's side in the case, but the U.S. Court of Appeals turned that motion down last year.

The judge's call for serious discussions of an out-of-court settlement follows at least eight discussions between the two parties in the last year and a half, none of which have borne fruit.

IBM's counsel Thomas Barr responded to the judge's call for a May 30 end of the trial with a warning about the large findings of fact that would be required at that time.

"The findings effort is truly an enormous and monumental undertaking," Barr said. "I am very concerned about the size of the paper that we will ultimately be delivering to your Honor. . . . The problem that I would have of getting my arms, in your Honor's place, around that huge volume of material from each of us, is really quite overwhelming."

To which the judge responded, "How do you think I have managed until now? Have the physical problems been small?"

Barr replied: "By comparison to what you are now going to be faced with, your Honor, I would go so far as to say they have been tiny."

IBM's counsel was referring to the summary of facts to be delivered to Judge Edelstein, who alone is hearing the case, by the government and IBM. Each side is expected to take several months to challenge the other's findings and then the judge would be able to make a judgment. Court observers indicate that the judge would probably not be able to begin sorting through the trial documents until sometime next fall and they point out that he has in the past said it would take him about a year to make a decision.

Judge Edelstein is in his '70s and it has been suggested that he is anxious to have the case settled out of court so he won't have to deal with the massive number of documents and complex arguments that have been submitted over the past six years.

Barr at one point suggested another way out: "At least one other way occurs to me—which would be a happy day—which is that the government finally understood what the case was all about and decided to drop it. That, it seems to me, it could do."

Later in the month IBM moved to have William J. Casey, the CIA director, be a witness for its side. At pre试me, that motion was being fought by the Justice Department on grounds it would unnecessarily delay the trial, especially in light of the
This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these securities. The offering is made only by the Prospectus.

1,650,000 Shares

Intertec Data Systems Corporation

Common Stock

Price $22.50 Per Share

Copies of the Prospectus may be obtained in any State in which this announcement is circulated from only such of the underwriters, including the undersigned, as may lawfully offer the securities in such State.

Bear, Stearns & Co.

Bache Halsey Stuart Shields
Dillon, Read & Co. Inc.
Drexel Burnham Lambert
L. F. Rothschild, Unterberg, Towbin
Warburg Paribas Becker
A. G. Becker
Allen & Company
Arnhold and S. Bleichroeder, Inc.
William Blair & Company
Alex. Brown & Sons
Cazenove Inc.
A. G. Edwards & Sons, Inc.
Ladenburg, Thalmann & Co. Inc.
Neuberger & Berman
New Court Securities Corporation
Rotan Mosle Inc.

Donaldson, Lufkin & Jenrette Securities Corporation
Shearson Loeb Rhoades Inc.
Wertheim & Co., Inc.
Bateman Eichler, Hill Richards
Incorporated
F. Eberstadt & Co., Inc.
Hambrecht & Quist
Moseley, Hallgarten, Estabrook & Weeden Inc.
Oppenheimer & Co., Inc.

Banca del Gottardo
Banque de Paris et des Pays-Bas
Bergen Bank
Credit Commercial de France
Lazard Brothers & Co.
Lombardfin S.p.A.
M. M. Warburg-Brinckmann, Wirtz & Co.

April 16, 1981
NEWS IN PERSPECTIVE

The man himself on the witness stand. The judge's targeted finishing date.

Casey, whose remarks were presented in printed form to a Dallas luncheon meeting at the Center for International Business Conference when he was unable to appear in person, contrasted Japan's government-sponsored R&D in the computer field with the U.S. government's attempt to "break up IBM."

"The United States now has a comparative advantage in agriculture, services, and though the advantage is slipping, in specialized manufactures (sic) such as wide-bodied aircraft and computers," the CIA man said. "We know that Japan is taking dead aim, through government-subsidized research and government-influenced consolidations, to create more powerful competitors to take on IBM in the world market.

"At the same time our antitrust policy, ignoring the reality of a world market, seeks to break up IBM, and many antitrust rules make it difficult for U.S. companies to rearrange their affairs in a way that reduces costs and increases productivity in order to permit them to compete both here and abroad on equal terms with their foreign competitors." IBM was quick to publicize Casey's remarks to the press, even if it couldn't get the man himself on the witness stand. The antitrust comments from a high-ranking government official seemed to echo recent comments by the Defense Department that a breakup of AT&T, which is undoubtedly a monopoly—albeit through federal regulation—would have dire consequences for national security. The Defense Department claimed that national security is dependent on a unified telecommunications network.

CIA director Casey seemed to connect preeminence in global markets by multinationals such as IBM to national security.

and questioned the Justice Department's antitrust case against AT&T.

Casey, too, seemed to connect preeminence in global markets by multinationals such as IBM to national security. He cites "increasing nationalism, increasing terrorism, and vanishing resources" as "three realities" that are threatening U.S. positions in key market arenas. The U.S. multinational, he said, is dependent on other nations for "such strategic minerals as chro­mite, cobalt, tantalum, and several other strange names we seldom see in a direct sense... . Were we to lose access to these minerals, it would mean massive shocks to our economic system and current lif­estyles. Without these minerals we cannot make tv sets or computers... . The implications for our defense capabilities are just as grim." —John W. Verity

SUPERCOMPUTERS

Highbrow Hardware

The goal of supercomputer scientists is to improve processing speeds by a factor of 100 by the end of the decade.

In designing nuclear weapons, reactors, and the like, one class of computer jobs run is the Monte Carlo calculation. With this technique, which attempts to duplicate a process that is statistical in nature, it is possible to trace the interaction of nuclear particles with different materials and learn about, for example, radiation shielding, e.g., how thick a concrete wall will be in order to protect delicate instruments from radiation damage? Such a calculation could run for an hour or two on a Cray-I supercomputer and produce a result with a 20% uncertainty factor. Unfortunately, results in Monte Carlo calculations are not considered believable until they get down below 10%. But a recent job would have taken 32 hours on a Cray computer to achieve a 5% uncertainty, and to get it down to a comforting 1% would have required 800 hours.

Solving large scale calculations, which chew up exorbitant amounts of machine cycle time, is what brought together a gathering of August users and pushers of supercomputers. The meeting, at Gleneden Beach, Ore., was sponsored by the two Dept. of Energy laboratories at Los Alamos, New Mexico (LaSL) and at Livermore, Calif. (LLL). And it drew computer designers from companies like Acsys, Burroughs, Control Data, Cray, DEC, Denelcor, Floating Point System, H-P, IBM, SEL, Univac, and that maker of big machines, Intel, in addition to some academicians.

But supercomputers are not the exclusive province of the U.S. The Japanese, with encouragement and financial impetus from the government, are also working on vector machines with speeds beyond anything available today. Cognizant of this, U.S. bureaucrats have sounded a tocsin against the Administration's budget cutters, lest on-going R&D projects in this technology be cut or cancelled.

Advances in supercomputer technology were placed into historical perspective by Jack Worlton of LaSL in an after-dinner presentation. He noted that 1981 marks the 38th anniversary of the founding of the Los Alamos lab, the 50th anniversary of the first "successful electronic computer"—ENIAC, and the 29th anniversary of the Livermore lab. In that period, Worlton said, the speed...
WE DIDN'T INVENT DISTRIBUTED DATA PROCESSING. WE MERELY PERFECTED IT.
THE ONLY DDP SYSTEM THAT COMES COMPLETE:
DATA GENERAL'S ECLIPSE SYSTEM.

Since its inception about five years ago, conservative estimates place the amount of money business has invested in DDP to be an astonishing three billion dollars.

Astonishing, particularly when one considers that almost all of it has gone for systems that, to put it mildly, are incomplete.

In point of fact, it's lamentably rare to find any DDP system that doesn't suffer from one form of this malady or another.

Some manufacturers have seemingly mastered the hardware but are all too wanting in software. While others are reasonably sound at software but at best only fair when it comes to communications.

However, there is one company with worldwide software and service support whose systems are operating in over 75% of the Fortune 100 companies, as well as countless other companies throughout the world, that offers through a unique combination of power, function and flexibility, the most comprehensive approach to Distributed Data Processing in the industry. Data General.

What specifically is it about Data General that allows us to claim superior DDP capabilities? Simply this: ECLIPSE® Systems supply more of the key ingredients for successful Distributed Data Processing at the same place and the same time than any other system you can buy.

For example, ECLIPSE Systems utilize the widest and most comprehensive range of software available. Instead of the traditional heavy, complex software that takes too much time to manage, Data General has dedicated a large part of its Research & Development resources over the past 12 years to provide you with easy-to-use, quality software, with sophisticated and simplified programmer productivity tools.

Software such as our Advanced Operating System (AOS), a modern, proven operating system designed for the interactive environment; ANSI-standard Interactive COBOL with easy-to-use display extensions; PL/1; INFOS® file system; a CODASYL compliant DBMS; and AZTEXT™ word processing. All of which helps you get your applications up and running faster, while measurably helping to reduce the time spent on enhancements and maintenance.

ECLIPSE Systems have the most comprehensive proven-in-use communications capability available and working today. Not only RJE and 3270, but also networking software based on X.25 protocols that have been successfully implemented in our customers' accounts for years.

And with Data General you get compatibility across our product line. This gives you the benefit of using your Data General software expertise on each successive distributed data processing application without costly program rewriting or programmer retraining.

There is a wide variety of sizes to choose from, ranging from a 1 to 4 terminal system to a 128-terminal mainframe-size system. And the selection of terminals and storage devices is, without question, unsurpassed in the industry.

If you have new applications or you want to distribute out of the mainframe environment, and you want the power, function and flexibility that allow you to implement, enhance and maintain applications not just on time, but in budget, contact our local office or write to Data General, 4400 Computer Dr., Westboro, Mass. 01580.

You'll discover our solution to DDP is the most comprehensive in the industry because our thinking is the most comprehensive in the industry.

© 1981 Data General Corporation. ECLIPSE and INFOS are registered trademarks and AZTEXT is a trademark of Data General Corporation.
of computing has grown from two or three operations per second on punched card accounting machines used at Los Alamos in the World War II years to more than 10 million operations per second today. That's more than seven orders of magnitude, he pointed out, and yet this group is meeting with vendors to say, "That's all well and good, but what we need is another two orders of magnitude—and preferably in this decade, if you don't mind."

George Michael, who heads the computer research group at L.L.L., filled in the details. He said in the decade between 1950 and 1960, which saw the development of transistors, of Univac computers, the CDC 1604, and the IBM 7900, the lab experienced a factor of 100 (two orders of magnitude) improvement in computers. From '60 to '70, it gained another factor of 100, thanks to MSI, LSI, "and Seymour," referring to the designer of CDC's supercomputers who went off to form Cray Research. But from 1970 to 1980, Michael continued, "we barely got a factor of 10." And outwardly there is no indication that in the current decade of the '80s there will be anything more than a factor of 10 improvement—and we'll be lucky to get that. Thus the meeting—not only to push the vendors to produce the factor of 100 jump by the end of the decade but specifically a factor of 10 improvement by 1985. The decade-end goal of something 100 times faster than a Cray-1 or a Cyber 205 would be performing from three to four billion floating point operations per second.

"I believe that's an achievable goal," Michael said hopefully. The solution must have a mathematical cast (new algorithms adapted to fit strange new architectures), a language cast (how do you express your ideas?) and an architecture cast (the possibility of a data flow machine, as well as various configurations of multiprocessors). Perhaps there's salvation, as well, in the Josephson technology or in gallium arsenide to get down into the range of a nanosecond per cycle.

To the casual observer, the frontrunners would appear to be Cray and CDC, which have been the primary vendors of supercomputers to the nuclear weapons and weather bureau folks. It was said that 70% of the LASL work load was in nuclear weapons work, some 90% at L.L.L. And at LASL there are between a half-million and a million lines of FORTRAN code to do these design calculations. It would appear, then, that the cards are stacked in favor of Cray and CDC. But Michael denied this, noting that at Livermore they are willing to rewrite their code for a new and incompatible machine that offers a factor of five improvement in speed, but not for a factor of two. Keith Taggart of LASL, on the other hand, said it would take an order of magnitude improvement before they'd do any recoding for an incompatible machine.

For anyone with a legitimate interest, the folks at Livermore have designed sample problems (declassified, of course) of the types of codes they run—things with names like Lagrangian and Eulerian hydrodynamic calculations, Monte Carlo calculations, and magnetohydrodynamic codes. They're complete problems including the graphics 1/0 requirements, and the like. These codes, in an international standard FORTRAN, enable a designer to run the job on his computer to see how it compares with the Cray, for the software comes with performance numbers on the Cray-1. It is available also not as code straight out of the language compiler but also with some hand coding that pro-
This terminal will make you feel better in the long run.

When it comes to those marathon performances at the keys, most terminal models can make the going rather rough. That's why Lear Siegler has developed the ADM-32 Intermediate Terminal™ video display. An ergonomic innovation.

Because using any other terminal for prolonged periods will cause an operator to twist, turn, hunch, bunch, squint and squirm. Which means that fatigue is maximized and productivity minimized. But with the ADM-32 you can do away with terminal torture. Because the 32 is engineered from the human point of view. That's ergonomics.

In the long run, comfort and ease increase productivity. And on the 32 you'll find such comfort-increasing features as a detachable keyboard that eliminates unnecessary twisting and turning. A 12" or 15" screen (30.5-38.1 cm.) that eliminates hunching and bunching. And a non-glare screen with optional tilt that eliminates squinting and squirming. And as a special added feature, you'll find visual attributes with complete editing to highlight and format the display. Plus, two pages of memory that allow you to enter data on one page while transmitting from the other.

What could make more sense? After all you're not paying your operators to train for the Olympic Marathon. So do what'll make everybody really feel better in the long run. Call Lear Siegler today. Ask about the ADM-32 Intermediate Terminal.

LEAR SIEGEL, INC.
DATA PRODUCTS DIVISION
714 North Brookhurst Street, Anaheim, CA 92803 800/854-3805. In California 714/774-1010.

Intermediate Terminal is a trademark of Lear Siegler.
Since its beginnings, SAS has provided a software system to save time. Now SAS/GRAPH adds a new dimension to the powerful, time-saving SAS system.

With SAS/GRAPH, you don't need a different software system for each of your different graphics devices. The same SAS/GRAPH system supports ADI, Calcomp, Chromatics, Hewlett-Packard, IBM, Ramtek, Servogor, Tektronix and Zeta equipment with device-intelligent software. SAS/GRAPH also provides a universal driver that can be easily linked with vendor-supplied software for most other devices.

Whatever device you use, in batch or interactive mode, you only need two or three simple statements to produce most displays. And that adds up to a big time-savings.

But best of all SAS/GRAPH is integrated into SAS, so you get the benefits of the total SAS system—a system now saving time in report writing, statistical analysis, data management and as a higher-level programming language at more than 2500 OS, OS/VS and VM/CMS sites.

And you can add SAS (including SAS/GRAPH) to your dp staff for less than half the cost of a new programmer.

For information on the Zeta 1453, write or call Nicolet Zeta Corporation, 2300 Stanwell Drive, Concord, CA 94520 (415/671-0600).
duces optimum run times; this so-called best-effort program, of course, will not run as is except on a Cray. According to Michael, some of these problems have been sent to CDC, Cray, Burroughs, IBM, DEC, to Europe and the U.K., and to a number of interested universities.

According to Worlton, there are four reasons why a superfast computer is needed. One is to telescope time. He explained that a job that runs for 100 hours on today's fastest computers doesn't actually get the luxury of one hundred consecutive hours on the mainframe; it is more likely performed over a three-week period since other scientists are waiting for their crack at the number cruncher. If it were possible to telescope by a factor of 100, the job could be done overnight. And a one-hour job could be done in less than a minute—with a scientist being able to work at a terminal.

Secondly, fast computers help improve the quality of products produced at the labs. Worlton observed that these are not your basic consumer products, but deal instead with the safety of reactors and other equipment.

Third, they help reduce both computing and the cost of major products. It is estimated now, he explained, that the first demonstration power plant for magnetic fusion energy will cost a billion dollars. With that much money at stake one wants some very powerful simulation tools with which to model the entire plant—not just bits and pieces of it—before proceeding to build one.

And finally, it would help increase productivity of the labs' most valuable resources—scientists and engineers.

Better hardware, continued Worlton, has been based on improvements at the components level and at the structural level. He referred to the so-called Moore's Law, a prediction by Gordon Moore in 1967 that the number of components on a chip would double every year. The Intel Corp. chairman and CEO, who worked for Fairchild at the time of his prognostication, was correct until about 1975. In 1979, Moore wrote in the IEEE Spectrum that the doubling was occurring every two years, rather than annually, and he expressed concern that the interval might stretch out over time. Others confirm this concern, Worlton noted, saying the industry just can't supply chips that are a hundred items faster than today's.

"So, just as there's no free lunch, there's no free computer speed," observed Worlton. This means tomorrow's machines will likely be incompatible with today's applications programs, for users will have to get their speed improvements from structural change in the processors, and this probably means dealing with explicit parallelism. The speaker also noted that Gene Amdahl, in a paper at the 1967 Spring Joint Computer Conference, spoke of the dangers of parallel processors. When you build a computer with two distinct modes of operation, one high-speed and one low-speed the overall operation will be dominated by the low-speed side, Amdahl had asserted. Worlton said he thinks this basic principle is still sound.

"There's less risk in using a small number of fast processing elements than there is in using a large number of slow processing elements," he wrote, adding, ". . . The success of multiprocessing, at least in the first generation, is going to depend at least as much on compiler quality as it will on computer quality."

But Worlton noted that while one must recognize the dangers of multiprocessing, one must also admit that the necessary speeds will not be achieved without it. The speaker also referred to Marvin Minsky's Turing lecture of 1970 in which he speculated that the speedup from multiprocessing would be proportional to the binary logarithm of the number of processors used. Or, in order to get a factor of 10 improvement in speed, one must have a thousand active processors. That may be overly pessimistic, Worlton said.

But none of the speakers at this conference, including Worlton, commented on an earlier observation by the meeting's keynote speaker, C. E. Leith of the National Center for Atmospheric Research, Boulder, Colorado. Leith spoke of the direction being increasingly complex software.
At last. A low cost, realistic alternative to the IBM 370. The Formation 4000 Information System is a complete minicomputer system that runs DOS/VS, OS/VS1 or VM370, plus your 370 applications software. Without reprogramming.

Think of the savings in time and money. Thanks to our unique Program Equivalent architecture, your library of 370 software is ready to put on your Formation 4000 as soon as it's operational.

Not a plug-compatible CPU. The Formation 4000 is a powerful, 32-bit minicomputer system that includes processor, controllers, and peripherals. In a complete, integrated system.

The Formation 4000 reduces costly downtime in two ways. Our unique, modular redundancy extends system performance and can automatically compensate for failing modules. Access via a remote console is available to provide instant hardware and software support, as well.

We supply the total package—complete installation, service and support of Formation 4000 systems.

Whether you market 370 software, develop customized computer solutions or manage data processing services, the Formation 4000 is the smart alternative in computer systems.

To learn more, write Formation, 823 East Gate Drive, Mt. Laurel, NJ 08054. Or call (609) 234-5020.
NEWS IN PERSPECTIVE

that the computational physicist has to deal with and the increasing degree to which knowledge of computer architecture is impacting on the computational physicist’s work.” On the Cray, he explained, there are issues like how to turn loops inside out, or why isn’t this loop vectorizing? “I never had to think of this before,” he said.

Kershaw added that he was concerned about the next generation of supercomputers, the multiprocessors, and the data flow machines “where the possible ways of executing a given FORTRAN statement are multiplied.” As this occurs, software becomes more complicated, and the physicist becomes more concerned with architectural issues, with physical issues, and less with numerical algorithms.

“. . . To whatever degree it’s possible to have the software worry about these issues for me, so I can focus my attention on physics issues and numerical algorithm issues,” he told the vendors, “that would be very much appreciated.”

The physicist also put his endorsement on a timesharing capability in any future system, acknowledging that some scientists disagree. Kershaw said large codes are much more easily debugged in an interactive environment than in batch. “. . . I think large programs are much more useful to the scientist if he can interact with them.” This capability allows the user to question his program as it’s running, thus determining what the current values are. And if the program is veering in the wrong direction, he can change parameters, alter the course of the simulation, provide a different set of initial conditions. In a batch system, he explained, one might not discover this until after the job had run for several hours.

Performance improvements stemming from improvements in algorithms were illustrated by Worlton. He told of a scientist who took the time to examine a job that ran for 90 minutes. Finding that it was using an inappropriate algorithm, he used a better method, reprogrammed the job, and got it to run in only five minutes. And that, he pointed out, is a factor of 18 improvement, or two supercomputer generations.

“Their are an awful lot of examples like that in our business,” he observed, including several that have produced an order of magnitude improvement independent of hardware advances. But the labs lack the manpower in their budgets to do more of this. He lamented the government’s willingness to put lots of money into new hardware instead of balancing the effort with money for numerical analysis and the development of new algorithms.

Conference co-organizer George Michael of LLL says he recognizes that high-speed computing, such as that discussed at this meeting, represents a minority of the computing community at large. But he feels there’s enough interest in it to warrant forming a special interest group, perhaps within the ACM (Assn. for Computing Machinery) or the IEEE (Institute of Electrical and Electronics Engineers), to conduct similar discussions among academics, manufacturers, and users.

In recognition of the need for more than exotic hardware, he quips: “We’re saying that high-speed computing is more than a floating-point muscle.”

—Edward K. Yasaki

APPLICATIONS

TELETETX TO THE RESCUE

Participation in an experimental teletext project just may save the license of a public broadcast tv station in Los Angeles.

Electronic home information systems are proliferating all over the world under a variety of names and with varying effects. In Los Angeles, one such system may actually save the license of a public broadcast television station.

In this case, it is a teletex system that’s being used in a cooperative project by the CBS Broadcast Group, CBS-owned KNXT-TV, public tv station KCET, the Caption Center/Los Angeles and Telediffusion de France. The latter is lending more than $1 million in Antiope Videotex Systems equipment for the project. The gear includes special page generating equipment, captioning equipment, and the French group’s patented transmission system, Didon.

Whatever the project’s far-reaching effects, it could have an immediate salutary effect on KCET. Last month the station found that its Federal Communications Commission license to operate was in danger of being revoked.

The license was renewed three years ago. But in a case brought before the U.S. Court of Appeals by a Los Angeles deaf person and by the Greater Los Angeles Council on Deafness (GLAD), complaints were made that the station wasn’t serving viewers with hearing impairments.

Because public television stations such as KCET receive federal financing, they must demonstrate to the FCC that they are complying with the Federal Rehabilitation Act of 1973, which protects the rights of handicapped persons. The court said KCET

FOR $1190, YOUR PBX CAN GIVE A GOOD ACCOUNT OF ITSELF

It’s more convenient, more durable than paper tape. And a built-in microprocessor assures highest data integrity. RS 232C interface provides a standard connection to your equipment. Data storage on cassettes is neat, uncluttered and dependable.

Learn how to end the paper chase. Call toll free: 800-258-3884.
Or write, MFE Corporation, Keewaydin Drive, Salem, NH 03079.

MFE’S MODEL 2500 CASSETTE TERMINAL.

Analyze your phone usage with an SMOR. Store over 1/2 megabyte data via industry standard RS 232C interface. Built-in microprocessor does most of the work.

So pick up the phone and make a new connection now.
Call toll free: 800-258-3884.
Or write, MFE Corporation, Keewaydin Drive, Salem, NH 03079.

MFE’S MODEL 2500 CASSETTE TERMINAL.

Analyze your phone usage with an SMOR. Store over 1/2 megabyte data via industry standard RS 232C interface. Built-in microprocessor does most of the work.

So pick up the phone and make a new connection now.
Call toll free: 800-258-3884.
Or write, MFE Corporation, Keewaydin Drive, Salem, NH 03079.

MFE’S MODEL 2500 CASSETTE TERMINAL.

Analyze your phone usage with an SMOR. Store over 1/2 megabyte data via industry standard RS 232C interface. Built-in microprocessor does most of the work.

So pick up the phone and make a new connection now.
Call toll free: 800-258-3884.
Or write, MFE Corporation, Keewaydin Drive, Salem, NH 03079.
Miniterm® is The Answer.
A remarkable tool that gives you instant information wherever your work takes you.

Finally, a truly portable computing system for people who don’t know the first thing about computers. Just plug it in, respond to a few simple prompts, and get immediate answers.

The Answer lets you audit field operations, enter orders on the spot, check inventory, automate field diagnostic operations, or provide computer-aided sales demos. In short, you can process data anywhere, anytime. You can even send data over ordinary telephone lines. It’s as easy to use as a portable typewriter, and it’s no bigger than a briefcase.

It’s the latest in the Miniterm Series from CDI, a leader in portable computing for over a decade; but you can call it The Answer, because that’s what it gives you.

For a demonstration or more information contact Computer Devices, Inc., 25 North Avenue, Burlington, MA 01803 USA, (800) 225-1230.


NEWS IN PERSPECTIVE

must meet those requirements. But now, KCET is involved in the joint teletex project, which offers captioned data as an option for persons with impaired hearing.

KCET is using what is known in simple terms as the narrow black bar that shows up at the bottom of the picture when a malfunctioning tv loses its horizontal hold and the picture starts jumping through the screen.

Below that black bar, a television user with a special decoder can receive “captioned” versions of the programs. The user also can receive a lot of other things, such as next week’s television programming schedules. Or, the user can push a button after a commercial for, say, refrigerators and get a list on the tv screen of all local distributors. This is done with a keypad, like a calculator keypad, which also

With the system KCET is using, a subscriber with a special decoder can receive “captioned” versions of the programs.

can be used to get information pertaining to a public affairs broadcasting program, such as what newspaper or magazine articles, books, or videotapes are available on the subject.

Antiope Videotex Systems introduced the French broadcast teletex system to the U.S. more than two years ago. CBS began studying it, along with the British CEEFAX and ORACLE systems, in January 1979. Actual on-air testing began in March 1979 at CBS-owned KMOX-TV, St. Louis. These tests continued in other cities and on network long lines to develop transmission methods to ensure reliable service in the U.S. KCET also conducted technical tests, culminating in a public test in March 1980.

On July 29, 1980, CBS filed a petition with the FCC to establish U.S. teletex standards, based on a modified Antiope system. On approval of standards by the FCC, broadcasters will be able to acquire the equipment to transmit teletex, and receiver manufacturers can begin mass production of decoders to be used with existing television sets, along with television receivers equipped with built-in teletex decoding capability.

On the other side of the world, the Australian Broadcasting Commission has begun field trials of Antiope equipment. ABS officials said the decision to turn to Antiope followed unsatisfactory trials of a British system. They said that system, originally designed for use in UHF stations, did not test well on its low-numbered VHF channels. Data was distorted in its passage from the transmitter to the tv set, they said, leading to errors or omissions in the pages of information.

The Australian broadcaster said it would make a request to its Federal Com-
Get your Green Book now—free.
28 valuable discount coupons worth $11,000 toward the purchase, lease or rental of terminals, printers, modems and more.
Without it your next data products acquisition could cost you more than it should. Lots more.
USIR can provide you with any data product you need. Or any combination of products as a package. Even competing lines. With service nobody can beat... not even the original manufacturer. And now the Green Book saves you thousands of dollars!
You get it all from USIR: top name brands, nationwide service, guaranteed delivery, and flexible financing. Including our new Extended Term Rental program that combines the convenience of renting with the lower rates of leasing.
Send the coupon today and get the best possible deal on data products. From USIR.
United States Instrument Rentals, Inc.

Save up to $11,000 this year on data products.

Don’t buy, rent or lease any data products without the USIR Green Book.

O.K. USIR, send me your free Green Book.

Name
Title
Company
Phone
Street
City/State/Zip
USIR, 2988 Campus Drive, San Mateo, CA 94403, (415) 572-6600.

CIRCLE 59 ON READER CARD
FOR APL FANS ONLY:

78 OVERSTRIKES, 20 SYNONYMS, AND A DEVILISHLY CLEVER APL EDIT KEY.

If you're not into APL, this ad won't interest you. But if you're an APL fan, you'll probably drool over the AJ 510 CRT with our new APL package.

Besides an APL keyboard and character set, you'll get 78 valid overstrike characters plus 20 "synonyms" to let you keep pace with printer terminals that can form these characters. We've expanded the language to increase your compatibility with various timeshare services—and your ability to handle a variety of applications.

We've also included other intriguing features to save you time and trouble. Such as on-line APL power-up. Off-line ASCII power-up. Default tab settings. Form feed recognition. Line-oriented editing. Auto line insertion. Cursor key transmission. Short form cursor addressing. Specified character repeat. Programmable field/page delimiters. And a lot more.

A call to the AJ regional office nearest you will get you full details: San Jose, CA (408) 946-2900; Rosemont, IL (312) 671-7155; Hackensack, NJ (201) 488-2525. Or write Anderson Jacobson, Inc., 227 Devcon Drive, San Jose, CA 95112.

ANOTHER AJ INNOVATION TO MAKE YOUR COMPANY RUN BETTER.

CIRCLE 60 ON READER CARD

NEWS IN PERSPECTIVE

munications Department, similar to CBS' request tests if the Antiope tests succeed.

And in Britain, where it all started, the system called Viewdata and now known as Prestel seems to be facing marketing problems. "The strategy behind the creation of Prestel," said Lee R. Greenhouse, director of new electronic media programs for LINK, New York City, "was that the mere presence of the system would attract users, and that service providers would pour their resources into developing applications. Neither has come true, leaving the system in a crippling chicken-and-egg dilemma. Because the system lacks users, service providers are reluctant to develop their applications, and in the absence of these applications, users see no compelling reason to regard the system seriously."

Bell Canada has been experimenting with what is generally known as the videotex concept since 1977. Its Telidon alphanumeric display system stores and describes images in the database as geometric shapes—points, lines, rectangles, polygons, and arcs. Telidon has been sold in the U.S. for use by the Public Broadcasting Service in Washington, D.C., and also in Venezuela. Canada's minister of communications, Francis Fox, has expressed the conviction that "where these systems are compared, Telidon will come out ahead on all counts, including cost."

Consumers are well aware of the new electronic media, but they have had little or no hands-on experience.

France calls its Antiope-based service Télétel. And here in the U.S., GTE has a system it calls Infovision, which attempts to use local newspapers as operators in a national system linked by GTE's Telenet operation. The GTE concept calls for newspapers to serve their markets with local videotex centers tying together various host computers (banks, retailers, etc.) and having gateways to remote computers in other cities. Under this plan, GTE shares revenue generated from the newspaper's market; the newspaper collects revenue every time a user from its locale accesses the system.

Greenhouse of LINK said a study his firm conducted with Dresser, Morris & Tortorello showed that consumers have a high degree of awareness of the new electronic media but that this is tempered by a lack of hands-on (or eyes-on) experience. "The mere presence of an operational system is not sufficient in itself to create a base of users," he said.

He said the study also indicated that consumers would have no difficulty in using such entertainment devices as a TV set for performing two-way functions, but that two-way service would have to be marketed distinct from the original entertainment offerings.
A Data Mover Product from DCC

Our STAT MUX can reduce your communications costs by combining multiple costly circuits into one circuit, and improve reliability with error-free transmission. DCC's Data Movers currently service major operating U.S. Networks.

The CM-9100 Statistical Multiplexer offers:

- 4 to 32 subscriber lines
- Synchronous or Asynchronous input protocol
- X.25 Level 2 support
- Built-in diagnostics
- Optional High Speed backup line
- No impact to existing terminals, computers, or software
- Many other standard and optional features
- Immediate delivery

Thirty-day free trial
For further information, or details about our new 30 day free trial offer, contact the Data Communications Marketing Department.

Digital Communications Corporation
A M/A-COM Company
11717 Exploration Lane
Germantown, Maryland 20767
(301) 428-5600 TWX 710-828-0541

Atten: Data Com Marketing
Please send me more information on DCC's Data Movers.

Name _______________________
Address _____________________
City _________________________
State _________________________
Zip __________________________

Digital Communications Corp.
11717 Exploration Lane
Germantown, Maryland 20767

CIRCLE 61 ON READER CARD
This announcement is neither an offer to sell nor a solicitation of an offer to buy these securities. The offer is made only by the Prospectus.

Not a New Issue / April 29, 1981

615,000 Shares
Graphic Scanning Corp.
Common Stock
Price $27 per share

Copies of the Prospectus may be obtained in any State in which this announcement is circulated only from such of the undersigned as may legally offer these securities.

E. F. Hutton & Company Inc.
Bache Halsey Stuart Shields
Bear, Stearns & Co.
Blyth Eastman Paine Webber
Dillon, Read & Co. Inc.
Donaldson, Lufkin & Jenrette
Drexel Burnham Lambert
Lehman Brothers Kuhn Loeb
L. F. Rothschild, Unterberg, Towbin
Smith Barney, Harris Upham & Co.
Warburg Paribas Becker
Wertheim & Co., Inc.

Available right now — and for under $600! PrintaColor ISB001, the world’s first low-cost color inkjet printer. All the advantages of hard-copy color graphics. And at a price you can afford! One thin dime — and two minutes time! Fast, quiet and cost efficient. Just 10¢ per copy! Typewriter-size desktop unit uses ordinary fanfold paper. And continuous copy printing, unattended. What you see is what you get! Now expand the advantages of color graphics to color hard copy. PrintaColor’s innovative overlay system gives you the high quality of color inkjet printing without the high cost. From the display screen to the desk or conference table — graphics in color — quickly, quietly, efficiently, and now affordably! Call or write for the name of your nearest representative.

PrintaColor Corporation P.O. Box 52 Norcross, Georgia 30091 404/448-2675

NEWS IN PERSPECTIVE

The service being offered in Los Angeles doesn’t have to interfere with a TV picture. The additional data is tucked away under the black bar at the very bottom of the screen and is not normally visible to persons who don’t have the keypad-like decoders.

For instance, KCET could, for users with a decoder, wipe out the entire picture and ask questions about a subject brought up on, say, the popular program “Sesame Street.” The user would come up with an answer and push the “reveal” button on the keypad. A portion of the page on the TV screen that was blank would quickly be filled with the answer to the question.

In the L.A. test, 30 receivers equipped with teletex decoders are located in public places. By this summer, 100 additional receivers will be placed in private homes. During the life of the experiment, the number of sets may increase.

And the service being provided for the deaf might just have an impact on the Court of Appeals—in KCET’s favor.—Edith Myers

WANTED: PUBLIC OPINION

It’s not clear what, if anything, people want to do with videotex, and how much they’re willing to pay.

For a number of reasons, very few homes in the U.S. are equipped to receive the new information and entertainment services becoming available through their TV sets or special videotex terminals. Neither side seems willing to make the first move.

“I don’t know if ‘obstacle’ is the right word,” says Robert Plummer, “but it seems to me that the thing that stands between where we are now and mass use of electronic systems in the home is that no one really knows whether the general public gives a damn. I think it’s just not clear yet what, if anything, people want to do with this kind of system.” Although people have been studying the market for two-way home video services, he added, it’s still not clear what the public wants and how much it’s willing to pay for it.

Plummer, of the Institute for the Future, was on a panel at a two-day symposium on these systems, sponsored by Strategic Inc., San Jose, Calif. Fellow panelist Carroll Reeves of Tandy Corp. said he thought the biggest obstacle to success in this market was the superfluity of conferences and study papers on videotex systems, which tend to divert valuable man-
For automobiles, Rolls Royce sets the standard by which all others are judged. For Direct Distance Dial (DDD) Data Modems, it's Rixon, and for good reason. Only Rixon offers a complete line of Bell compatible DDD modems operating from 300 BPS to 4800 BPS. As in automobiles, quality makes the difference. When selecting modems, look for reliability, latest in LSI and microprocessor technology, diagnostics, appearance, size, and intermixing of different card modems in the same rack. Like superior automobiles, you will enjoy the experience.
This announcement is not an offer to sell or a solicitation of an offer to buy any of these securities. The offering is made only by the Prospectus.

May 6, 1981

830,410 SHARES

DATA I/O

COMMON STOCK

PRICE $22 PER SHARE

Copies of the Prospectus may be obtained in any State in which this announcement is circulated only from such of the Underwriters as are qualified to act as dealers in securities in such State.

Blyth Eastman Paine Webber
Incorporated

Hambrecht & Quist

Bache Halsey Stuart Shields
Incorporated

The First Boston Corporation

Bear, Stearns & Co.

Donaldson, Lufkin & Jenrette
Securities Corporation

Drexel Burnham Lambert
Incorporated

Goldman, Sachs & Co.

E. F. Hutton & Company Inc.

Kidder, Peabody & Co.
Incorporated

Lazard Frères & Co.

Lehman Brothers Kuhn Loeb
Incorporated

Merrill Lynch White Weld Capital Markets Group
Merrill Lynch, Pierce, Fenner & Smith Incorporated

L. F. Rothschild, Unterberg, Towbin

Salomon Brothers

Shearson Loeb Rhoades Inc.

Smith Barney, Harris Upham & Co.
Incorporated

Dean Witter Reynolds Inc.
power from the implementation of such systems. Reeves, whose company brings you Radio Shack and the TRS-80 personal computers, is in favor of starting small with home video information services and growing along with the using public.

"I guarantee you, I don't know what the people want. And I don't think you'll find out if you ask them," he said. But if you test market enough systems, offering a variety of services, you'll find enough winners, popular features, and programs to determine what sells and what doesn't. "I think interchanges like this are good," he added, "but let's not forget that doing it is going to get us more information."

Concerns about the social implications of these home systems were also raised, such as the invasion of privacy, whether information services broaden or narrow the gap between the information-rich and the information-poor in our society, and whether transaction services will cut out middlemen such as travel agents and insurance salesmen.

But Robert Sullivan of Warner Amex Cable Co. said an initial concern over privacy among customers of the Qube system in Columbus, Ohio, became a nonissue after the first year of operation. The system vendor is in a position to know what every Qube viewer is watching every minute of the day, he explained, a necessity because a viewer pays to see certain programs and must be charged accordingly. Qube sometimes also polls its viewers' sentiments online, if you will, like an address by the President of the U.S. The results are immediately flashed on the screen, but expressed only as a percentage of the viewers participating, never in terms of absolute numbers. "So I think there's an overconcern about privacy," Sullivan said.

According to Joseph Roizen of Telegen, promoters of the French Antiope Video-text System, there are two main obstacles to be overcome. One is the lack of any standards in the U.S. to assure that a teletex receiver in one part of the country picks up the same type of signal as one used in some other part of the nation. Roizen says the Electronic Industries Assn. has a teletex committee studying the different teletex systems and, hopefully, will recommend to the FCC by the end of this year the parameters for a U.S. teletex service that would apply to the entire nation. And if we're fortunate, he said, it will also be adopted by Canada and Mexico.

Secondly, Roizen sees perhaps a bigger obstacle, the incremental cost to the user to equip his tv set to receive teletex signals. But the voluble speaker was optimistic that a decoder in mass production could be offered for perhaps 20% of the price of the set. And perhaps the government will insist that all tv sets sold be so equipped, as it did with the uhf tuner.

—Edward K. Yasaki
This advertisement is neither an offer to sell nor a solicitation of offers to buy any of these securities. The offering is made only by the Prospectus.

May 8, 1981

4,000,000 Shares
Heizer Corporation
Common Stock
(Par Value $.01)

Of the above shares of Common Stock, 800,000 shares are being sold by the Company and 3,200,000 shares are being sold by certain Selling Stockholders.

Price $17.50 per share

Copies of the Prospectus may be obtained from any of the several underwriters, including the undersigned, only in States in which such underwriters are qualified to act as dealers in securities and in which the Prospectus may legally be distributed.

The First Boston Corporation
Bache Halsey Stuart Shields
Dillon, Read & Co. Inc.
Goldman, Sachs & Co.
Lazard Frères & Co.
Merrill Lynch White Weld Capital Markets Group
Salomon Brothers
Wertheim & Co., Inc.

Shearson Loeb Rhoades Inc.
Bear, Stearns & Co.
Donaldson, Lufkin & Jenrette
E. F. Hutton & Company Inc.

Blyth Eastman Paine Webber
Drexel Burnham Lambert
Kidder, Peabody & Co.
Leehman Brothers Kuhn Loeb

Incorporated
Securities Corporation
Incorporated
Incorporated
Incorporated

L. F. Rothschild, Unterberg, Towbin

Warburg Paribas Becker
A. G. Becker

Hambrecht & Quist
Much of the current momentum behind IRM in the government derives from the passage of the Paperwork Reduction Act of 1980.

have to answer to stockholders about what they’re doing with information techniques,” the source says. “Top management is going to feel more accountable about what it’s doing. More and more businesses are going public with their computer and information systems.

“This will create a bandwagon effect. Management will want to show that what it’s doing to get markets makes the company viable. As the MIS [management information services] department gets more into the limelight, it will be seen as a career path to top management. Then the question will be whether the technician is capable of expanding into the new management role.”

And opportunities increase in what formerly was a closed profession, the depth and breadth of people entering IRM is growing rapidly.

“Most of us associate information gathering with a library, where you look at books on the shelf, hear ‘ssshh!’ and ‘did you look in the card catalogue?’ all the time,” says Ramona Crosby, an organic chemist and supervisor of information services for Stauffer Chemical Company. “Librarians were given no thought in large corporations. If one of those companies had a library, they operated it under the same mental set as when you grew up. That meant the decision-makers gave it no resources.

“Now the management is taking an active interest in IRM. The first time I tried to hire a PhD for the library, they wanted to know why. Now they don’t ask me anymore. There’s a much more positive attitude about it. I think the Paperwork Reduction Act is going to help, too, because a lot of companies will use it as a model. I certainly plan to.

“I’m convinced at this point that IRM is being recognized by management as a resource within the corporation.”

“That’s absolutely true,” agrees a private sector source. “The key to IRM is to have the tools to manage information cheaply and effectively. At its fundamental level,
PRC Shipping, Carrying and Storage Cases give your software all the protection it deserves.

Meet Data Vault™. The most advanced system ever developed to protect your tapes, disc-packs and floppies from the hazards of shipping and storage.

All, available in a range of designs to meet virtually all your single- and multiple-unit carrying, shipping and storage needs. And, backed by the reputation of reliability we’ve earned in fifteen years of providing cases for specialized markets like the computer and film industries.

We can also design and manufacture Custom Cases to meet your special requirements. Call your dealer—or, if you prefer, contact us directly.

SINGLE SHIPPERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV1-06-25</td>
<td>Ships one 600' tape reel in tape seal</td>
</tr>
<tr>
<td>DV2-06-25</td>
<td>Ships one 600' tape reel in canister</td>
</tr>
<tr>
<td>DV1-12-25</td>
<td>Ships one 1200' tape reel in tape seal</td>
</tr>
<tr>
<td>DV2-12-25</td>
<td>Ships one 1200' tape reel in canister</td>
</tr>
<tr>
<td>DV1-24-25</td>
<td>Ships one 2400' tape reel in tape seal</td>
</tr>
</tbody>
</table>

DVS-06-01 holds 600' reels
DVS-12-01 holds 1200' reels
DVS-24-01 holds 2400' reels

MULTIPLE SHIPPERS AND CARRYING CASES

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DV2-24-25</td>
<td>Ships one 2400' tape reel in canister</td>
</tr>
<tr>
<td>DV6-24-25</td>
<td>Ships one 2400' tape reel in Easy Load II seals</td>
</tr>
<tr>
<td>DV3-23-25</td>
<td>Holds one front-loading disc cartridge (IBM type 2315)</td>
</tr>
<tr>
<td>DV3-54-25</td>
<td>Holds one top-loading disc cartridge (IBM type 5440)</td>
</tr>
<tr>
<td>DV3-67-25</td>
<td>Holds one top-loading disc cartridge (DEC RK06 or RK07)</td>
</tr>
<tr>
<td>DV0-FD-25</td>
<td>Ships from 1 to 10 standard or mini floppy discs</td>
</tr>
<tr>
<td>DV5-FD-25</td>
<td>Ships up to 50 standard or mini floppy discs</td>
</tr>
</tbody>
</table>

Multiple-unit Data Vault shippers and carrying cases feature:
- Thick-walled polyethylene foam construction
- Interlocking, all-plastic internal panels
- All-foam top and bottom
- Only one removable insert—no wire or metal parts to scratch or damage contents
- Rugged, luggage-type handle
- Industrial-quality hardware throughout
- Will fit reels in canisters, tape seals, or Easy Load II seals

Patented positive-action locking system.

Rugged, unbreakable polyethylene construction
- Internal shock-absorbing foam
- Our patented positive-action locking system
- Built-in carrying handle and address card holder
- Wide variety of colors for coding
- Optional logo or corporate identity imprinting

PRC Computer Products Company

A Division of Plastic Reel Corporation of America, 46 Passaic Street, Building 52, Wood Ridge, NJ 07075 (201) 933-9125

See us at COMDEX, booth #2927

©1981 Plastic Reel Corporation of America

CIRCLE 68 ON READER CARD
NEWS IN PERSPECTIVE

IRM says that the development in computers and communications has made it possible to manage information as if it were a concrete resource. Business is getting the message.**

Despite their recent phenomenal growth, MIS and IRM are not yet express lanes to the executive suite. Many corporations still regard the skills necessary in these areas as lacking in business and general management background to qualify their practitioners for high level positions.

But as information needs multiply within companies, MIS managers and executives will have a greater sphere of influence and involvement in broad areas of corporate decision-making. And as more corporations turn into reality the theory of information as a resource equivalent to people, labor, and capital, the greater the role MIS executives will play. As IRM comes to the fore, requiring corporate investment, time, energy, and organization, so will its promulgators.

"MIS departments can have a leading role in IRM, but it won't happen automatically," warns Joseph Ferreira, vice president of The Diebold Group. "Unless MIS department heads take steps to free themselves of a lot of the routine, time-consuming, low-payoff activities that clog their work load, they won't be able to involve themselves in new business tools that are a crucial part of the IRM picture. The key to success will be offloading as much routine work as possible to the users and getting maximum user involvement in system development."

The hard part will be educating and training users. A recent survey by The Diebold Group indicates that MIS departments are spending less than 1% of their budgets on education and training and less than one-tenth of one percent on users. That's equivalent to less than 40 cents per year per corporate employee, which won't even get them on the subway. If IRM is to continue its good times, it's mandatory that maximum attention be paid to developing computer literacy throughout companies as a whole, not merely in the MIS department. How well that department performs the task may determine whether its employees will move up the ladder or out the door.

"For the long-term health of MIS departments, it is essential that strong efforts be made to place MIS personnel in positions within user departments," says Robert Tobey, director of Diebold's research program. "In large measure, the high turnover we see in the ranks of key MIS personnel is due to feelings of dissatisfaction and lack of appreciation because their career paths are blocked. Those firms that have actively sought to place their MIS people in key business positions already have a large measure of de facto IRM responsibility and know-how."

IRM's other major difficulty is its intangibility. It shows immediately on the debit side of the ledger, but might remain invisible for a few years on the credit side. The instant expenses of installing a new system are obvious; the savings so achieved are not. Without outside pressures from aggressive competitors or an inquisitive government seeking a plethora of health, education, welfare, and whatever other information strikes its fancy, businesses may be reluctant to part with the significant capital outlays often required to institute meaningful IRM.

"I think big business sees it as a drain on corporate resources," Solomon says. "It's still viewed as overhead. It's an overt expense but a hidden saving, and it doesn't present a tangible return. But companies that are heavily regulated and scrutinized are moving forward faster than those which aren't. Under the negative pressures of regulatory control and a hostile Congress, companies will marshal their resources to resist governmental intrusion. "Companies will turn the corner when they realize the lack of goals to support IRM is costly, time-consuming, and wasteful. Information can only be measured from the cost of not having it."

Fewer and fewer businesses are willing to pay the unknown price. Even the government has finally gotten the hint. "The implementation of the Paperwork Reduction Act is one possible avenue corporations should be watching," admits a knowledgeable private sector observer. Fallout could include raising the country's overall level of competency in computer usage, if from nothing else than sheer volume of agency usage; a significant reduction in data collection demands and reporting requirements imposed on business, and learning from the government's experiences in practicing IRM.

"The agencies are starting from a different position because of their obsolete equipment and crusted-over bureaucracy," the observer says. "Most chief executive officers would say their organization is managed far better than the Post Office. But the fact that IRM has reached government levels proves it is pervasive."

—Willie Schatz

Model 204 DBMS. You're 'remiss' if you don't check it out.

Here's what the leading software rating service says: "Anyone interested in installing a flexible, user-oriented DBMS would be remiss if they did not evaluate Model 204."

They're right. It will pay you to check out Model 204. Because you'll find that Model 204 is so easy to use that you won't need large teams of programmers for bringing up new applications. And you'll get the job done quickly. Which means big cost savings.

And it will pay you to evaluate Model 204 performance. Because you'll discover that Model 204 performs—and keeps performing, even if your database grows up into the billions of bytes and your terminals get into the hundreds. Which means no system changes, no reprogramming. Which means big cost savings.

Don't be 'remiss.' Get further information by clipping your card to this ad and mailing to us at 675 Massachusetts Avenue, Cambridge, MA 02139. Or call 617-491-7400.

Model 204 DBMS

Computer Corporation of America


CIRCLE 69 ON READER CARD

JUNE 1981 75
OUR MEDIA IS OUR MESSAGE.

Over the past seven years we've earned a name for ourselves by making the best magnetic media in the business. Precision magnetic media — Diskettes, Mini Diskettes, Diagnostic Diskettes, Rigid Discs, Disc Packs, and Disc Cartridges — all certified to be 100% error free both on-track and between the tracks.

Now we're making it easier for you to buy the best.

Just dial Dysan direct TOLL FREE at 800/538-8150 or 408/988-3472 (in California) or contact your local Dysan office.

Precision magnetic media from Dysan.

Our media says it all.
### News in Perspective

**Banking**

**ATM Nets Go National**

American Express has endorsed the networking concept of automated teller machines.

It appears as if it will be a nonbank that will take electronic banking nationwide.

American Express Co. has, in a sense, put Instant Teller, a California-based Automated Teller Machine (ATM) network for independent banks, on the national scene. Amex brought up two of Instant Teller's ATMs into its gold card cash dispensing program. A link has been established between Instant Teller's computer center in Los Angeles and American Express' center in Phoenix. "We're the switch for American Express," said Nell A. Cox, senior vice president and general manager of City National Bank's computer center.

American Express gold card holders can access the two machines (one owned by City National and the other by California Canadian Bank) and get on-line verification for cash dispensing via the switch from California to Phoenix and back. Although only two machines in California are involved initially, Instant Teller is the first multiple bank ATM network to hook up with a national travel and entertainment ATM system.

And now, American Express has announced plans for a pilot system it will develop with "a number of banks" to do what amounts to the reverse. The big T&E operation is talking to banks and bank networks in Los Angeles, Houston, Washington, Dallas, Miami, and Detroit for a scheme whereby bank cards (debit cards, not charge cards) could be used in American Express traveler's check dispensing machines to obtain travelers checks.

After negotiations are concluded with the first six cities, Amex plans to go into New York, Philadelphia, and Atlanta. "They can't move too fast," said Cox of City National. "They'll have to develop a lot of software to enable their system to recognize a lot of different individual debit cards. We could do it easily (take part in the pilot). All we'd have to do is reverse the software we already have."

Instant Teller is the largest multi-bank ATM interchange on the West Coast. Last month it became the first such network to operate interstate; the network moved into Oregon. "We're in the process of moving into Washington state and will move into Arizona very shortly," said Cox.

The Instant Teller network includes 40 banks (with 16 more committed) and 107 ATMs (with an additional 41 committed). Cox said they expect to have about 200 ATMs by the end of 1981.

"We're probably the fourth or fifth largest ATM network in the country," said Gil Davenport, head of marketing for Instant Teller. "But it's like comparing apples and oranges. We drive all of our ATMs through our central host computer. In other networks, the network center drives some ATMs and merely acts as a switch for others. In terms of the number of ATMs driven by the central host, we're the largest."

Davenport was hired by Instant Teller in 1979 from Docutel. The Instant Teller program actually was started by Community National Bank of Bakersfield in 1975 with 12 machines installed in six banks. City National acquired the name and customer base in 1977 as the first step in providing independent banks in the West with a way into electronic funds transfer (EFT). The original idea was to sell on-line teller terminals and strengthen their position in the marketplace for correspondent banking.

But City National soon realized that California banks were interested in an ATM interchange. It decided it had the size and expertise, acquired through handling data processing for 30 correspondent banks, to handle the job.

The bank charges a $7,000 initiation fee for each new bank, which covers marketing materials and training of key personnel. A minimum service charge of $495 per month is levied for each ATM installed. City National's data processing department employs more than 400 people, with 53 working exclusively on Instant Teller. The bank's own data processing services account for only 15% of the data center's total volume.

Davenport of Instant Teller estimates that there are about 100 ATM networks across the country, "but less than 10 are of any size." Among the larger he listed: Rocky Mountain Bank Card, run by Colorado National Bank in Denver; Tyme, a cooperative of users of software by Tyme Corp., Milwaukee; MAC, run by Philadelphia National Bank; and Option, run by Tymshare, Inc., Cupertino, Calif. Tymshare built its network on one it acquired several years back from a consortium of Southern California savings and loans.

Davenport said that services firms "have the potential to be a significant factor [in the ATM networking race] but so far it's just talk."

And both national bank card organizations are in there, too. MasterCard has said it hopes to have a pilot system operating by November of this year, and Visa has indicated it will support interchange of automated teller machine transactions.

—Edith Myers

---

**NEWS IN PERSPECTIVE**

**BANKING**

**ATM Nets Go National**

American Express has endorsed the networking concept of automated teller machines.

It appears as if it will be a nonbank that will take electronic banking nationwide.

American Express Co. has, in a sense, put Instant Teller, a California-based Automated Teller Machine (ATM) network for independent banks, on the national scene. Amex brought up two of Instant Teller's ATMs into its gold card cash dispensing program. A link has been established between Instant Teller's computer center in Los Angeles and American Express' center in Phoenix. "We're the switch for American Express," said Nell A. Cox, senior vice president and general manager of City National Bank's computer center.

American Express gold card holders can access the two machines (one owned by City National and the other by California Canadian Bank) and get on-line verification for cash dispensing via the switch from California to Phoenix and back. Although only two machines in California are involved initially, Instant Teller is the first multiple bank ATM network to hook up with a national travel and entertainment ATM system.

And now, American Express has announced plans for a pilot system it will develop with "a number of banks" to do what amounts to the reverse. The big T&E operation is talking to banks and bank networks in Los Angeles, Houston, Washington, Dallas, Miami, and Detroit for a scheme whereby bank cards (debit cards, not charge cards) could be used in American Express traveler's check dispensing machines to obtain travelers checks.

After negotiations are concluded with the first six cities, Amex plans to go into New York, Philadelphia, and Atlanta. "They can't move too fast," said Cox of City National. "They'll have to develop a lot of software to enable their system to recognize a lot of different individual debit cards. We could do it easily (take part in the pilot). All we'd have to do is reverse the software we already have."

Instant Teller is the largest multi-bank ATM interchange on the West Coast. Last month it became the first such network to operate interstate; the network moved into Oregon. "We're in the process of moving into Washington state and will move into Arizona very shortly," said Cox.

The Instant Teller network includes 40 banks (with 16 more committed) and 107 ATMs (with an additional 41 committed). Cox said they expect to have about 200 ATMs by the end of 1981.

"We're probably the fourth or fifth largest ATM network in the country," said Gil Davenport, head of marketing for Instant Teller. "But it's like comparing apples and oranges. We drive all of our ATMs through our central host computer. In other networks, the network center drives some ATMs and merely acts as a switch for others. In terms of the number of ATMs driven by the central host, we're the largest."

Davenport was hired by Instant Teller in 1979 from Docutel. The Instant Teller program actually was started by Community National Bank of Bakersfield in 1975 with 12 machines installed in six banks. City National acquired the name and customer base in 1977 as the first step in providing independent banks in the West with a way into electronic funds transfer (EFT). The original idea was to sell on-line teller terminals and strengthen their position in the marketplace for correspondent banking.

But City National soon realized that California banks were interested in an ATM interchange. It decided it had the size and expertise, acquired through handling data processing for 30 correspondent banks, to handle the job.

The bank charges a $7,000 initiation fee for each new bank, which covers marketing materials and training of key personnel. A minimum service charge of $495 per month is levied for each ATM installed. City National's data processing department employs more than 400 people, with 53 working exclusively on Instant Teller. The bank's own data processing services account for only 15% of the data center's total volume.

Davenport of Instant Teller estimates that there are about 100 ATM networks across the country, "but less than 10 are of any size." Among the larger he listed: Rocky Mountain Bank Card, run by Colorado National Bank in Denver; Tyme, a cooperative of users of software by Tyme Corp., Milwaukee; MAC, run by Philadelphia National Bank; and Option, run by Tymshare, Inc., Cupertino, Calif. Tymshare built its network on one it acquired several years back from a consortium of Southern California savings and loans.

Davenport said that services firms "have the potential to be a significant factor [in the ATM networking race] but so far it's just talk."

And both national bank card organizations are in there, too. MasterCard has said it hopes to have a pilot system operating by November of this year, and Visa has indicated it will support interchange of automated teller machine transactions.

—Edith Myers
NEWS IN PERSPECTIVE

BENCHMARKS

REFRESH YOUR MEMORY: A price of one cent per byte has been established by Hewlett-Packard for its HP 1000 L-Series microcomputers, believed to be an industry first. The vendor historically lowers prices about 30% a year or increases performance by that much while holding prices steady. Back in 1978, in introducing the HP 3000 Series III system with a main memory capacity of 2MB, the company priced an incremental megabyte of memory at only $32,000—and this at a time when the going rate from IBM and the like was about $110,000. At that time, HP began using the 16K memory chip, and others were upgrading to the lower-technology 4K chip. But HP is now a big user of the 64K chip and thus is interested in exploring the personal computer market. For the first quarter of 1981, IBM showed a rise in net income of 7.2% to $730 million, or $1.25 a share, from the year-earlier $681 million, or $1.17 a share. The firm declared a regular dividend of $0.86 a share, adopted a new employee stock purchase plan, and reelected to block grants to schools employing Marxists, were defeated.

KIDS AND COMPUTERS: The last weekend of April saw the opening of the Future Center at the Capital Children's Museum in Washington, D.C. Equipped with a score of Atari 800 personal computers, donated by the manufacturer along with a $15,000 cash grant, the Future Center will provide both classes and public access for local residents and museum visitors. Future Center is but one element of a major new permanent display, Communications, currently under development. Digital Equipment has agreed to absorb 80% of the price of an 11/70 system, contingent on the museum's ability to come up with the remaining 20% within one year. The 11/70 will become a major part of the exhibit.

Joining the Center were Theodor H. Nelson of Project Xanadu, and Alan Kay, of the Xerox Palo Alto Research Center, who jointly cut the traditional ribbon, in this case a length of punched Mylar tape. In his keynote speech, Kay described his work, ranging from the conception of powerful personal (in all but price) computers at the University of Utah more than 10 years ago, through the Dynabook conceived and prototyped into the Alto desk-sized computer at Xerox. He went on to discuss the language Smalltalk—expected to be put in the public domain by Xerox within a year—and further advanced language concepts suggested by the Smalltalk implementation experience.

Nelson and a contingent from Project Xanadu explained their latest progress in developing a Hypertext system. Work continues in Ann Arbor, Mich., where a working back-end Hypertext system (Nelson's concept of nonsequential literature allowing multiple linked paths through text) is being programmed from the ground up. As a back-end, the system will require appropriate front-ends for each user's needs—a potential application for commercially available personal computers.

JOINING THE CROWD: Informatics, Inc., the big Woodland Hills, Calif. software and services firm, is getting into the hardware business. "We're doing what other service bureaus have been doing," said president Walter F. Bauer at a press briefing following the firm's annual meeting April 30, "buying minicomputers and selling them to customers with distributed systems." It also is offering a product it calls TAPS (Terminal Application Processing System), a $20,000 package for micros. It's portable and can be used on a variety of mainframes, minis, and micros. TAPS is touted as making it possible to build "user friendly transaction-based applications faster." It's embedded in a chip. Bauer also said the company is experimenting with a workstation to handle its Mark IV file management system, called Information II.

MORE WORK PER WORKER?: Automation in Silicon Valley has led the semiconductor industry to outstrip the overall U.S. economy in productivity in the late 1970s, according to a report issued by the Semiconductor Industry Association. The reports shows semi makers' productivity increased an average of more than 22% annually between '75 and '79 compared to virtually no growth in the economy as a whole during that period. The productivity was measured as the value added per employee. Nationwide U.S. semiconductor company employment grew in excess of 50% to about 225,000 workers from 1975 to 1979. Capital spending in the industry grew at an annual rate of 75% during those years, the report claimed. It pointed out that manufacturing productivity is expected to grow only 2% a year, so showed a downward trend in productivity since 1977 and negative growth in 1979.

TAKE YOUR PICK: With litigation between his firm and Microdata settled (no money was exchanged), Dick Pick is back to doing what he likes best: programming. "We're seven programmers doing what we like best and having a ball," said the developer of Microdata's popular DM 5120 operating system. Still in Irvine, Calif., Pick & Associates collects royalties on the operating system from several other turnkey system vendors: Applied Digital Data Systems, selling the Mentor line; Ultimate Corp., selling Honeywell Level 6-based systems; and Evolution Computer Systems, selling its Evolution line. (Pick founded and once headed Evolution, which has a French connection for hardware.) An unmarketed version of the Pick Universal Operating Systems, as he calls it, exists for the Hewlett-Packard HP 3000 minicomputer. Pick will also continue to collect royalties from Microdata until Dec. 15, 1981, all of which will put him on firmer financial footing than in 1972 when he formed his software firm.

WE'RE NUMBER TWO: National Semiconductor Corp., Santa Clara, Calif., says it has passed IBM in the number of supermarket checkout systems shipped. National said this makes its Datachecker system the number two in the marketplace behind industry leader NCR.
Gain instant access to over 1,000 information and communication services for only $15 an hour.

It's all at your fingertips when you join THE SOURCE, America's Information Utility. The Source will improve the efficiency and reduce the expenses of your entire organization by giving you access to services that run the gamut from electronic mail and hotel reservations to stock reports and a discount buying service.

And you can gain access to The Source from almost any microcomputer, communicating word processor, or data terminal.

Source Mail™ is faster than U.S. Mail and less expensive than most long distance calls. Source Mail is an electronic mail system that lets you send messages to anyone in the world who is a Source subscriber. Communicate with your field offices or sales staff around the country. Send messages to over 200 people simultaneously, and receive timely sales or status reports — if you wish, in hard copy form.

You can also use Source Mail to forward your mail to others with comments, store correspondence, and have your messages electronically scanned for spelling errors. You can "chat" interactively with other Source subscribers and automatically get a printed record of the entire conversation.

Streamline your business operations.

Just feed The Source your figures and it will calculate your taxes, cash flows, equity capital, lease vs. purchase of equipment, loan amortizations, the annual interest rate on installment loans, produce depreciation schedules and much, much more.

You can even write and store your own programs in The Source using such computer languages as BASIC, COBOL, FORTRAN, RPG II and assembly language. And, of course, we give you a private access code so that the programs and information you input into The Source are secure.

Use The Source as your electronic travel agent.

The Source gives you instant, specific national and international flight schedule information. And through the exclusive Travel Club™ you can use The Source to order airline tickets, rent a car and make your hotel reservations.

The Source also gives you access to the complete Mobil Restaurant Guide. So you can get in-depth reviews and recommendations on some 5,000 restaurants in thousands of localities across North America.

Get instant access to the stock market.

Whatever your investments — stocks, bonds, mutual funds, treasury bills, commodities, futures, precious metals, and more — The Source can give you investment information 24 hours a day. We even go beyond mere financial reporting to give you economic, business and financial commentary from economists and securities analysts.

Get news hot off the UPI wire.

Now, no matter what's happening around the world or around the corner, you can find out about it straight from United Press International. And you can get any specific information you need simply by using our unique "keyword" access. Get the latest news on the prime lending rate. If you've heard an industry rumor, get the facts. If there's a conflict in a foreign country where you do business, find out about it.

And that's only a fraction of what The Source can do.

Every one of these services alone is worth the remarkably low cost of a Source subscription. But there's so much more. The Source has an electronic personnel search network. It lets you barter your goods and services with other businesses. Find out current international monetary exchange rates. Order over 20,000 business or consumer items at discount prices. Order a printed document from anywhere in the world or request a complete research report on any topic. Manage your stock portfolio. Get a statistical analysis of consumer trends, potential markets, and much more.

And we're constantly adding new information and communication services.

You know an incredible bargain when you see one.

The Source is one of America's great business buys. For all the communication and information services you receive, all you pay is a $100 one-time subscription fee and $15 per hour during the business day when you are actually using The Source. From 6 p.m. to midnight, The Source is just $4.25 per hour. And from midnight to 7 a.m. you pay a mere $2.75 per hour! There is also a $10 monthly minimum usage charge.

Call Toll-Free for 16-page Source Brochure.

This free, full color brochure will give you complete details on The Source. To order it just dial 1-800-323-1718 and ask for Operator 91. In Illinois phone 1-800-942-8881, Operator 91. Or if you prefer, mail us the attached coupon. If someone has beaten you to the coupon, call the above number or write The Source, 1616 Anderson Road, McLean, Virginia, 22102.

Source

Department BB-5
1616 Anderson Road,
McLean, Virginia 22102

— Please send me/my company your comprehensive 16-page brochure on The Source. I understand I am under no obligation.

Name (please print clearly)

Company

Address

City/State/Zip

We need The Source for more than one location. Please contact us with quantity discount information.

THE SOURCE is a service mark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc.
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. This allows you to standardize on the new, reliable VISUAL 200 for virtually all of your TTY compatible video terminal applications, with no change in the software you've written for the older, less powerful terminals. And you're not limited to mere emulation; you can outperform them at the same time by taking advantage of the additional features and human engineering of the VISUAL 200, such as:

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

For a pleasant surprise on prices, call or write us today.

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

---

**FEATURE COMPARISON CHART**

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>Visual 200</th>
<th>Hazeltine 1500</th>
<th>Hazeltine 1420</th>
<th>Lear Siegler ADM 3A</th>
<th>ADDS 520</th>
<th>ADDS Regent 25</th>
<th>ADDS Regent 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 x 80 Screen Format</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>7 x 9 Dot Matrix</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Background/Foreground</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Insert/Delete Line</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Insert/Delete Character</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Clear End Line/Field/Page</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Blink</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Security Mode</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Columnar and Field Tab</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Line Drawing</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Upper/Lower Case</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>OPT</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Numeric Pad</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Composite Video</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Current Loop</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>OPT</td>
<td>OPT</td>
<td>OPT</td>
<td>OPT</td>
</tr>
<tr>
<td>Serial Copy Port</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>OPT</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Hold Screen</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Detachable Keyboard</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Solid State Keyboard</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Typewriter Keys</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Cursor Addressing</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Read Cursor Address</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Cursor Control Keys</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Secondary Channel</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Soft Test</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Baud Rate to 19,200</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Smooth Scroll</td>
<td>STD</td>
<td>NO</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Microprocessor</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
<td>STD</td>
</tr>
<tr>
<td>Tilt Screen</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Switchable Emulations</td>
<td>STD</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

**VISUAL 200**

See for yourself

Visual Technology Incorporated
540 Main Street, Tewksbury, MA 01876
Telephone (617) 851-5000, Telex 951-539

CIRCLE 76 ON READER CARD
Retro-Graphics is quite literally changing the face of the display terminal marketplace. Because the line of graphic enhancement products that carries the Retro-Graphics name transforms some of today's most popular alphanumerics terminals—the DEC® VT100® terminal, for instance, and Lear Siegler's ADM-3A and 3A+ Dumb Terminal® products—into terminals that feature full graphics capabilities.

These enhanced terminals feature complete emulation of their Tektronix® counterparts, the 4010 Series graphics terminals. Additionally, they boast vector drawing and point plotting capabilities, selective erase, alphanumerics overlay, raster scan technology and, of course, complete compatibility with industry standard software, including Tektronix Plot 10® and ISSCO's® DISSPLA® and TELLAGRAF®. And Retro-Graphics delivers all of this while retaining the original alphanumerics features of the enhanced terminals.

Thousands of users who have put Retro-Graphics enhancements into action can attest not only to the performance benefits but, importantly, to the often dramatic cost savings over comparable terminals. Savings that have amounted to upwards of 50% and more. Together, high quality and low cost make Retro-Graphics one of the brightest ideas to come along in some time. The idea you can check out for yourself by calling your Digital Engineering distributor. Or contact us direct.

See us at NCGA '81
in Booth #501
630 Bercut Drive, Sacramento, CA 95814
(916) 447-7600  TWX 910-367-2009
In their efforts to avoid profitless prosperity, vendors are rapidly altering industry’s marketing traditions.

CHANGING PATTERNS OF COMPETITION

by Frederic G. Withington

The data processing industry looks healthier. The revenue growth of the DATAMATION 100 was impressive in both 1979 and 1980, considering the international recession and economic uncertainty of the period. Profits, however, have been more of a problem. A couple of years ago, a pattern of "profitless prosperity" began to develop, with all competent competition steadily increasing sales, but not making much money doing so. Profits remain thin, though (with significant exceptions) they have recently been improving for most of the industry.

It’s worthwhile to examine the causes of the profit squeeze and the measures the industry has taken to avoid profitless prosperity, because measures are leading to permanent changes in the patterns of competition.

Price competition. Kicked off by IBM’s response to plug-compatible competitors, price competition has broadened across international boundaries as Japanese (and recently French) manufacturers have proved successful at producing high quality products at low prices.

Inflation. Salary costs for programmers, salespeople, customer support and service staffs have increased faster than the rate of inflation. (The industry has grown faster than the supply of competent people, so competition has forced salaries up.) Historically, such salary inflation has been balanced by decreasing electronic component costs, but now electronic components contribute only 10% to 20% to product costs so further improvement doesn’t help much.

Vendors have responded with:

Selective price increases. The focus of price competition has been on hardware. No competitor has yet found dramatic ways of reducing the cost of providing quality software, marketing, or field service. Recognizing this, the industry (led by IBM) has moved steadily to unbundle hardware charges from those for people-intensive activities and to increase their prices frequently. (IBM’s 1980 Annual Report shows that “services” revenues, including maintenance contracts and program product licenses, has increased 27% per year during the last two years, well above IBM’s 12% overall growth rate. IBM has instituted two general price increases in these categories during this period.)

Redesign of products. Most new products use multilayer circuit boards (or ceramic chip carriers) with direct bonding of large-scale integrated circuits. Most companies now develop them using automated design engineering that increasingly customizes products through software (microcode or overlays on general-purpose logic chips) instead of through unique circuits. These new products are more powerful and cheaper to design and to manufacture. More significantly, they are (or should be) more reliable, which reduces maintenance cost; upgradable through software change, which reduces the number of new hardware products needed while permitting more variations in customer-oriented “packages”; and easier to support, since microcoded modules can incorporate functions formerly performed by software.

Neither customer support nor customer personnel need as much detailed knowledge of hardware and system programs as they used to.
No competitor has found dramatic ways of reducing the cost of providing quality software, marketing, or field service.

These redesigned products, then, should have a major impact on people-intensive costs. Unfortunately, they have proved to have an equally great impact on the engineering and manufacturing practices of their manufacturers. Everything from raw materials purchasing to maintenance procedures and software documentation practices must be changed and disciplined more tightly. (After-the-fact hardware fixes, for example, become nearly impossible.) Almost every manufacturer from IBM down has had difficulty making these changes, but most are getting better at it. Over time, these new products should relieve the profit squeeze, but it will take years to turn over much of the installed base.

In addition to these two internationally implemented responses to the profit squeeze, most vendors have been changing the areas or ways in which they compete. These new patterns of competition involve new relationships with other organizations.

USING AN OUTSIDE SUPPLIER

If you can't make something as cheaply as someone else, maybe you can buy it from him. This pragmatic idea has already revolutionized the peripheral equipment industry: companies like Control Data and Storage Technology have thrived as more and more system vendors have turned to them for peripherals. The resulting vulnerability of the system vendor can be partly offset by joint ownership of a dedicated subsidiary; Honeywell and NCR, for example, share control and profits of the subsidiaries jointly owned with Control Data that produce their peripherals. Even IBM has increasingly gone outside for peripherals: Qume and Dataproducts printers now appear in the systems of this erstwhile leader in all areas of printer technology.

More strikingly, some of the largest companies have turned to others for major products. IBM obtains its model 3101 terminals (and may at some time obtain small computers) from Matsushita, its convenience copiers from Minolta, and its hand-held dictating machines from Toshiba. Siemens gets its large computers from Fujitsu, and TRW has set up a joint subsidiary with Fujitsu, while IBM may import much of its product line to the U.S. Japanese companies are not the only offshore partners; GTE has ordered a large number of terminals for U.S. resale from Thomson-CSF in France.

Concern about the viability of U.S. hardware vendors is justified, but the battle is far from over. IBM and the other U.S.-based mainframers still lead the world in system architecture and software, and the pace of system change is accelerating. IBM's 3081 and 4300 systems are only the beginning of a slow revolution: as further models appear, as front-end and back-end IBM processors continue to evolve, and as the promised "application machines" that may revolutionize the capabilities of the existing products appear, IBM's product line will develop a very different appearance. The other U.S.-based mainframers are evolving along the same lines in their own ways, and it appears that most plug-compatible and foreign-based vendors will have to play catch-up.

Semiconductors appear to be exempt from this trend toward external sources of supply. Most vendors (from IBM down through middle-sized minicomputer vendors such as Prime) appear to be enhancing their in-house semiconductor design and manufacturing capabilities. All except IBM say they will depend on the external semiconductor industry for most commodity-type circuits (such as 64K RAMS), but all want an internal capability in case of shortages. More important, all want to be able to integrate the design and manufacture of critical logic chips at the cores of their products. System, software, and circuit designs seem to be merging into an integrated process (illustrated by Intel's decision to adopt Ada and to implement a compiler for it as an integral part of its 32-bit microprocessor project).

NEW SALES METHODS

Computer stores sprang up nationwide (to a degree, now worldwide) to market personal computers. Mainframe manufacturers have observed them with intense interest because the costs of conventional marketing are too high for the low-priced products mainframers want to offer. By now most mainframers have established retail stores of their own on an experimental basis. More conventional electronics distributors and system houses have long been used for indirect marketing by the minicomputer companies, but the mainframers' unwillingness to discount their products has until recently made them unwilling to participate. Cost pressures have changed this; even IBM now discounts selected products competitively for resale by distributors and system houses.

AT&T has opened telephone stores; Xerox has opened full-line office equipment stores. These and comparable giants, starting from positions outside the computer industry, see retail stores both as means of cutting marketing costs and as means of adding selected computer products made by others to their competitive offerings. One wonders how far this will go—will AT&T sell personal computers in its stores, and will IBM sell telephones in its?

The retail store chains have naturally been interested in competing. Tandy with its Radio Shacks moved first and has been rewarded with the premier position in the personal computer market. Expanding, Tandy has taken on an increasing variety of hardware made by others, compatible software, and even database services (The Source). Almost all other major chains, including Sears and Montgomery Ward, are at least experimenting with computer stores.

Retailers and other kinds of local marketers have obviously attracted the attention of the entire information industry, but most vendors are proceeding cautiously. Computer systems are different from consumer electronic products: requirements for training, support, software, and service are of a different order. The average retail clerk cannot be used to sell computers, nor the average appliance serviceman to repair them—at least not yet. It will not be long, however, before the industry learns what the minimum customer requirements are, what the costs to meet them are, and what the resulting profitability of retail outlets is.

The packaged software business has been growing faster than most parts of the hardware business, and its growth is likely to accelerate as the products mature and the users' cost pressures intensify. Software can now be copyrighted, and patent protection has been extended somewhat. The mainframe packaged software business has grown without these protections (obtaining some from trade secret laws), mainly because most mainframe users want the support and maintenance that can be provided only by a package's originator. These increased protections, however, will apparently help stimulate the software industry at the personal computer level.

So far, software packages have generally been marketed much like hardware, but the pattern is changing. Already, mainframe vendors are delivering some software via down-line loading from their centers to customer machines. When most users' information appliances can be connected to most software sources, what better way to market than by live demonstration, followed by down-line loading, electronic funds transfer, and subsequent on-line maintenance—all without any face-to-face contact at all?

As the usefulness of software grows, it comes to dominate the user's vendor choice. Many of the large network service bureaus, facing increased competition from minicomputer-based standalone systems, have simply decided to offer their own. Automatic Data Processing, Xerox Computer Services, and recently, Tymshare are examples: obtaining appropriate small computers from manufacturers and offering packaged versions of their services to customers who might otherwise be lost. Software is the primary consideration; whether the hardware is local or remote is secondary.

Vendors offering on-line database services and data networks have large fixed
Tadiran rechargeable nickel-cadmium batteries provide years of reliable and trouble-free service over a wide range of industrial, consumer and military applications such as portable communication equipment, emergency lighting and special airborne duties.

Tadiran nickel-cadmium sealed batteries feature:
- 0.45 to 7.0Ah capacity
- Stable discharge over wide range of discharge currents and temperatures
- Sintered plate construction
- Cell or battery pack configurations

Tadiran now introduces a high-temperature range of nickel-cadmium cells for longer battery life when the average operating temperature is higher than normal:
- Special high-efficiency electrodes
- Polypropylene-based separator system
- High-temperature electrolyte
- Low-resistance, welded internal connections with improved thermal conductivity.

For a power source that you can use, but not use up, turn to Tadiran nickel-cadmium rechargeable batteries and cells.

For further information please contact:
Australia: Sydney, Technico Electronics, Tel: 427-3444, Telex: AA1611;
Melbourne, Technico Electronics, Tel: 544-7833, Telex: AA31244.
Hong Kong: G.T.E., Tel: 5-260141, Telex: 276144.
Sweden: Mittor, Tel: 08-823210, Telex: 19553.
Finland: Insmat, Tel: 90655880, Telex: 121394.
Spain: Diode, Tel: 465-3686, Telex: 42148.
Italy: Compelet, Tel: 688-8746, Telex: 321528.
Switzerland: Angst & Pfister, Tel: 01-3012020, Telex: 52633.
Austria: Elbatex, Tel: 0222-885611, Telex: 01-3128.
U.S.A.: Spectrum, Tel: 714-996-9400.
AES Electronics, Tel: 212-371-8120.
The packaged software business has been growing faster than most parts of the hardware business, and its growth is likely to accelerate.

costs for maintenance; profits depend on distributing the services to many customers. Publishing companies are in the business of packaging and distributing information—usually in printed form to date—but few publishing companies are unwilling to consider telecommunications as a distribution medium. One of the most striking recent changes in the information industry’s competitive pattern has been a combining of these two groups.

Table I lists recent combinations of publishers with varied kinds of network service firms. Software in the form of database and network services, not to mention software packages, will clearly form an important part of these publishers’ future offerings.

GLUING MODULES TOGETHER

The Datamation 100 has been expanded this year to include word processing and telecommunications. This is very desirable. No one needs to be told that vendors that started in computers, communications, and office products are converging; that multipurpose office-oriented systems can no longer be placed in any of these traditional categories. We are used to the idea that information systems are becoming networks of distributed modules held together by the “glue” of data communications.

We are also used to the idea that specialized common carriers are offering particular varieties of glue. Telenet blazed the trail and has been followed by companies like Tymshare and Satellite Business Systems offering their own versions of digital communications services. Others will follow: Xerox with XTRAN and AT&T with ACS may yet be competitors.

Newer is the idea that the user can buy its own glue from a vendor that offers few if any of the processing modules. The clearest example is Network Systems Corp. whose Hyperchannel plus adapters can interconnect a variety of processors with one another or with the SBS service. Xerox (Ethernet), DEC (DECnet), and Datapoint (ARC) will also sell glue to end users. Each hopes that a variety of its terminals and/or processors will be sold with the glue, but each has such a range of compatibility with other vendors’ standards that much of the module business can be obtained by others.

IBM is beginning to find itself in a similar position. The ring network offered with the Series/1 minicomputers and the loop of the 8100 support IBM’s System Network Architecture, and an increasing number of competitors offer SNA-compatible modules. This kind of glue is usually referred to as local area networks, but the term is too restrictive. A user can equip each of its sites with Ethernets, for example, and interconnect them with lines leased from the telephone company: the user effectively owns its own nationwide (or worldwide) data communications glue. This phenomenon is new and confused, but its clearly competitive implications are profound.

In their efforts to avoid profitless prosperity, then, vendors are rapidly altering the patterns of competition in the industry. It has been possible for some time to forecast that this would happen, but hard to be specific. Now some of the new patterns are emerging, and it is already clear that they will be radically different from the patterns of the past.

Mr. Withington is a vice president of Arthur D. Little, Inc., Cambridge, Mass., and a contributing editor of Datamation.
Now that the WICAT System 100 has quietly proven itself...

We're ready to announce it.

While others were announcing their MC68000-based systems, we were proving ours. While other companies were scrambling to build and debug prototypes, WICAT's system was working successfully in Fortune 100 companies. While others are promising 68000's, WICAT is delivering. Ask any of our Fortune 100 customers. Or ask us. Call or write today for additional information.

WICAT Systems.
1875 South State  P.O. Box 539  Orem, Utah 84057    801 224-6400

CIRCLE 80 ON READER CARD
It prints 18,000 lines a minute and has all the processing power of a Level 6. Our new PPS II/E does everything but feed the dog.”

Ron Borelli  
Director, Page Processing Systems  
Honeywell Information Systems

PPS II was a productive printing system to begin with. But now, by giving users access to the power of the Level 6 computer, we have created a system that is a data collector, processor, and printer all in one. So users can customize an output system to fit their particular printing needs.

The new PPS II/E collects data from word processing diskettes and magnetic tapes, as well as from on-line and remote connections to a variety of mainframes. It can even collect data from multiple sources simultaneously. Then, using Level 6 application programs, it organizes and prints this data at speeds as high as 18,000 lines a minute. PPS II/E will even interface with impact printers for specialized requirements such as check printing.

“This is one of the most cost-effective page processing systems ever designed.”

On one hand, PPS II/E is a high-speed non-impact printing system, capable of producing up to 18,000 lines a minute. It also punches, collates, perforates, and addresses.

PPS II/E lets you print your own forms, choose your own colors, and sizes, and design your own character sets.

More important, PPS II/E is growth-oriented. You can add disk storage or stackers. Increase printing speeds. Design new characters or forms as your applications change. Or add more CPU power or memory.

“Built-in processing power gives PPS II/E unbeatable flexibility.”

Of course, the new PPS II/E is also a processing system. And it can accept Level 6 software programs. PPS II/E can be used to relieve your computer during peak load times. Or reserved for
new applications development. Or custom-designed to perform a certain function. For example, PPS II/E can change your output processing system into an electronic mailroom — accepting input from data or word processors — organizing, prioritizing, and addressing it before printing for quick and easy distribution.

Efficiency has been enhanced by the addition of a new disk queuing capability that lets you store and merge data coming in from different sources. Now you can organize, process, and print information at your convenience.

In short, PPS II/E is a powerful and versatile system that gives you the flexibility to manage your operation with maximum efficiency. It prints like a demon. It processes like a computer. It does just about everything.

For more information call 800-328-5111.
(In Minnesota call collect 612-870-2143.)
Or write Honeywell, 200 Smith Street (MS 487), Waltham, Massachusetts 02154.

Honeywell

The ingenuity of people, the power of computers.
New from GDC

2400 bps ASYNC

Double your long haul async throughput with the 2400 ASM

The all new GDC 2400 ASM — the world’s most flexible 2400 bps modem — now offers users the ultimate in operating performance and versatility.

Take a look at the:
- built-in 2400 bps async operations over long haul facilities
- superior character oriented async protocol
- 9 to 11 bit character format (up to 9 data bits)
- point-to-point or multi-point operation
- selectable CCITT or Bell compatible synchronous modes

Plus DataCommonality
The GDC 2400 ASM features Data Commonality — an uncommon approach to modem packaging. Data Commonality uses the same compact modem module for both standalone and rack mount configurations. It means less inventory, less maintenance, less training — in short, less hassle!

...with the added feature of DataCommonality.

The Complete DataComm Family

<table>
<thead>
<tr>
<th>2400 ASM</th>
<th>103J</th>
<th>113C</th>
<th>113D</th>
<th>108</th>
</tr>
</thead>
<tbody>
<tr>
<td>202S/T</td>
<td>202T</td>
<td>212A</td>
<td>201C</td>
<td>208A</td>
</tr>
<tr>
<td>208B</td>
<td>9600</td>
<td>LDM</td>
<td>ACU</td>
<td></td>
</tr>
</tbody>
</table>

Available Now

Get control now, contact the experts at:

General DataComm Industries, Inc.
One Kennedy Avenue
Danbury, CT 06810
(203)797-0711

New York, NY (212)445-5626
Orlando, FL (305)293-6617
Pittsburgh, PA (412)821-1100
San Francisco, CA (415)939-2336
Seattle, WA (206)839-1961
Santa Ana, CA (714)957-0244
TWX: 910 595 1907

General DataComm Industries (Canada) Ltd.
104-1220 Innes Road
Ottawa, Ontario K1B 3V3
(613)745-9174

Washington, DC (703)255-2882
Common Carrier
Dallas, TX (214)249-5393
Everett, WA (206)359-4600
Green Valley, IL (309)352-3400
Indianapolis, IN (317)849-7113
Marietta, GA (404)971-5914

General DataComm (UK) Ltd.
Toutley Road
Wokingham, Berkshire
RG11 5QN, England
(0734) 791 444

Portland, OR (503)840-8529
Santa Ana, CA (714)957-0244
Tampa, FL (813)796-7271
Railroad
Herndon, VA (703)573-1700
Wheaton, IL (312)653-9262
THE DATAMATION 100
THE TOP 100 U.S. COMPANIES IN THE DP INDUSTRY

by Peter Wright

The dp industry had an exceptionally strong year in 1980, especially considering recessions hit both the U.S. and European economies. The top 100 U.S.-based companies grew 20.4% to $55.6 billion. Other highlights depict existing industry trends and may foretell future prospects. Consider that in 1980:

- IBM again lost revenue market share
- Without IBM, the DATAMATION 100 grew 24%
- Operating margins declined to 17% from 18.5%
- Microcomputers, word processing, and CAD/CAM were the fastest growth dp subsectors
- Capital expenditures increased 37%; R&D increased 22%
- Revenue per employee was up dramatically

The rankings changed significantly during 1980. Because of a broadening of the definition of dp to include word processing and data communications, and because of a very active year in corporate finance, 19 new companies joined the ranks of the DATAMATION 100. Of these, eight can be attributed to the broadened definition with four in word processing (Lanier, Exxon, CPT, and Philips Information Systems) and four in data communications (Racal Electronics, Motorola, Paradyne, and General DataComm). Remarkably, nine companies in the 1979 DATAMATION 100 survey were merged or acquired during 1980: Calcomp by Sanders Associates, Documentation by Storage Technology, Infomat by Datapoint, Qantel by Datapoint, and Manufacturing Data Systems by Schlumberger.

In reviewing this list of acquirees, we note that three were losing money, and three others were experiencing declining margins. In an era of high stock prices for growing technology companies, firms that are experiencing problems can become takeover targets as depressed stock prices can make these companies attractive asset plays.

Already in 1981, System Development Corporation has been acquired by Burroughs and The Signal Companies has announced plans to acquire Ampex.

The top 10, which generated $39.4 billion in revenues and grew at 17%, represented 71% of the total revenues of the DATAMATION 100 (Table I). IBM generated 38.4% of the total revenues, yet this marks a decline from 40% in 1979 and 43.2% in 1978. IBM's 1980 U.S. revenue market share has declined even further to just 30%.

While IBM remains perched on top of the list, other vendors in the top 10 shifted positions. On the positive side, Digital Equipment climbed two places to fourth and is now within $100 million from becoming the second leading vendor within the industry. Xerox, with a 35% gain in dp revenues, broke into the top 10, replacing Data General. On the negative side, Burroughs slipped from second to sixth. Memorex also slipped a notch to tenth and appears vulnerable for making this exclusive list in 1981, with Wang Laboratories, Data General, and Storage Technology close behind.

HIGH AND LOW FLYERS

Although growth rates are interesting, it is also important to track the absolute dp revenue gains by the top vendors. During 1980, 16 companies had gains in excess of $100 million, compared to 12 companies in 1979 (Table II). These $100 million gainers accounted for 72% of the $65.3 billion total revenues gained by the DATAMATION 100. Not surprisingly, IBM led with an increase of $3.0 billion, which was tantamount to creating, in one year, an incremental force greater than any other U.S.-based computer company.

Digital Equipment's gain of $712 million would have put it into the top 10, while Control Data had a notable gain in excess of $500 million during 1980.

In aggregate, 1980 was clearly a superior year to 1979, but in 1979 eight DATAMATION 100 companies did grow in excess of 100%, compared to just three in 1980—Sands Associates (through acquisition of Calcomp), Apple Computer (for the second consecutive year), and Philips Information Systems (a newcomer to the DATAMATION 100). Scanning the high fliers for 1980 (Table III), one notes that the top 20 in revenue growth rate is populated by microcomputer, CAD/CAM, and word processing vendors. Two of the three microcomputer vendors made this top 20 (Tandy Corporation ranked 21), while five of the six CAD/CAM vendors and five of the six word processing vendors were also among the top 20 gainers.

The "low fliers" performed better in 1980 (Table IV). During 1979, five companies had revenue declines, while in 1980 only Northern Telecom had an absolute revenue decline. Making this less than illustrous list is clearly not a condemnation, as the thirteenth company with the lowest growth rate still showed a revenue increase in excess of 10%, which would have been considered to be a strong year for leaders of less glamorous industries. Nevertheless, the bottom 20 represents poor comparative performance, and a decline in market share. The bottom 20 includes three mainframe vendors, six small systems vendors, six peripherals vendors, and four software/service vendors.

One measure of the current health of an industry is its growth in profits (or more technically, growth in cash flow from operations) as those funds which are used for capital investments and R&D expense help to assure future growth. While not performing as abysmally as in 1979, when dp industry continued to decline in 1980 as a result of continued competitive and inflationary pressures.

While only 70 companies were available for profit analysis, these companies represented 90% of the revenues for the DATAMATION 100 (Table V), and therefore serve as a useful proxy. We have used dp operating profits (defined as revenues from dp products and services; less cost of goods sold; less R&D expenses; less selling, general and administrative expenses) as a measure of profitability, because comparisons from year to year and company to company are more meaningful since operating expenses exclude interest revenues and expenses (which is a function of the company's balance sheet and not operations) as well as taxes (which can vary dra-
matically from year to year). Operating profits increased 10% in 1980 to $8.5 billion, which translates to a decreased operating margin of 17%, from 18.5% in 1979. Of the 70 companies reporting, only 29 had an improved operating margin in 1980.

Although IBM's revenue market share declined, its operating profit market share increased by virtue of its 12.5% increase in operating profits. While accounting for 43% of the total revenues for these 70 companies reporting, IBM accounted for 62% of the operating profits. The fastest growers among the top 10 in operating profits during 1980 were Wang (up 65%), H-P (up 53%), Control Data (up 35%), and DEC (up 33%).

Although orders and backlog are often used by this industry to gauge its short term health, both measurements are elusive and can be misleading. Capital expenditure, on the other hand, is a hard dollar commitment made by management to increase productive capacity. Capital expenditures have been defined to include additions to plant, property, and equipment net of retirements. Also included is hardware purchased by service companies that increases productive capacity. Explicitly excluded are investments made by companies to finance their lease bases.

During 1979 capital expenditure grew an incredible 30%, led by a 35% increase from IBM; yet, despite a slowing of IBM's growth rate to a "mere" 28%, the industry increased its growth to 37%. The total level of dp capital expenditures reached $4.1 billion for the 60 reporting companies (which represents 87% of the DATAMATION 100 dp revenues—see Table VI). IBM dominates with almost $2.0 billion in dp capital expenditures. Equally impressive is the strong growth in expenditures by the major minicomputer and word processing vendors. Stripping away IBM from the industry total, DEC, H-P, and Wang spent $565 million in 1980, up 85% for the year, and representing 27% of the remaining total.

The computer industry, because it is a technology-driven industry which is subject to short product cycles and rapid obsolescence, has traditionally been a heavy spender in R&D. We have defined R&D to only include expenses on unannounced products and services that are funded by the company (R&D projects that are funded by outside vendors are excluded). Although we only have estimates for 64 companies, the results serve as a useful proxy since the companies represented are 87% of the total for dp revenues. Following an 18% increase in 1979, R&D expenses grew another 21% in 1980 to $3.7 billion (Table VII). R&D as a percentage of sales increased slightly to 7.6% from 7.5%. The subsectors experiencing the greatest growth in R&D were the word processing vendors (four companies reporting) at $65 million, up 102%, and CAD/CAM vendors (five companies reporting) at $46 million, up 78%. Only 10 companies spent 10% or more of their revenues in R&D, and four of these companies (Auto-trol, Apple, Intergraph, and Computervision) were CAD/CAM vendors. The focus in R&D expenses has traditionally been in hardware; however, while hardware R&D continues to be important, software development will show larger R&D growth rates throughout this decade.

The total for the 83 companies reporting dp employment (representing 93% of total revenues) was 863,000, up only 57,000 or 7% during 1980 (Table VIII). IBM, which accounted for 41% of this sample's revenues and an even higher percentage of its operating profits and capital expenditures, accounted for only 32% of its employment.

The top 10 in reported dp employees accounted for 75% of the total. Interestingly, only Digital Equipment of the top 10 had an employee growth rate in excess of 12%, and all 10 companies' revenue growth was faster than its employee growth. This all translates to improved employee productivity as measured by revenue per employee which increased to $60,100 in 1980 from $53,600 in

### TABLE I

<table>
<thead>
<tr>
<th>Top 10 DP Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>1980</td>
</tr>
<tr>
<td>IBM</td>
</tr>
<tr>
<td>NCR</td>
</tr>
<tr>
<td>Control Data</td>
</tr>
<tr>
<td>DEC</td>
</tr>
<tr>
<td>Sperry</td>
</tr>
<tr>
<td>Burroughs</td>
</tr>
<tr>
<td>Honeywell</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>Xerox</td>
</tr>
<tr>
<td>Memorex</td>
</tr>
<tr>
<td>Total Top 10</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Top 10 as a Percent of Total</td>
</tr>
</tbody>
</table>

### TABLE II

<table>
<thead>
<tr>
<th>$100 Million Revenue Gainers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980 Dp Revenue Gain</td>
</tr>
<tr>
<td>1980 % Growth Rate</td>
</tr>
<tr>
<td>IBM</td>
</tr>
<tr>
<td>DEC</td>
</tr>
<tr>
<td>Control Data</td>
</tr>
<tr>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>NCR</td>
</tr>
<tr>
<td>Sperry</td>
</tr>
<tr>
<td>Wang Labs</td>
</tr>
<tr>
<td>Xerox</td>
</tr>
<tr>
<td>Honeywell</td>
</tr>
<tr>
<td>Texas Instruments</td>
</tr>
<tr>
<td>Computer Sciences</td>
</tr>
<tr>
<td>Data General</td>
</tr>
<tr>
<td>Storage Technology</td>
</tr>
<tr>
<td>Prime Computer</td>
</tr>
<tr>
<td>Apple</td>
</tr>
<tr>
<td>Teletype</td>
</tr>
<tr>
<td>Subtotal</td>
</tr>
<tr>
<td>Total Dp 100</td>
</tr>
</tbody>
</table>
Not surprisingly, IBM led with an increase of $3.0 billion, creating an incremental force greater than any other U.S.-based company.

The Broad Classifications

Although the breakdown of each company’s revenues into 11 categories is subject to estimation and consistency errors, it still serves as a useful proxy. In Table IX, we present the aggregated results. Mainframes, minicomputers, microcomputers, and word processing systems (which include all peripherals sold at the time of the initial installation) accounted for $25.6 billion or 46% of total dp revenues. Although systems did grow at an industry rate of 21%, growth in mainframe systems lagged, up only 14%. Microcomputer system revenues (defined as fully configured systems selling for under $15,000) increased 85% in 1980, while word processing systems increased 64% to $881 million and minicomputers increased 28% to $8.8 billion. These revenue trends have been consistent over the past few years—mainframe systems continue to lose market share to minicomputer, word processing, and microcomputer systems. Since minis and micros are typically purchase-only, and mainframe systems have a greater lease propensity, shipments would be a better measure of market share. This measure would show an even greater market share erosion by mainframe systems.

Peripheral products grew at 20% to $10.9 billion (this excludes peripheral products sold initially with systems) in 1980. End user peripherals which are typically used in mainframe systems grew at 16%—greater than the growth rate in mainframes themselves. The oem market for peripherals had a 27% increase in sales (to $4 billion). This rapid growth reflects the continued proliferation of small systems. Meanwhile, sales of data communication gear (sold separately from the initial installation) grew 23% to $1.1 billion.

Software products and services in total accounted for $17.1 billion, 30.7% of the industry’s total revenues. Maintenance revenues at $8.9 billion and other service revenues at $6.4 billion maintained an industry growth rate. However, software products continued to show rapid gains, growing 29% to $1.7 billion. Behind this surge is the unbundling of software by IBM starting with the 4300 announcement in 1979. We estimate IBM’s software revenues at $1.3 billion, up 30%. Software products should continue an accelerated growth as the multitude of hardware offerings generate further requirements for both operating systems and applications software.

Word processing hardware revenues increased 64% to $881 million in 1980. The leading vendor, not surprisingly, was Wang...
with word processing revenues of $252 million, up 112%. In Table X, we have listed the top 10 word processing companies (hardware systems revenues only). This list includes NBI as the tenth largest word processing company even though NBI did not make the DATAMATION 100, as it ranked 109.

The top 10 is filled with an assortment of vendors. In addition to Wang, the stock market has added public awareness to several of the standalone wp vendors including Lanier, CPT, and NBI. Philips Information Systems (the American marketing subsidiary of Micom) should be considered another important vendor in the class of product. If its Canadian sales were included, Micom would have been the third largest wp vendor in 1980. The list also includes several companies that have entered the wp arena through acquisition—Raytheon (Lexitron), Exxon (Vydec), and Burroughs (Redactron). Although profitability of these subsidiaries was not released, we would guess that only Lexitron is showing a profit. And finally, the other two vendors appearing on this list are DEC and Xerox, important dp names, but not necessarily commonly identified as wp vendors. Yet, according to our survey, DEC and Xerox were the third and fourth largest wp vendors. Noticeably missing from the top 10 is IBM. However, with several wp announcements in 1980, including Displaywriter and enhancements on the 5520, we suspect that in 1981 its wp sales will be large enough to place it among the top 10.

Data communications revenues in 1980 were $1.1 billion (up 23%), excluding data communications equipment purchased with initial installations. Including initial installations, we would estimate data communications revenues at $1.6 billion.

Data communications revenues have been included in this survey because of the increasing importance and decreasing distinctions of data processing and data communications. In deriving our estimates, we have defined data communications to include front-end processors, modern, multiplexors, and network diagnostic equipment. PABXs have not been included in the data communications and data processing definitions for 1980, although we acknowledge that it probably will be in the future, given the large amounts of data currently transferred through PABXs.

Coming up with a meaningful top 10 in data communications is more than a trivial exercise, because of the arduous task of determining which processors should be classified as communications processors. For example, with IBM the 370S is clearly a front-end processor. However, the 8100 series of distributed data processors is less clear as some are used in the communicating as well as in the processing mode. With Digital Equipment,
This book can save your company a lot of money.

Rental Electronics is renting
- Amplifiers
- Wave and Distortion Analyzers
- Logic Analyzers
- Microwave Line Analyzers
- Network Analyzers
- Acoustics
- Sound and Vibration Analyzers
- Spectral Analyzers
- Oscilloscopes
- Voltmeters
- Counter
- Function Generators
- Signal Generators
- Digital Signal Source Generators
- Digital Waveform Generators
- Code Generators
- Graphic Oscilloscopes
- Analytic Oscilloscopes
- Cavity Synthesizers
- Frequency Synthesizers
- VCO's
- Function Generators
- Transistors
- Switches
- Digital Logic
- Digital Memory
- Digital Microprocessor
- Digital Minicomputer
- Multiprocessor Instrumentation
- Telemetry
- Radios
- Telecommunication

GSA # GS-04S-23590
Catalog

Rental Electronics, Inc.
(800) 227-8409
In California (213) 993-7368 or (415) 968-8845 or (714) 879-0561

- Send me a copy of this book. Soon, please. In these inflationary times, my company would like to save money. Your Rental Catalog might help.
- I'd like a copy of your Equipment Sales Catalog, too.
- I'm interested in desktop computers. Send me a copy of your Hewlett-Packard Desktop Computer rental brochure.
- I'd like to see a brochure on Intel's Intellic Microcomputer Development Systems now for rent.
- I understand you have scads of data terminals and printers for rent off-the-shelf. Send me a brochure.
- I need immediate assistance. Have someone phone me quickly here: (A.C.) (number) (ext.)
- I have specific interest in the following electronic equipment:

NAME _______________________
TITLE _______________________
ORGANIZATION _______________________
ADDRESS _______________________
CITY/STATE/ZIP _______________________

PHONE _______________________
MAIL STOP _______________________

© Rental Electronics, Inc. 1981

CIRCLE 83 ON READER CARD
Dp industry profits only increased 1%; operating margins declined again in 1980 because of continued competitive and inflationary pressures.

an extra printed circuit board is added to the processor to make it communicating, yet its main function is not communications.

However, even with these definitional issues, certain trends remain evident. IBM is the leading data communications vendor with close to $1 billion in revenues. Burroughs, Memorex, and NCR are easily in the top 10, with dc revenues (generated most by front-end processors) ranging from $85 million to over $100 million. The leading modern and multiplexer suppliers, Racal (through its Milgo and Vadic subsidiaries), Motorola (mainly through its Codex subsidiary), General DataComm, and Paradyne are also among the top 10 suppliers in datacom. Refinements beyond this are difficult.

International market opportunities are still vast, although Europe is becoming very competitive and is also heading into an economic recession. In 1979, international revenues grew at almost 16%, compared to a U.S. growth rate of 10%. However, without IBM, foreign dp revenues grew at 24%, compared to a U.S. growth rate of 21%. In 1980, foreign growth excluding IBM expanded to 27% while the U.S. growth rate remained relatively flat at 22%.

Given the better international performance over the past couple of years, it is noteworthy to look at companies within the DATAMATION 100 that have a large percentage of sales generated by its overseas operations. The top 20 (foreign dp revenues as a percentage of total dp) had international revenues in excess of 40%, while seven companies had revenues in excess of 50% (Table XI). Of the 20 companies, only five had higher U.S. growth rates in 1980. Commodore International, with 76% of dp revenues generated overseas, heads the list.

METHODOLOGY: We have defined dp revenues as general purpose data processing products and services during calendar 1980. Included are mainframes, minicomputers, microcomputers, word processors, oem peripherals and terminals, end user peripherals and terminals, data communications, software products, hardware and software maintenance, services, and disk and tape media. Explicitly excluded are communication services; electronic and mag card typewriters; electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; telecommunications equipment such as PBXs; and dp suppliers with the exception of magnetic media for disk and tape drives. All peripherals that attach to a dp system are included. For computer-based manufacturing systems such as computer controlled machine tools, however, only the computer and hardcopy output devices are included.

Prior year results were restated to

| TABLE VIII |
| TOP 10 DP EMPLOYMENT |
| (in thousands) |
| 1980 | 1979 | Change |
| IBM | 278 | 270 | 2.9 |
| NCR | 66 | 65 | 1.6 |
| DEC | 60 | 50 | 21.0 |
| Burroughs | 57 | 57 | 1.4 |
| Control Data | 49 | 48 | 1.4 |
| Sperry | 47 | 46 | 2.8 |
| Honeywell | 29 | 29 | 1.8 |
| Hewlett-Packard | 28 | 25 | 12.0 |
| Computer Sciences | 15 | 13 | 10.6 |
| Data General | 14 | 14 | 4.8 |
| Total Top 10 | 643 | 616 | 4.5 |
| Total | 863 | 806 | 7.1 |
| Top 10 as a Percent of Total | 74.5% | 76.4% |
| Number of Companies Reporting | 83 |
| Total Dp Rev. Represented | 51,894 | 43,221 |
| Percent Dp Rev. Represented | 93.3 | 94.0 |

| TABLE IX |
| DP REVENUES BY PRODUCT SEGMENT |
| (in $ millions) |
| 1980 | 1979 | Growth Rate |
| Systems | Minicomputers | 15,148 | 13,312 | 13.8 |
| Mainframes | Microcomputers | 8,840 | 6,916 | 27.8 |
| Word Processing | 769 | 416 | 84.9 |
| Total Systems | 881 | 538 | 63.8 |
| OEM Peripherals | 3,968 | 3,128 | 26.9 |
| End User Peripherals | 6,910 | 5,943 | 16.3 |
| Data Communications | 1,141 | 927 | 23.1 |
| Software Products | 1,738 | 1,347 | 29.0 |
| Maintenance | 8,888 | 7,372 | 20.6 |
| Service | 6,432 | 5,329 | 20.7 |
| All Other | 911 | 772 | 18.0 |
| Total | 55,626 | 46,000 | 20.9 |

| TABLE X |
| TOP 10 WORD PROCESSING |
| (in $ millions) |
| 1980 | % Change |
| Wang Labs | 252.3 | 112.0 |
| Lanier | 110.1 | 48.6 |
| DEC | 82.3 | 102.6 |
| Xerox | 69.3 | 35.1 |
| Raytheon | 67.5 | 37.8 |
| Exxon | 66.2 | 31.9 |
| CPT | 65.7 | 68.9 |
| Burroughs | 49.6 | 1.5 |
| Philips Info Systems | 46.0 | 100.0 |
| NBI | 40.1 | 95.5 |

96 DATAMATION
Computer executives with no time to waste are enthusiastically welcoming the Computer Systems information service from DATA DECISIONS. They're finding they accomplish their research and evaluation objectives more efficiently because the DATA DECISIONS format lets them follow a direct, logical path to meaningful conclusions—on any currently-marketed mainstream product.

When you review DATA DECISIONS (with no obligation to buy), you'll agree with them and with William Hill.

Our rethinking the basic assumptions of the design and standards for a DP information service brings users important benefits. You find a complete report on every major system within 90 days of its announcement. And never a report more than one year old. If you're serious about staying current, DATA DECISIONS is the only information service for you.

You find information in a consistent order of related functions (exactly as you would organize it): software, CPU, memory, I/O, peripherals—with pricing in context. Since we've eliminated arbitrary mainframe or minicomputer system categories, you move immediately to what you need to know about all systems that perform the functions you need—in a single subscription to DATA DECISIONS Computer Systems.

Complementing services make DATA DECISIONS more valuable.

- Reference manuals: a two-volume looseleaf information service. Authoritative, independent reports on products and technology assess features, performance and pricing of mainstream DP offerings, plus detailed user ratings to assist you in product evaluations.
- "Hotline" consulting service: a unique, dedicated telephone inquiry service to help you find answers to specific questions about products or applications. The benefit of a full-time consultant on your staff—at no additional charge.
- News service: current news and commentary by DATA DECISIONS editors; late news and trends, and highlights of key product introductions. Newsletters are designed to be filed into the binders for future reference.
- Monthly updating service: more than 100 pages put the latest information in your hands, as soon as it is announced.

Review and compare DATA DECISIONS with no obligation to purchase.

Besides appreciating the time and effort saved, William Hill went so far as to venture that our format "...may well make its own contribution toward accelerating the development of integrated information systems." Isn't it time to find out how much DATA DECISIONS can do for you? Fill out and mail the coupon or postpaid card, and we'll tell you how you can arrange for your trial review with no obligation to buy.

“DATA DECISIONS Computer Systems beats other DP information services I've seen, and I believe I've seen them all. Vital facts, condensed format, no redundancy, nothing extraneous.”

William H. Hill, Vice President, Management Services, Nebraska Federal Savings and Loan Association

YES: I'd like to see for myself how DATA DECISIONS can keep me current and save me time, too. Please tell me how I can arrange for my no-purchase-obligation trial review.

Name ____________________________  Title ____________________________

Company ____________________________________________________________

Address ______________________________________________________________

City ____________________________ State ______ Zip ________________

Telephone ____________________________

Save time up front: Call toll-free 800-257-7732. In New Jersey, call 609-429-7100.

The DP Information Service of the 80s.

20 Brace Road
Cherry Hill, NJ 08034

CIRCLE 84 ON READER CARD
Mainframe systems keep losing market share to minicomputer, word processing, and microcomputer systems.

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

While most companies were cooperative although subject to corporate rules, others were particularly uncooperative. Among those that would not confirm our estimates were Litton Industries, Diebold, Schumberger (who has taken over Manufacturing Data Systems), Warner Communications (Atari), NEC, Data Printer, Grumman Corporation, and Data Terminal Systems.

Also, it is inevitable that we missed some potential companies. We invite any firm believing it merits consideration for the 1981 DATAMATION 100 to let us know.

Peter Wright is director of portfolio programs, Gartner Group, Inc., Greenwich, Conn. He was previously with IBM DPD in financial planning and IBM World Trade in product pricing. He has an MBA from Cornell Univ.

### TABLE XI

<table>
<thead>
<tr>
<th>TOP 20 FOREIGN REVENUES AS A PERCENT OF TOTAL DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

We're Your Washington Connection To World Markets

Interested in selling your products abroad? Do it the easy way. The International Trade Administration of the U.S. Department of Commerce has a unique vehicle to put you in touch with interested and ready buyers for your products overseas—International Trade Exhibitions, custom-tailored to your specific products.

Our project managers will take care of all the details—from helping you plan your marketing strategy to the nuts-and-bolts of arranging transportation, customs clearance, and booth design, including electricity, water pressure—whatever you need. We'll do all the leg work—all you do is arrive and throw the switch.

You specify the audience you want to target, and the U.S. embassy will go to work promoting your products to interested buyers and inviting them to visit your booth at the exhibition. You don't have to go to the buyers—they'll come to you.

Twenty-two International Trade Exhibitions are planned in the coming months, for computers, peripherals, software, data communications, word processing, and other business equipment—in cities like Sao Paulo, Paris, Tokyo, Milan, Munich, Geneva, Mexico City, Birmingham, Taipei, and Izmir.

Like more details? Call us today:

Robert Wallace  Simon Bensimon
Project Manager  Project Manager
(202) 377-3002  (202) 377-2298

Or write:
U.S. Department of Commerce
International Trade Administration
Office of Export Promotion/IPD
Room 6015A, Washington, D.C. 20230
The Crunch.

High-volume information processing comes easy to Wang Virtual Storage computer systems. Virtual memory management gives each VS user a full megabyte of logical address space for big-program development and execution. Multiple Input/Output Processors work independently to break the I/O bottleneck, buffering the CPU for faster throughput. And our sophisticated VS instruction sets cut through complex tasks with ease.

Expansion is easy, too. The VS family lets you grow from 6-user support on the VS 50 to 32 users on the VS, to 128-user support on VS 100 systems. Use up to 2 million bytes of main memory and 4.6 billion bytes of mass storage. And get an eight-fold increase in processing speed with the VS 100's 32-bit processor, 64-bit data path and 32K-bytes of integral cache memory. While protecting your software and peripheral investment every step of the way.

Unsqueezed.

But Wang VS systems aren't just powerful computers. They're complete systems that make computer power ingeniously easy to use. Our programming aids, for example, let you create a data entry screen as easily as writing a word processing document. Our Symbolic Debug utility lets you test and modify COBOL, BASIC, RPG II and Assembler programs at the source level. And our menu-driven file management facilities let you set up files, process transactions, generate reports and establish field-level security controls — interactively.

In all, Wang VS systems give you more easy ways to use computer power than any other system marketed today. Word processing, phototypesetting, electronic mail and telecommunications are all VS system options.

Call us. And let your local Wang Representative show you how to apply the crunch. Without getting caught in the squeeze.
AT&T  NASA
Bendix  Rockwell
Citicorp  7-Up
General Motors  Shell Oil
Gulf Oil  Stanford Univ.
Honeywell  Upjohn
Kemper Ins.  U.S. Steel
Marriott  Westinghouse
YOU MAY NOT BE FAMILIAR WITH THE COMPANY THAT SELLS THIS MACHINE, BUT YOU'RE FAMILIAR WITH THE COMPANIES THAT BUY IT.

Believe it or not, there are still some companies who haven't heard about the Word Processors from NBI. Fortunately, there are a lot who have. Because when it comes to selling Word Processors, NBI can list some of the most impressive companies in the world. Corporations like General Motors, Honeywell, AT&T and U.S. Steel. Insurance companies like Allstate, Kemper, Fireman's Fund and Blue Cross/Blue Shield.

Energy companies like Shell, Gulf and Standard Oil. As well as leading Universities like Harvard, Columbia and Stanford.

Organizations which did a lot of research before they selected their word processing equipment, and ultimately selected Word Processors by NBI.

Some were impressed that Datapro* rated NBI Word Processors superior to Xerox, Lanier, Wang and IBM. Others felt that NBI provided the best information processing products to interface with the networking architecture they had already chosen for their offices... while still others felt secure in the fact that NBI was among the largest producers of word processing systems in the world; and appreciated NBI's long term commitment to insure successful transition into future information networks as they develop.

Word Processing systems by NBI.

When companies like Blyth Eastman Paine Webber and Smith Barney, Harris Upham & Company start to buy them you know they're a solid investment.

For more information, call 1-800-525-0844 or write NBI, P.O. Box 9001, Boulder, Colorado 80301.

*NBI Systems. Used by NASA for the Columbia.

*Based on Datapro's 1980 survey among word processing system users.

NBI WORD PROCESSORS.
CIRCLE 87 ON READER CARD
# The Datamation 100
## The Top 100 U.S. Companies in the DP Industry

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IBM</td>
<td>1</td>
<td>$21367</td>
<td>17%</td>
<td>278200</td>
<td>$26213</td>
<td>Dec.</td>
</tr>
<tr>
<td>2</td>
<td>NCR</td>
<td>2</td>
<td>2840</td>
<td>12</td>
<td>65500</td>
<td>3322</td>
<td>Dec.</td>
</tr>
<tr>
<td>3</td>
<td>Control Data</td>
<td>4</td>
<td>2790</td>
<td>23</td>
<td>49000</td>
<td>3808</td>
<td>Dec.</td>
</tr>
<tr>
<td>4</td>
<td>Digital Equipment Corp.</td>
<td>6</td>
<td>2743</td>
<td>35</td>
<td>60000</td>
<td>2743</td>
<td>Feb.</td>
</tr>
<tr>
<td>5</td>
<td>Sperry Corporation</td>
<td>5</td>
<td>2552</td>
<td>12</td>
<td>47435</td>
<td>5331</td>
<td>Mar.</td>
</tr>
<tr>
<td>6</td>
<td>Burroughs</td>
<td>3</td>
<td>2478</td>
<td>1</td>
<td>57300</td>
<td>2902</td>
<td>Dec.</td>
</tr>
<tr>
<td>7</td>
<td>Honeywell</td>
<td>7</td>
<td>1634</td>
<td>12</td>
<td>29000</td>
<td>4925</td>
<td>Dec.</td>
</tr>
<tr>
<td>8</td>
<td>Hewlett-Packard</td>
<td>8</td>
<td>1577</td>
<td>37</td>
<td>28000</td>
<td>8197</td>
<td>Oct.</td>
</tr>
<tr>
<td>9</td>
<td>Xerox</td>
<td>10</td>
<td>770</td>
<td>35</td>
<td>0</td>
<td>3160</td>
<td>Dec.</td>
</tr>
<tr>
<td>10</td>
<td>Memorex</td>
<td>9</td>
<td>686</td>
<td>4</td>
<td>10700</td>
<td>769</td>
<td>Dec.</td>
</tr>
<tr>
<td>11</td>
<td>Wang Laboratories</td>
<td>14</td>
<td>682</td>
<td>66</td>
<td>14000</td>
<td>682</td>
<td>June</td>
</tr>
<tr>
<td>12</td>
<td>Data General</td>
<td>11</td>
<td>673</td>
<td>25</td>
<td>14370</td>
<td>673</td>
<td>Sept.</td>
</tr>
<tr>
<td>13</td>
<td>Storage Technology</td>
<td>12</td>
<td>603</td>
<td>26</td>
<td>11536</td>
<td>603</td>
<td>Dec.</td>
</tr>
<tr>
<td>14</td>
<td>Texas Instruments</td>
<td>16</td>
<td>562</td>
<td>41</td>
<td>0</td>
<td>4075</td>
<td>Dec.</td>
</tr>
<tr>
<td>15</td>
<td>Computer Sciences</td>
<td>13</td>
<td>560</td>
<td>35</td>
<td>14568</td>
<td>560</td>
<td>Mar.</td>
</tr>
<tr>
<td>16</td>
<td>Automatic Data Processing</td>
<td>15</td>
<td>505</td>
<td>24</td>
<td>13500</td>
<td>505</td>
<td>June</td>
</tr>
<tr>
<td>17</td>
<td>General Electric</td>
<td>17</td>
<td>475</td>
<td>21</td>
<td>7500</td>
<td>24959</td>
<td>Dec.</td>
</tr>
<tr>
<td>18</td>
<td>Electronic Data Systems</td>
<td>17</td>
<td>408</td>
<td>31</td>
<td>6544</td>
<td>414</td>
<td>June</td>
</tr>
<tr>
<td>19</td>
<td>Amdahl Corporation</td>
<td>18</td>
<td>394</td>
<td>23</td>
<td>4200</td>
<td>394</td>
<td>Dec.</td>
</tr>
<tr>
<td>20</td>
<td>TRW</td>
<td>22</td>
<td>377</td>
<td>33</td>
<td>0</td>
<td>4983</td>
<td>Dec.</td>
</tr>
<tr>
<td>21</td>
<td>Datapoint</td>
<td>24</td>
<td>364</td>
<td>34</td>
<td>6000</td>
<td>364</td>
<td>June</td>
</tr>
<tr>
<td>22</td>
<td>Triumph-Adler</td>
<td>20</td>
<td>325</td>
<td>10</td>
<td>5200</td>
<td>325</td>
<td>Dec.</td>
</tr>
<tr>
<td>23</td>
<td>Management Assistance Inc.</td>
<td>23</td>
<td>310</td>
<td>13</td>
<td>5300</td>
<td>310</td>
<td>Sept.</td>
</tr>
<tr>
<td>24</td>
<td>Tektronix</td>
<td>30</td>
<td>286</td>
<td>38</td>
<td>0</td>
<td>1023</td>
<td>May</td>
</tr>
<tr>
<td>26</td>
<td>Mohawk Data Sciences</td>
<td>25</td>
<td>278</td>
<td>12</td>
<td>4956</td>
<td>278</td>
<td>April</td>
</tr>
<tr>
<td>27</td>
<td>Prime Computer</td>
<td>39</td>
<td>268</td>
<td>75</td>
<td>4011</td>
<td>268</td>
<td>Dec.</td>
</tr>
<tr>
<td>28</td>
<td>Harris Corp.</td>
<td>29</td>
<td>260</td>
<td>24</td>
<td>3230</td>
<td>1453</td>
<td>June</td>
</tr>
<tr>
<td>29</td>
<td>Teletype Corp.</td>
<td>44</td>
<td>250</td>
<td>72</td>
<td>0</td>
<td>416</td>
<td>Dec.</td>
</tr>
<tr>
<td>30</td>
<td>ITT Corporation</td>
<td>26</td>
<td>250</td>
<td>2</td>
<td>5300</td>
<td>23819</td>
<td>Dec.</td>
</tr>
<tr>
<td>31</td>
<td>Dataproducts</td>
<td>34</td>
<td>248</td>
<td>44</td>
<td>4900</td>
<td>248</td>
<td>Mar.</td>
</tr>
<tr>
<td>32</td>
<td>National Semiconductor</td>
<td>28</td>
<td>245</td>
<td>7</td>
<td>2000</td>
<td>1159</td>
<td>May</td>
</tr>
<tr>
<td>33</td>
<td>Perkin-Elmer</td>
<td>35</td>
<td>226</td>
<td>31</td>
<td>3600</td>
<td>1044</td>
<td>June</td>
</tr>
<tr>
<td>34</td>
<td>Raytheon Company</td>
<td>33</td>
<td>225</td>
<td>29</td>
<td>4600</td>
<td>5002</td>
<td>Dec.</td>
</tr>
<tr>
<td>35</td>
<td>Tandy Corporation</td>
<td>42</td>
<td>220</td>
<td>47</td>
<td>1900</td>
<td>1515</td>
<td>June</td>
</tr>
<tr>
<td>37</td>
<td>Racal Electronics Ltd</td>
<td>40</td>
<td>212</td>
<td>40</td>
<td>3487</td>
<td>212</td>
<td>Mar.</td>
</tr>
<tr>
<td>38</td>
<td>Tymshare</td>
<td>32</td>
<td>211</td>
<td>20</td>
<td>3615</td>
<td>236</td>
<td>Dec.</td>
</tr>
<tr>
<td>39</td>
<td>SM Company</td>
<td>37</td>
<td>205</td>
<td>28</td>
<td>0</td>
<td>6080</td>
<td>Dec.</td>
</tr>
<tr>
<td>40</td>
<td>Four-Phase Systems</td>
<td>31</td>
<td>197</td>
<td>10</td>
<td>3748</td>
<td>197</td>
<td>Dec.</td>
</tr>
<tr>
<td>41</td>
<td>Computervision</td>
<td>52</td>
<td>191</td>
<td>86</td>
<td>3000</td>
<td>224</td>
<td>Dec.</td>
</tr>
<tr>
<td>42</td>
<td>C. Itoh Electronics Ltd</td>
<td>38</td>
<td>189</td>
<td>23</td>
<td>587</td>
<td>189</td>
<td>Dec.</td>
</tr>
<tr>
<td>43</td>
<td>System Development Corp</td>
<td>36</td>
<td>187</td>
<td>15</td>
<td>3897</td>
<td>187</td>
<td>June</td>
</tr>
<tr>
<td>44</td>
<td>Motorola</td>
<td>46</td>
<td>175</td>
<td>30</td>
<td>2300</td>
<td>3099</td>
<td>Dec.</td>
</tr>
<tr>
<td>45</td>
<td>General Instruments</td>
<td>43</td>
<td>172</td>
<td>15</td>
<td>0</td>
<td>823</td>
<td>Feb.</td>
</tr>
<tr>
<td>46</td>
<td>Ampex Corporation</td>
<td>41</td>
<td>170</td>
<td>12</td>
<td>4055</td>
<td>493</td>
<td>May</td>
</tr>
<tr>
<td>47</td>
<td>Apple Computer</td>
<td>74</td>
<td>165</td>
<td>175</td>
<td>1100</td>
<td>165</td>
<td>Sept.</td>
</tr>
<tr>
<td>48</td>
<td>Bunker Ramo</td>
<td>45</td>
<td>147</td>
<td>8</td>
<td>7050</td>
<td>468</td>
<td>Dec.</td>
</tr>
<tr>
<td>49</td>
<td>Sanders Associates</td>
<td>82</td>
<td>145</td>
<td>209</td>
<td>2500</td>
<td>318</td>
<td>July</td>
</tr>
<tr>
<td>50</td>
<td>Bradford National</td>
<td>48</td>
<td>143</td>
<td>19</td>
<td>4300</td>
<td>143</td>
<td>Dec.</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------</td>
<td>-----------</td>
<td>---------------------</td>
<td>-----------------------</td>
<td>-------------------</td>
<td>------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>51</td>
<td>Nixdorf Computer</td>
<td>54</td>
<td>138</td>
<td>38</td>
<td>2036</td>
<td>138</td>
<td>Dec.</td>
</tr>
<tr>
<td>52</td>
<td>Centronics</td>
<td>47</td>
<td>129</td>
<td>2</td>
<td>2600</td>
<td>129</td>
<td>June</td>
</tr>
<tr>
<td>53</td>
<td>Tandem Computers</td>
<td>66</td>
<td>129</td>
<td>94</td>
<td>1630</td>
<td>129</td>
<td>Sept.</td>
</tr>
<tr>
<td>54</td>
<td>Lanier Business Products</td>
<td>62</td>
<td>128</td>
<td>64</td>
<td>0</td>
<td>275</td>
<td>May</td>
</tr>
<tr>
<td>56</td>
<td>General Automation</td>
<td>49</td>
<td>127</td>
<td>7</td>
<td>0</td>
<td>127</td>
<td>July</td>
</tr>
<tr>
<td>57</td>
<td>Informatics</td>
<td>50</td>
<td>126</td>
<td>12</td>
<td>2500</td>
<td>126</td>
<td>Dec.</td>
</tr>
<tr>
<td>58</td>
<td>Boeing</td>
<td>57</td>
<td>125</td>
<td>30</td>
<td>0</td>
<td>9426</td>
<td>Dec.</td>
</tr>
<tr>
<td>59</td>
<td>Telex Corporation</td>
<td>55</td>
<td>118</td>
<td>19</td>
<td>2276</td>
<td>172</td>
<td>Mar.</td>
</tr>
<tr>
<td>60</td>
<td>Reynolds and Reynolds</td>
<td>51</td>
<td>118</td>
<td>8</td>
<td>1450</td>
<td>208</td>
<td>Sept.</td>
</tr>
<tr>
<td>61</td>
<td>Wyly Corporation</td>
<td>60</td>
<td>118</td>
<td>35</td>
<td>1600</td>
<td>118</td>
<td>Dec.</td>
</tr>
<tr>
<td>63</td>
<td>Recognition Equipment</td>
<td>56</td>
<td>113</td>
<td>15</td>
<td>2700</td>
<td>113</td>
<td>Oct.</td>
</tr>
<tr>
<td>64</td>
<td>Shared Medical Systems</td>
<td>61</td>
<td>106</td>
<td>28</td>
<td>1266</td>
<td>107</td>
<td>Dec.</td>
</tr>
<tr>
<td>65</td>
<td>AM International</td>
<td>67</td>
<td>99</td>
<td>49</td>
<td>1386</td>
<td>936</td>
<td>July</td>
</tr>
<tr>
<td>66</td>
<td>Commodore International</td>
<td>71</td>
<td>99</td>
<td>54</td>
<td>0</td>
<td>150</td>
<td>June</td>
</tr>
<tr>
<td>67</td>
<td>Dun and Bradstreet</td>
<td>59</td>
<td>97</td>
<td>6</td>
<td>1500</td>
<td>1176</td>
<td>Dec.</td>
</tr>
<tr>
<td>68</td>
<td>Comshare</td>
<td>65</td>
<td>88</td>
<td>32</td>
<td>856</td>
<td>88</td>
<td>June</td>
</tr>
<tr>
<td>69</td>
<td>The Sun Company</td>
<td>68</td>
<td>87</td>
<td>31</td>
<td>1348</td>
<td>12945</td>
<td>Dec.</td>
</tr>
<tr>
<td>70</td>
<td>Gould</td>
<td>64</td>
<td>87</td>
<td>22</td>
<td>1650</td>
<td>87</td>
<td>June</td>
</tr>
<tr>
<td>71</td>
<td>Exxon</td>
<td>72</td>
<td>86</td>
<td>39</td>
<td>0</td>
<td>108449</td>
<td>Dec.</td>
</tr>
<tr>
<td>72</td>
<td>Computer Automation</td>
<td>70</td>
<td>81</td>
<td>26</td>
<td>1200</td>
<td>81</td>
<td>June</td>
</tr>
<tr>
<td>73</td>
<td>Modular Computer Systems</td>
<td>63</td>
<td>81</td>
<td>13</td>
<td>1481</td>
<td>81</td>
<td>Dec.</td>
</tr>
<tr>
<td>74</td>
<td>Martin-Marietta</td>
<td>76</td>
<td>78</td>
<td>43</td>
<td>2245</td>
<td>2538</td>
<td>Dec.</td>
</tr>
<tr>
<td>75</td>
<td>Gerber Scientific</td>
<td>75</td>
<td>78</td>
<td>42</td>
<td>1300</td>
<td>89</td>
<td>April</td>
</tr>
<tr>
<td>76</td>
<td>CPT Corporation</td>
<td>84</td>
<td>76</td>
<td>69</td>
<td>826</td>
<td>76</td>
<td>June</td>
</tr>
<tr>
<td>77</td>
<td>Paradyne Corporation</td>
<td>89</td>
<td>76</td>
<td>83</td>
<td>1617</td>
<td>76</td>
<td>Dec.</td>
</tr>
<tr>
<td>78</td>
<td>BASF Systems</td>
<td>77</td>
<td>75</td>
<td>39</td>
<td>0</td>
<td>90</td>
<td>Dec.</td>
</tr>
<tr>
<td>79</td>
<td>Lear Seigler</td>
<td>69</td>
<td>75</td>
<td>15</td>
<td>500</td>
<td>1489</td>
<td>June</td>
</tr>
<tr>
<td>80</td>
<td>Conrac</td>
<td>73</td>
<td>70</td>
<td>13</td>
<td>0</td>
<td>147</td>
<td>Dec.</td>
</tr>
<tr>
<td>81</td>
<td>Interactive Data</td>
<td>78</td>
<td>69</td>
<td>30</td>
<td>1100</td>
<td>69</td>
<td>Dec.</td>
</tr>
<tr>
<td>82</td>
<td>Applicon</td>
<td>85</td>
<td>68</td>
<td>51</td>
<td>1000</td>
<td>68</td>
<td>April</td>
</tr>
<tr>
<td>83</td>
<td>Commerce Clearing House</td>
<td>80</td>
<td>67</td>
<td>37</td>
<td>0</td>
<td>254</td>
<td>Dec.</td>
</tr>
<tr>
<td>84</td>
<td>Quotron Systems</td>
<td>81</td>
<td>64</td>
<td>35</td>
<td>785</td>
<td>64</td>
<td>Dec.</td>
</tr>
<tr>
<td>85</td>
<td>Dyan Corporation</td>
<td>96</td>
<td>63</td>
<td>86</td>
<td>1800</td>
<td>63</td>
<td>Oct.</td>
</tr>
<tr>
<td>86</td>
<td>Cray Research</td>
<td>88</td>
<td>61</td>
<td>42</td>
<td>761</td>
<td>61</td>
<td>Dec.</td>
</tr>
<tr>
<td>87</td>
<td>Triad Systems</td>
<td>94</td>
<td>60</td>
<td>61</td>
<td>818</td>
<td>60</td>
<td>Sept.</td>
</tr>
<tr>
<td>88</td>
<td>General Datacom</td>
<td>87</td>
<td>57</td>
<td>30</td>
<td>1050</td>
<td>57</td>
<td>Sept.</td>
</tr>
<tr>
<td>89</td>
<td>Anacomp Inc</td>
<td>95</td>
<td>57</td>
<td>60</td>
<td>950</td>
<td>87</td>
<td>June</td>
</tr>
<tr>
<td>90</td>
<td>Intergraph</td>
<td>99</td>
<td>56</td>
<td>91</td>
<td>764</td>
<td>56</td>
<td>Dec.</td>
</tr>
<tr>
<td>91</td>
<td>Rolm</td>
<td>93</td>
<td>53</td>
<td>43</td>
<td>0</td>
<td>251</td>
<td>June</td>
</tr>
<tr>
<td>92</td>
<td>MSI Data</td>
<td>83</td>
<td>53</td>
<td>17</td>
<td>852</td>
<td>53</td>
<td>Mar.</td>
</tr>
<tr>
<td>93</td>
<td>Nashua</td>
<td>91</td>
<td>53</td>
<td>34</td>
<td>467</td>
<td>67</td>
<td>Dec.</td>
</tr>
<tr>
<td>94</td>
<td>National Data</td>
<td>90</td>
<td>53</td>
<td>29</td>
<td>2175</td>
<td>67</td>
<td>May</td>
</tr>
<tr>
<td>95</td>
<td>American Express</td>
<td>79</td>
<td>53</td>
<td>6</td>
<td>1600</td>
<td>53</td>
<td>Dec.</td>
</tr>
<tr>
<td>96</td>
<td>MSA Inc.</td>
<td>92</td>
<td>52</td>
<td>37</td>
<td>799</td>
<td>52</td>
<td>Dec.</td>
</tr>
<tr>
<td>97</td>
<td>Auto-Trol Technology</td>
<td>97</td>
<td>51</td>
<td>51</td>
<td>660</td>
<td>51</td>
<td>Dec.</td>
</tr>
<tr>
<td>98</td>
<td>Philips Information Systems</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>500</td>
<td>50</td>
<td>Dec.</td>
</tr>
<tr>
<td>99</td>
<td>Printronix</td>
<td>98</td>
<td>49</td>
<td>49</td>
<td>838</td>
<td>49</td>
<td>Mar.</td>
</tr>
<tr>
<td>100</td>
<td>Verbatim</td>
<td>86</td>
<td>48</td>
<td>8</td>
<td>1200</td>
<td>48</td>
<td>June</td>
</tr>
</tbody>
</table>
INTERNATIONAL BUSINESS
MACHINES CORPORATION
Old Orchard Road
Armonk, NY 10504
(914) 765-1900

In 1980, IBM served notice to the industry that it has no intention of relinquishing its number one position.

Significant investments were made in plant and equipment expansion, rental machines, and R&D. Capital expenditures grew to $6.592 billion, following a record $5.991 billion in 1979. Research and development expenses amounted to another $1.520 billion vs. a record $1.360 billion in 1979.

IBM completed construction of 4 million sq. ft. of manufacturing and laboratory space and 1 million sq. ft. of additional space for marketing operations. More than 8 million sq. ft. of manufacturing/laboratory space and 3 million sq. ft. of marketing space remained under construction at year-end.

IBM also tested new marketing and service techniques. Quantity discounts, outside distributors, retail stores, business computer centers, direct mail and telephone selling, customer support centers, application information centers, software distribution centers, etc. were all evaluated and expanded.

Some significant events in 1980 were:

- A cosponsored announcement in office information systems: the Displaywriter from OPD, DPP's word/data processing distributed office system for the $1000, and GSD's 5520 administrative/test/documents distribution system.
- First, though delayed, shipment of the System/38, which may have reached a volume of 500 per month by end year.
- Rental price increases in June and December of approximately 12% per year (December '79, June '80, December '80).
- New models of the 4300 family.
- The 3081, considered to be the first model of the new H Series, with the highest computational speed and lowest circuit packaging density yet developed by IBM (750,000 logic circuits contained in four cubic feet).
- Increased performance and price maintenance of the 3033N.
- Announcement of the smallest 3033s, called model group S.
- An uncharacteristic "directional statement" to reassure prospective OS/360 users that IBM will provide, over time, the necessary support to permit communications among office information systems products offerings.
- One of the first major uses of holography in a commercial product, the 3687 supermarket checkout scanner.
- A "statement of objection" by the EEC to certain IBM business practices.
- The orbiting of SBS's first satellite.
- A joint venture in videodisk technology called DiscoVision.
- Election of John Opel to replace Frank Cary, who retains the position of chairman.
- The return of Tom Watson, Jr., and Cyrus Vance to IBM's board.

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

A slow start in 1980 saw lower margins in the first and second quarters, and earnings per share off more than 8% compared to the first six months of 1979. Component shortages and production startup problems on new products led to production shortfalls; resulting delivery delays had consequent revenue and earnings impact. Production problems lessened in each quarter, and NCR closed the year with revenues up 12%, net income up 12%, and earnings per share up 8%. The increases resulted from a 10% improvement in U.S. revenues and a 14% revenue gain in international markets. We estimate that dp revenues for the year increased almost 12%, despite the early production problems.

NCR's order experience for the year was the reverse of its revenue and earnings history. Worldwide orders were strong in the first quarter, but U.S. orders started to show a downturn by spring. Foreign orders were sufficiently strong in the third quarter to offset the U.S. decline, but by year-end foreign orders also turned down, due in part to the onset of a European recession. The company closed the year with a flat year-to-year order performance. Since NCR's business is strongly influenced by the retail sector, worldwide economic conditions are mirrored in the company's business levels.

The acquisition of COMTEN in 1979 was followed by the acquisition of Applied Digital Systems (ADDS) in 1980.

Financial terminals and systems showed the strongest growth in 1980 (up 27%), followed by revenues from computer systems (up 15%). Retail terminals and systems had lower revenues for the year, posting a 5% decline from the 1979 level.

Service revenues were up 14%, primarily as a result of improvements in maintenance revenues.

Despite reduced revenues from retail terminals and systems, NCR further consolidated its leadership position in the retail market, particularly in universal product code scanning systems for supermarkets. As part of its plans to become a more vertically integrated supplier, NCR announced plans to begin manufacturing its own lasers.

R&D expenditures increased 17.5% to $201 million. Interestingly, for the second year in a row, considerably more than half (nearly 60%) of NCR's R&D expenditures was for software development, resulting in more software announcements during the year than new hardware products.

NCR's capital expenditures were $156.4 million during the year up more than 36% from 1979. Major projects included a new retail systems plant, a new systems engineering facility, general plant expansion, and a continuing expansion of microelectronics design and production facilities. NCR has made a commitment to in-house semiconductor capabilities and will soon be capable of supplying nearly two-thirds of its components needs, second only to IBM among the mainframe vendors.
CONTROL DATA CORP.
8100 34th Avenue South
Bloomington, MN 55440
(612) 853-8100

Control Data had another good year in 1980, its sixth consecutive year of earnings improvement. Despite the recession impact on Commercial Credit Corp., combined company revenues were $3.8 billion, up 18%, while net earnings were $150.6 million, up 21%. The strong overall results emanate from computer operations: Commercial Credit reported no growth over 1979. Computer revenues were up 23%; earnings per share from computer operations grew a very strong 36% year to year.

As in past years, the strongest performance within the computer operations came in peripheral products. Peripherals accounted for 42% of computer revenues, and sported a year-to-year growth rate of 31.5%. Control data markets one of the industry’s broadest lines of computer peripherals, for both its own and other companies’ systems. Peripherals for other systems are marketed both to oems (up 30% in 1980) and to IBM system end users (down in 1980). Control Data manufactures nearly all of its peripheral equipment either in its own facilities or through joint ventures. The joint ventures are Magnetic Peripherals (70% owned by CDC) and Computer Peripherals (60% owned by CDC).

Computer Services (37% of computer revenues) had the next strongest performance in 1980, with revenues up 17.3%. Control Data’s computer services are made up of data services (with revenues of $549 million, up 17%), engineering services (with revenues of $313 million, up 14%), and education and consulting services (with revenues of $173 million, up 25%). Education services include the PLATO computer-based education system, which offers hardware and extensive sourceware libraries. Control Data has made a major investment, which has yet to show any commercial profit, in the PLATO system.

Computer Systems, the original business of Control Data, now represents 21% of computer operations revenue. This business grew 16.7% in 1980, with a 13% growth rate in traditional dp systems and 31% growth in government systems, which had a down year in 1979. Computer Systems operates primarily in the large-scale scientific market for engineering, educational, and scientific applications. At the top of the line is the CYBER 205, introduced in 1980 and one of the most powerful computer systems in the world. The CYBER 205 supercomputer has a claimed peak performance of 800 million floating point instructions per second.

For 1981, the outlook appears to mirror 1980. Peripherals, services, and computer systems should grow. Financial services (Commercial Credit Corp.) should continue to be hampered by high interest rates and a sluggish world economy.

With growth in all segments of computer operations anticipated, and another decline in the income contribution from Commercial Credit expected, the dominance of Control Data’s original business—computers—has effectively been restored.

DIGITAL EQUIPMENT CORPORATION
129 Parker St., PK 3-1/552
Maynard, MA 01754
(617) 493-3631

Digital Equipment continued to breeze through the current economic uncertainties. While industry leader IBM took nine years to expand revenues from $500 million to over $3 billion, and Xerox—with a legal monopoly date derived from patent protection—required seven, DEC crossed the mark in six years. No signs of a slowdown appear. Despite management’s assertion that such heady growth rates cannot continue, the company inevitably ends up trying and accomplishing the extraordinary for just one more year.

Indeed, the recession for DEC came just in time to bail the company out of problems with extended delivery lead times in 1979, only partly attributable to a case of overpopularity. DEC itself pursued a conscious course of allowing lead times to run during the upturn and refused to chase demand as it had in the past.

In one of its troubled product lines, the VT/100 crt terminal, a trebling in production capacity coinciding with a softening in demand finally broke the one-year delivery lag that prevailed in late ’79. By fall, ads heralded immediate availability. The trend affected DEC’s competitors, who for the first time in three years, faced the burden of matching DEC in product capability, rather than relying primarily on availability. Data General in the December quarter, and Prime in its first quarter of 1981 succumbed to the rising pressures of increased competition in a weakening economy.

VAX software gained the software maturity required for DEC to sustain a drive into commercial markets. Seven enhancements in the spring included new BASIC native mode COBOL compilers, another release of FORTRAN, CORAL 66 support for realtime, Forms Management System (FMS), Datatieve for inquiry, and an enhancement for the VAX/VMS operating system. At press time database management software constituted the only missing element for commercial applications.

In October DEC released the VAX-11/750, extending the VAX family downwards with 60% of the capacity of the VAX 11/780’s performance at 40% of the price. Significantly, with VAX DEC is offering a processor version—only geared to oems and systems houses—as well as fully configured systems for end-users.

Customer service remained a top priority with service related revenues up 39%, almost a fourth of total corporate revenues.

DEC budgeted capital spending for the June ‘81 fiscal year at over $400 million, almost double the amount spent in the prior year. Employment rose from 49,600 to 60,000.
HP presents graphic improved
Whether it's computer-aided engineering, image processing, simulation or management presentations, Hewlett-Packard graphics can give you a fast, easy way to focus on the facts. From initial system set-up to final hard copy output.

**Peripheral vision.**

All our plug-in graphics peripherals are designed to work together, so you can build a complete workstation with the products that make the most sense for your applications.

Start with our easy-to-use input devices. Digitizers, data tablets and light pens let you convert line drawings, schematics, flow charts and other graphic information into coordinate data for processing and storage.

Then you can display and manipulate your data on any of our high-performance graphics terminals or integrated graphics systems. All use HP's powerful graphics language extensions, giving you extraordinary flexibility to shape the way your information is presented. And for hard copy output, our graphics printers and eight-color plotters put the equivalent of an entire art department right at your fingertips.

**The picture of productive systems.**

HP offers a full range of technical computer systems to support our graphics products. Which means that the compatibility is designed right in.

If you'd like to see an eye-opening demonstration of our graphics workstations, call your local HP sales office listed in the White Pages. You can also write for more information to: Hewlett-Packard, Attn: Pete Hamilton, Dept. 04104, 3404 E. Harmony Road, Ft. Collins, CO 80525.
SPERRY CORPORATION
1290 Avenue of the Americas
New York, NY 10019
(212) 926-3273

Sperry Corporation is a more than $5 billion conglomerate. Sperry consists of New Holland Div., deriving more than $1 billion from farm machinery sales; Vickers Div., with more than $500 million in sales from hydraulics and fluid power equipment; Sperry and Flight Systems divisions, with combined revenues of nearly $900 million from guidance and control equipment; and Sperry Univac Div. with $2.6 billion in dp revenue.

Sperry Corp.'s calendar year revenues were $5.3 billion in 1980, up 15% from 1979, with net income increasing 18.7%. Sperry Univac contributed 48% of revenue and approximately 47% of net income. Univac's revenues in the calendar year increased by 24.5% (16% growth in U.S. business and 37% growth in foreign markets). Univac's operating income increased approximately 24%, and new order bookings and backlogs both showed a 9% gain at year-end.

Univac emphasizes a selective industry marketing and support specialization. Approximately 80% of Univac's business now comes from six major target industry markets—manufacturing, energy, airlines, distribution, financial services, and the public sector. U.S. defense systems is considered a separate major market area within Univac.

Software and service revenues are becoming increasingly important to Univac, and the company is making a substantial investment for developing new applications packages for its target industries. Unbundled software and services revenues have nearly reached the $100 million level, and growth in this area is expected to approach 50% per year.

A semiconductor division was recently formed to meet Univac's demand for special-purpose logic components. The new division began to implement an initial $50 million capital expansion program for LSI and VLSI operations in the Minneapolis area.

One of the greater product successes for Univac is the 1100/60. Since its introduction in late 1979, more than 550 orders have been received and over 500 will have been installed by the end of fiscal year '80 in March. Additional models of the 1100/60 were announced in 1980. The mid-range computer product area has likewise been strengthened. More than 500 System 80 orders have been received, and installations are already being made at a rate approaching 100 per quarter.

Distributed processing, data communications, and the office automation markets also attracted Univac's attention in 1980. A new micro processor-based distributed processing terminal family, the UTS-4000, was announced during the year, as were additional models of the V77 minicomputer family. All new hardware and software are designed to operate under Univac's own communications standard, "DCA" (distributed communications architecture). A fully integrated office system is in development. Several test sites are already under way, and product announcements are expected in 1981.

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

At the end of 1979, Burroughs uncharacteristically went outside the company and selected a new top manager, W. Michael Blumenthal, to succeed the chairman and chief executive officer as of Jan. 1, 1981. Thus, the '80s began with change, and the events of 1980 forecast more to come.

Problems were evident. The rate of revenue growth slowed throughout the year and margins came under increasing pressure. In addition to Blumenthal, other new management people were brought into the company, and management emphasis was shifted to cash and asset management. By the end of the third quarter, earnings per share had declined 13.5% year to year, and management immediately began to rethink its position in the industry, and to reevaluate and initiate new strategic plans.

In the fourth quarter, the company took action that resulted in a reduction of 1980 and fourth quarter net income by $125.1 million or $3.03 per share. These actions included dropping the large-scale scientific processor development, phasing out calculators and adding machine products, closing certain manufacturing facilities and some overseas marketing operations, establishing an early retirement program, inventory write-offs and adjustments, and reserves.

As a result of these changes, revenues in 1980 were flat; 1979 earnings plummeted to $1.99 per share from $7.45 in 1979. Without write-offs and adjustments, operating earnings per share would have been approximately $5.02, a decline of 33%.

Along with management, accounting, and strategic goal changes, organizational changes were also put in place. A new office systems group was formed. Burroughs also began a major expansion of its integrated semiconductor manufacturing capability, and a refinement of its systems distribution channels. The major acquisition of Systems Development Corp. was also completed, bringing new strength to the company's integrated hardware, software, and services capabilities. As a Burroughs subsidiary, SDC will operate under its current management and retain its own identity.

Despite the turmoil of 1980, at year-end Burroughs orders showed an increase for the year as a whole, reflecting strength in the first half of 1980 and some softening in the last half of the year. Year-end backlogs were at an all-time high.
SOMETHING TO CELEBRATE!
TRT's 110,000th SEMATRANS MODEM DELIVERED.

And this one's no Johnny-come-lately: it's another SEMATRANS 2424 with a hefty track record in applications requiring 2400 bps full-duplex operation over leased 2-wire lines or on the dial-up network. Like all TRT data sets, it naturally comes with the technology and dependable user support that have made TRT France's leading modem builder and exporter. We're quite proud of No. 110,000, and of the performance of its brothers in bringing reliable data communications to countries the world over.

...leading the communications field.

TRT
88, rue Brillat Savarin 75640 PARIS Cedex 13 FRANCE
Tél. (1) 581.12.60 · Telex 270616 F.
HONEYWELL, INC.
Honeywell Plaza
Minneapolis, MN 55408
(612) 870-5200

Honeywell had a strong 1980, completing its sixth consecutive year of earnings increases. Total revenues increased 17% to $4.9 billion, operating income rose 7.4%, and earnings per share were up 14.8% to $12.57. Marking its 25th year in the computer business, Honeywell’s Information Systems Div., in which the company’s data processing operations are centered, achieved substantial revenue and profit increases in 1980, despite generally poor economic conditions. Honeywell Information Systems (HIS), accounting for one-third of Honeywell’s revenues and about 35% of profits, posted revenue gains of 12% (to $1.6 billion) and a gain of 22% in operating profits (to $186 million). Orders, shipments, revenues, and year-end backlogs hit record levels.

Honeywell’s other business centers are Environmental Systems and Controls, accounting for 25% of revenue and 27% of profit; Industrial Systems and Controls, accounting for 22% of revenue and 25% of profit; and Aerospace and Defense, making up 20% and 12% of revenue and profit, respectively.

Information Systems’ international operations were a major contributor to 1980 results. About a third of HIS revenues is derived from wholly owned subsidiaries, primarily in Canada, the United Kingdom, Italy, and from Cii-Honeywell Bull in France, 47% owned by Honeywell. Honeywell’s share of the ordinary income of Cii-Honeywell Bull rose to $23 million in 1980 from $13.5 million in 1979. The French government program of granting subsidies to Cii-Honeywell Bull expired, as planned, in March 1980.

HIS’ management structure was streamlined early in the year, giving the systems division direct responsibility for worldwide planning and for facilitating development and market responsiveness. In product announcements, HIS strengthened itself in distributed processing, small systems, and large systems. The DPS-6 family of ten small computers was announced, including two 32-bit “superminis” and four 16-bit models. HIS entered the office automation market with the introduction of integrated word processing, data processing, and communications features for both the new DPS-6 and the older Level 6 minicomputer.

In large systems, Honeywell began to ship the DPS-8, announced in 1979, and more than 100 systems were installed by year-end. A notable strength of Honeywell in large systems is the GCSOS-8 and MULTICS operating systems software.

Honeywell’s investment in research and development for systems products, software, and communications increased 20% to $130 million. Computer-related research and development totaled about $280 million, including $130 million spent by Cii-Honeywell Bull. Solid-state electronics and software continue to be the major focus of Honeywell’s research.

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

In FY ’78 Hewlett-Packard opted for increased growth in its dp activities. Since then, expansion in employment and revenues have continued at 27% and 36% compound rates, respectively, for the data products group, compared to 15% and 25%, respectively, for the company’s medical, analytical, and test and measurement groups. With the 3000 and the Image database management software, HP established a strong position in commercial markets; over 6,000 3000 systems are installed worldwide.

The pace slowed modestly for the data products group in 1980; orders rose only 20% in the three months ending in July. The commercial products group even ran below quotas for a time before the introduction of the 3000/Series 44, which offers twice the performance of 3000/Series III at 5% higher cost. Still to come is the HP 55, employing dual 16-bit processors with reputedly four to six times the performance of the Series III.

With the Series 44, HP offers customers a money-back maintenance agreement that guarantees 9% hardware up time. Under this option, up time is evaluated monthly for the previous three months. The user is given a month’s credit if 99% up time is not achieved in this period.

Even so, industry wags continue to ponder the potential remaining product life for the 3000, and, in particular, for the MPE operating system. Through at least five significant revisions, the operating system has minimally doubled in size, with 11 functional enhancements added to the data structure alone. Current efforts appear to have focused on revisions to the existing MPE software, which would not meet the need for a fundamental rewrite. Yet, a new operating system to capitalize fully on 32-bit hardware engines may be 18 months away.

Hewlett-Packard has targeted the international manufacturing industry as its prime market, and has contracted with University Computing for APT—the standard language in numerical control—and other software. New materials management/3000 software simulates new production plans, identifies critical supply problems, recommends manufacture or purchase of materials, and eliminates shutdowns for the taking of physical inventory.

Personal computers are roughly 12% of group revenues, or $180 million, recorded the best relative performance in the company last year, with more than a million of the HP 30EC family of pocket calculators now shipped. The new HP 80 series expands the concept of calculators into computers with a built-in display, graphics, and basic language programming.

With only nine months’ worth of shipments made in FY ’80, the HP 80 achieved the number six position on HP’s list of top selling products, with sales hitting $100 million a year by January 1981. A high proportion of sales have been marketed through an independent dealer market; HP does not currently plan to open its own retail stores.
New, from the makers of DMAX/16™

Super Max

The single-board, 16-line ABLE DH/DM™ that enhances any UNIBUS system with DH-performance at DZ-prices.

Two years ago, we broke new ground with our DMAX/16™, the original alternative to the DEC DH11. DMAX cut the space requirements from nine slots to three and became an immediate worldwide success. Now we've come up with something even better. This time it's ABLE DH/DM™, an alternative that achieves the optimum cluster size - 16 lines with modem control on a single board. You can compare price, or you can compare throughput. Either way, ABLE DH/DM™ beats everything in its class. No one else comes close.

The ABLE DH/DM™ is today's answer to VAX system needs for DMA communications multiplexing and serves all standard UNIBUS systems equally well. Each 16-line ABLE DH/DM™ installs in any standard hex-width slot at only one unit bus load and is DH11 compatible to the diagnostic level. Just plug it in and see it run - up to 19.2K baud using only half the UNIBUS bandwidth of a DEC DH11.

Key ABLE DH/DM™ features include on-board diagnostics with LED display, modem control on all lines, improved on-board silo depth and variable PROM set for proprietary OEM applications.

Keep up with ABLE and optimize your VAX, PDP-11 or System 20. Write or call today for details on our full line of UNIBUS-compatible special-memory, general-purpose and data-communications products.

ABLE the computer experts
ABLE COMPUTER, 1751 Langley Avenue, Irvine, California 92714. (714) 979-7039. TWX 910-595-1729 ACT IRIN.
ABLE COMPUTER-EUROPE, 74/76 Northbrook Street, Newbury, Berkshire, England RG13 1AE. (0635) 32125. TELEX 848507 HJULPHG.
XEROX CORPORATION
800 Long Ridge Road
Stamford, CT 06904
(203) 329-8711

The scope of Xerox now includes office and information systems. Xerox Office Products Div. alone generated $400 million in revenues worldwide during 1980; there were also dp revenues from subsidiaries such as Shugart, Diablo, Versatec, and Century Data. During 1980, in office systems, Xerox introduced information processing machines communications such as the Xerox 5700 electronic printing system and the System 8000 which can be linked to Ethernet. In May 1980, in a move to position Ethernet as the potential standard network for the industry, Xerox announced an agreement with DEC and Intel to jointly develop specs for data rates, reliability, and access techniques.

Business continued strong for Versatec, which sells its electrostatic printer/plotter markets that felt no recession, such as oil, gas, and mineral exploration businesses, and CADCAM. Shugart Associates, a leading supplier of floppy disk control and memory units and a growing factor in higher-capacity rigid disks, had a strong year as a result of demand related to microcomputer sales.

Diablo Systems introduced a new computer terminal-printer. Competition in daisywheel printers continues to increase.

Kurzweil Computer Products was acquired early in 1980. The Cambridge firm has proprietary software technology.

Besides office systems and peripherals, Xerox also has a rapidly growing computer services business that has reached nearly $100 million. Overall, we estimate Xerox’s information processing revenues were $770 million in 1980, up 35% from $570 million in 1979.

Total Xerox revenues for 1980 were $8.2 billion, up 17%, with net income at $619 million, up 10%. Profit margins are expected to remain under pressure during 1981. Revenues from systems, components, and other businesses have increased from 15% of total revenues in 1975 to about 25% in 1980.

Xerox is experimenting with various merchandising approaches. During 1980, it opened retail stores, contracted with dealers and distributors, and tried mail order as a sales technique.

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

Memorex incurred its first yearly loss since 1974 as Clarence Spangle took over as president and chief executive officer. In many ways, however, 1980 was a productive year as the company refocused its corporate strategy by charting out its future market opportunities, streamlining current operations, and eliminating some of its unprofitable business.

In 1980 dp revenues were up 4.3% to $686 million, while dp operating income declined from $52.2 million in 1979 to a deficit of $92 million in 1980. Losses were reduced as the year progressed, and while the corporation still incurred a $2.8 million loss in the last quarter, dp operating income turned profitable. Results in 1980 were due in part to economic conditions— inflation, high interest rates, and recession. Dp markets remained strong, but were characterized, particularly during the first half, by tough price competition and uncertainty related to the IBM 3380 disk drive announcement. Demand for the disk drives picked up strongly after IBM’s June announcement. Memorex’s sub-par operating results were also due to operations (high manufacturing costs, inventory changes, and startup costs with several new products) and reduced third-party financing.

Throughout 1980, Memorex actively worked at restoring profitability. Asset management improved markedly as inventories were down $20 million in the last quarter. Accounts receivable also improved as days-collectible were the lowest in years. In addition, operating cash flow from operations in the fourth quarter was positive for the first time since the third quarter of 1977. Memorex reduced employment by 1,100 to 11,300 by year-end.

While improving asset management and reducing employment, Memorex also attempted to identify losing operations: it dropped the Business Systems Div., combined its magnetic recording media groups, and dropped its word processing supplies division.

Memorex’s new strategic thrust will be in the oem market to diversify from its IBM-dependent business.

Memorex started volume shipments of its Model 101 8-inch Winchester disk drive during 1980. In addition to manufacturing these 8-inch drives in its 100,000 sq. ft. leased facility, Memorex formed a joint venture with Olivetti to manufacture drives in Italy. This European venture strengthens Memorex’s position as a leading oem supplier in Europe.

Although the oem division appears to hold the key for any future Memorex success, it did have some setbacks in 1980 when it lost two key executives—Dr. John Scott, president of Memorex’s mini disk drive company, went to Apple Computer, and Keith Plant, vp of oem marketing, joined a startup firm.

Despite the unprofitable operations, R&D expenses were not slashed to improve short-term results. In fact, dp R&D expenses increased 25% to $32.5 million.
A blueprint for office automation.

There's a lot of questions these days about office automation—what it is, what it will do, how to build the right system.

Artelonics has analyzed these questions and more, and thinks it has an answer. We call it our "blueprint for office automation." And the cornerstone is a powerful 8086 microprocessor-based desktop office computer—the Series 1000.

**Designed for systems architects.**
From its inception, the Series 1000 has been specifically designed as a tool for use in an integrated office computing system.

Combining word processing, data processing and communications with high resolution graphics, the Series 1000 offers extraordinary versatility at a surprisingly low cost.

**A building block for office automation.**
The Series 1000 is readily expandable. You can begin with a fully-featured stand-alone terminal, add to it in small increments, or build it into a large and complex system using your own customized hardware and applications software.

**A cornerstone for future expansion.**
Multibus™—compatible, the Series 1000 lets you plug-in a variety of custom interfaces, and currently supports RS232 and asynchronous communications.

Bisynchronous communications protocols including 3270, 2780 and 3780 will be available soon.

**A blueprint—plus the right tool—equals office automation.**
A blueprint is only as useful as what it enables you to build.

With the Series 1000's exceptional combination of features plus remarkable flexibility, you can begin creating the future of office automation...today.

High resolution graphics...maps, bar charts, pie charts, combination words and charts, etc.

CP/M-86™ is available now. MP/M-86™ is coming soon.

For more information, contact: Artelonics Corp., 2852 Bunker Hill Lane, Santa Clara, CA 95050, or call (408) 727-3071.

GP/M-86 and MP/M-86 are trademarks of Digital Research.

Multibus is a trademark of Intel Corporation.
WANG LABORATORIES

1 INDUSTRIAL AVENUE
Lowell, MA 01851
(617) 459-5000

Wang continued its blitz with orders up over 50% despite IBM's mid-year introduction of the Displaywriter. Word processing paced expansion, with orders almost doubling to roughly $385 million.

New products provided the momentum. First introduced in 1979, the Office Information Systems (OIS) series was extended downwards with new low-end models 105 and 115. Entry-level 25 megabytes of disk storage.

Another factor in DG's market expansion in the early '70s was aggressiveness. Wangwriter took the company into standalone markets. This market suffered from benign neglect since a marketing emphasis had been given to large corporate accounts. A small business marketing group (200 salesmen) will support the effort with an expected 10,000 units to be shipped the first year. Features and functions appear competitive; pricing of $7,500 list comes in slightly under the IBM Displaywriter.

The VS family of computers enjoyed a 76% gain in orders, aided in part by the ability of the Wang sales force to cross-sell the "dp" version of "Integrated Information Systems."

In small business computers, Wang has trailed the industry pace partly because of a lack of new products; the company has concentrated on the larger VS computers and on word processing. The spring introduction of the 2200 LVP, the 2200 SVP, and PCS-III reinstilled confidence among the company's OEM systems house customers who were considering shifting to other suppliers.

Also at year-end, Wang announced its intention to incorporate broadband communications capability for local networking, in sharp contrast to the base band Ethernet approach of DEC, Intel, and Xerox.

Wang's dramatic fivefold expansion in revenues, aggravated by personnel turnover, has burdened the company in service where the company's reputation suffered in 1979. The company successfully reversed the trend in 1980; the personnel turnover rate of 24% to 26% for fiscal 1979 fell to 14% for fiscal 1980, and 7.2% for the six months ending December 1980.

An extraordinarily aggressive program of outside financing supported an increase in the equity base; convertible debt increased from $118 million in June 1979 to $517 million by December 1980. The current strength in the balance sheet supports the company's product and market drive.

Wang now faces less pressure to generate dramatic gains in current earnings to support the financing program, providing increased leeway to turn to new product development. Indeed, R&D bills were $17.5 million for the December quarter alone, and included new communications and semiconductor programs. This figure is more than Wang spent for the full 1979 fiscal year.
Sorbus services
Portland, Portland, Portland, Portland and Portland.

That's Texas, Connecticut, Indiana, Michigan, and of course, Oregon.
We've built our reputation by providing prompt, first-class computer service to clients wherever they may be - across the hall or across the country.
The readers of Datamation and Data Communications magazines must appreciate that kind of attention, for in every brand preference survey conducted since 1974, they've selected MAI's Sorbus Service Division as the number one service company - the third party service company they'd most prefer to do business with.
That same good feeling carries over to the OEM market, where Sorbus is the service arm for over 50 manufacturers. Why?

Because Sorbus takes full responsibility for maintaining their hardware. We install the equipment; write the manuals; train the people; stock the parts; make the calls.
Sorbus also knows a little about IBM equipment. In fact, we service more IBM systems than anybody else - except for IBM themselves.
Sorbus. Providing service for more pieces of hardware (90,000), in more user locations (30,000), from more cities (160) than any other third party maintenance company in the business.
So, no matter where you are today, or where you'll be tomorrow, Sorbus service isn't far away. In fact, we're probably already there.
The only truly strong survivor of the plug-compatible peripherals market, Storage Technology Corp. (STC) had a year that was filled with both significant accomplishments and disappointments. Strategically, however, 1980 may go down as the most fundamental turning point in its relatively successful corporate life. STC is in the midst of a high stakes game, but if successful, it could propel itself to the ranks of Digital Equipment and IBM, becoming one of the largest dp companies by the end of the decade.

In January STC opened its 65,000 sq. ft. semiconductor facility to produce ECL bipolar and CMOS logic circuits as well as thin-film heads. This new facility supplements its STC micro technology subsidiary, a hardware and software development lab that uses advanced computer-aided design techniques. Then in April, STC tried unsuccessfully to merge with Amdahl.

Not to be thwarted in its obvious attempt to become a full-systems supplier, STC consummated a merger with Documation, a financially ailing high-speed printer manufacturer that sells to the same markets as STC. It turned out to be attractive for both parties as STC was able to capitalize on Documation’s marketing, manufacturing, and international presence.

Large tapes, which accounted for almost 45% of 1979 revenues, showed little growth in 1980. Margins were hurt by a purchase price reduction implemented in October following a similar move by IBM. STC, however, did introduce the 4500 line of drives for intermediate-sized computer systems. With IBM lacking a competitive equivalent, this product showed strong market acceptance, particularly for use with the IBM 4300 computers, which were shipped in volume during the year.

STC’s ECM disk business had a strong year. Volume shipments of its double-density version of IBM’s 3350, the 8650, although delayed until spring, picked up dramatically, and so did the purchase propensity. STC announced answers to IBM’s 3370 and 3380 disk drives, as well as a new controller.

The drive to further penetrate the oem market was stalled during 1980. Sales were up only 3%, to $3.6 million. Almost all oem sales were from tape products. Disk oem penetration was almost nil because the plagued 2700 disk drive was removed from the market. The problem appears to have been that the drive was too sophisticated for the oem market and too expensive to manufacture. We expect to see STC reenter the oem disk drive market in the near future. In October, STC established STC Peripherals, Inc., as the division in control of its oem fortunes, and named William Mansfield, formerly corporate treasurer, as president.

Financial results were respectable considering all the extraordinary corporate activities, major semiconductor investments, and turbulence in the peripherals market during the year. Revenues increased 26% to $603.5 million, while dp operating margins slipped a point to 16.8%.

Texas Instruments had an estimated 41% gain dp-related products in 1980. Although TI does not provide breakouts of dp finances, 1980 dp revenues are estimated to be about $562 million, up from about $398 million in 1979.

More than half (53%) of the digital products group revenues are from dp products (minis, peripherals, and home computers), with the remaining 47% from consumer electronics products such as calculators and watches. The total group registered an 18.6% increase over last year, the large dp-related growth offset by a 1.5% shrinkage in consumer electronics, particularly calculators. Overall after-tax margins for the digital products group remained at the 1979 level of about 6%, although dp operating margins improved to 13.3% from 12.4%.

During 1980, TI concentrated on production, achieving volume shipments of the 990/12 minicomputers, and four new high-speed printing terminals. Many of their chips announced last year (voice synthesis, memory, etc.) were in volume production in 1980. Not surprisingly, shipments of the DFS*Y seismic data acquisition systems are at an all-time high. TI’s heritage in physical equipment and services is paying high dividends.

In July, TI expanded its peripheral product capabilities by acquiring production rights to Seagate Technology’s 5½-inch Winchester drive, which allows TI to add inexpensive, fast access disk capacity to the 990 line of minicomputers. TI will separately offer the drive to oems.

New TI product introductions in the microcomputer market included the TMS 9995, a higher performance 16-bit microprocessor compatible with the 9900 family that forms the nucleus of the 9900 minicomputer line. Also introduced was a new family of bipolar gate arrays.

Texas Instrument’s disappointing 1979 showing in the personal computer market was mitigated in 1980 by a marginally successful rebate program followed by a 30% price cut in November. This cut made the TI 99/4 price competitive with Apple and Commodore, and the 99/4 is now reportedly selling better than before.

Texas Instruments has been challenging DEC in the teleprinter production race. After establishing a position in the thermal printers market with the Silent 700 series, which was not directly competitive with DEC’s matrix printers, TI was able to match or beat DEC’s production in 1980 (based upon market surveys of end-user installed populations) through the 1977 introduction of its matrix (Omni 800).
Send for a sample plot and see for yourself the real beauty of HP's new 8-pen plotters.

Hewlett-Packard's new 8-pen plotters bring true color capabilities to hard copy graphics. There are ten beautifully coordinated colors to choose from, all carefully selected for shading compatibility and line differentiation. And each pen color comes in two line widths.

HP plotters offer extremely fine resolution assuring superior line and character quality. High performance plotting coupled with automatic pen selection enables you to produce fully annotated graphs on paper or overhead transparency slides in minutes. Automatic pen capping keeps the pens fresh and ready for use, and a paper advance version is offered for unattended plotting applications as well.

HP makes a family of hard copy graphics products and software to meet a wide range of needs on a wide range of systems. For more information, write to Nancy Carter, Hewlett-Packard, 16399 West Bernardo Drive, San Diego, CA 92127, U.S.A.; or call Bill Fuhrer at (714) 487-4100.

☐ Send me a free sample plot and product information.
☐ Have your representative call me.

My number is ( )

My Computer Model is:

My application is:

Name ____________________________
Title ____________________________
Company __________________________
Address __________________________
City __________ State __ Zip __________
Who offers peripheral switches with higher capacity and more features at lower cost?

Data/Switch...the outperformer.

Simply stated, Data/Switch outperforms every other peripheral switch. Its integrated semi-conductor matrix assures the highest throughput for data transparency. You can even reconfigure off-line control units while the channels remain active.

Start with the industry's single largest matrix: 16x24 or build up to it gradually from a 2x2, because

Data/Switch is modular and easily field upgradable.

A unique channel diagnostic display monitors data passing through the switch to isolate hardware problems in the computer room. And with the widest selection of expandable matrices at the industry's lowest cost per crosspoint, Data/Switch provides unrivalled economy.

For higher capacity and more features at lower cost, Data/Switch is the outperformer.

For more details, write or call Data/Switch at (203) 853-3330.

CIRCLE 99 ON READER CARD
Out of the box, up and running fast.

Bring up multi-user applications in weeks, not months, with the Datashare® system

Now there's a new reason to choose Datashare, the business computer users depend on in 15,000 installations worldwide. It's AIM™, Datapoint's Associative Index Method™—the most significant advance in file access since ISAM.

AIM searches files by content and retrieves every record containing the keys you enter. You use your same files, add the feature to existing programs, or implement those previously “impossible” applications.

AIM lets you find what you're looking for even with partial, fragmented, or descriptive keys. Multiple keys are maintained with a single index that speeds record retrieval without the need for pointers, links, or trees.

Now you can search parts files by any remembered field or element of descriptive text. Search personnel files by any combination of first, middle, and last names. If you can't find it with AIM, it isn't there.

Simple Programming. Comprehensive utilities, efficient file structure, and complete documentation all help you put custom applications on-line quickly.

Ready-to-Run Applications. Select from a wide variety written by Datashare users and software houses, all listed in our free Applications Software Catalog.

Transaction Processing Power. Datashare was designed specifically for interactive business applications. A choice of compatible processors lets you match capacity exactly to the job.

Proven Performance. Datashare has been helping organizations do business since 1972 and has grown in capability every year.

Pick Your Disk, Pick Your Printer. Choose from a small diskette-based system up to a large 180 MB system. Select from 7 printers—80 CPS to 900 LPM. Share one and add others at individual displays.

Grow and Expand without Reprogramming. With our ARC™ local network architecture, you can add displays, increase processing power, expand peripherals, and extend your database virtually without limit. When you're ready, add word processing and electronic message service.

Nationwide Service and Support. Our systems engineers and service professionals grew up with Datashare. And we back them up around the clock.

Need more facts? Call (512) 699-7059 for the name and number of your nearest Datapoint® representative. Or write to Datapoint Corporation, Corporate Communications T-41DM, 9725 Datapoint Drive, San Antonio, TX 78284.
Local access from remote locations
Enhanced MVS/370 terminal support

HYPERchannel™, the high-performance local networking facility from Network Systems Corporation, now offers 3270 terminal support to IBM MVS/370 users.

The HYPERchannel MVS/370 package provides "local" attachment performance for 3270 terminals in remote locations.

HYPERchannel extends the 370/303X data channel via its 50 megabit-per-second coaxial trunk system. Regional extension is also possible via wideband links such as private microwave, fiber optic links or telco circuits. HYPERchannel maintains standard peripheral I/O unit support including OLTF.

The HYPERchannel MVS/370 package is a complete hardware and software system. It is available now.

For more information, write us. Or call our Marketing Services Department at (612) 425-2202.

We want to help you bring your computer rooms up to speed.

Network Systems Corporation

7800 Boone Avenue North, Minneapolis, MN 55428. TWX 910-575-1153

Sales offices: Atlanta, Boston, Chicago, Dallas, Denver, Detroit, Houston, Huntsville, Los Angeles, New York, Philadelphia, Providence, San Francisco, Seattle and Washington, D.C.
Computer Sciences Corp. (CSC) breezed through the half-billion dollar revenue mark in calendar 1980, closing the year at $560 million, up 35%. Internal expansion accounted for nearly 80% of the increase in revenue; acquisitions accounted for the rest.

Largely responsible for the internal growth was a buildup in activity on several large contracts, in particular the company's $129.5 million five-year contract for a claims processing system, and a $221.5 million five-year contract for a communications network in Saudi Arabia. Although work on the latter appears to be proceeding smoothly, the former represents CSC's first foray into the claims processing market long dominated by EDS, and implementation has been stormy.

Overall, the largest part of CSC's business is Contract Services systems development, facilities management, and provision of turnkey computer communications systems, which contributed $411 million, 73% of total revenue last year. Data Services accounted for the remaining $149 million and includes such activities as the worldwide INFONET remote computing service, on-line distribution and manufacturing services, third-party health insurance claims processing, income tax preparation, payroll, and general accounting services. Data Services is commercially oriented, whereas Contract Services is government oriented.

Of special significance as an enhancement to its remote computer service capability was the June announcement of Distributed Network Services (DNS), in which DEC-manufactured minicomputers and terminal are tied into the INFONET system for distributed processing applications. Prime targets for this service are the fast growing markets for order entry type services in industries such as finance, manufacturing, and distribution.

In Contract Services, noteworthy new business included a $13 million contract for a naval warfare gaming system, a $9.6 million contract for communications systems to the METrorail rapid transit system in Dade County, Fla., and a $22.2 million subcontract from Spry Unisave for the U.S. Air Force's base level data automation program (Phase IV).

Late in the year, CSC was hurt by a federal indictment charging the company with fraud and other misconduct in its 1972-1977 contract with the General Services Administration for timesharing services. All charges have since been dropped, but for a brief period the company lost marketing momentum because of temporary constraints on new procurement activity in certain government markets. The company has also had some difficulty hanging on to pieces of the accounting services client base it purchased from Itel late last year. Possibly as a result of this "indigestion," 1980 acquisition activity was nil.

CSC's operating margins declined to 8% from 10.8%, although its aftertax margins remained flat at 4.5% following a two-point reduction in its tax rate.

Automatic Data Processing

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

ADP posted $505 million in revenues for 1980, a gain of 24% over 1979. Net income rose to $43 million from 1979's $36 million, up over 19.5%. The company continues to hold a stable, though somewhat more distant, second place in the services industry, behind CSC. Its traditional batch services, on-line services, and on-site services to general and specialized markets all posted healthy gains in 1980.

The year found ADP applying new technology to its services through both internal development and acquisition. Three divisions now offer microprocessor-based services. In the thrust division, an on-line teller system with an intelligent terminal was added to the service mix through the acquisition of Total Systems. Color graphics in a real-time system for commodities traders came with the purchase of Comtrend. Internal development within the dealer services division created the RCS service for auto dealers, which uses an intelligent terminal to produce daily reports while feeding to a remote batch system for large jobs.

Network services, ADP's timesharing division, added about 20 installations of its DEC-2020 on-site service, bringing total international installations to 50. By midyear, network's cash management services were handling over $2 billion in daily deposits for over 1,100 corporate clients at 45 banks. By year-end, the joint venture with Alan Greenspan's Townsend-Greenspan Co. to provide economic forecasting and analysis was producing revenues.

Meanwhile, the basic payroll and accounting service provided by ADP's commercial services group continued to perform well. The group's much-heralded but long-delayed interactive accounting services grew in test markets, and wider deployment is planned for 1981.

The company's services to the brokerage community was buoyed by the year's record securities trading volume. Owing to transaction pricing, ADP's traditional back office brokerage services have historically been exposed to swings in market trading activity. In recent years, ADP has aggressively added new services to support its brokerage marketing, and to dampen the impact of market fluctuations. New services accounted for nearly a fourth of brokerage revenues last year.

After an initial year of heavy losses, ADP now believes a profit turnaround is in sight for its acquisition of the Audatex division of Itel, now known as ADP Collision Estimating Services (CES). Three of the top 12 U.S. auto insurers are now CES customers.
Give every kilobit intensive care.

An ailing data stream can't tell you where it hurts, and that can mean hours of trial-and-error testing, some of it done far away and hard to supervise.
The Bell System's Dataphone® II modular data transmission subsystem gives you central monitoring, diagnosis and control of your whole data communications system, and automatically identifies system faults.

Regardless of your system's host or line protocol, Dataphone II is fully compatible, at transmission rates of 2400, 4800, or 9600 bps. Three levels of service are available, covering every level of system complexity. And because the service is fully modular, it can grow with your needs by simple addition of components.

Dataphone II service is state-of-the-art in sophistication, yet extremely simple in operation, and communicates in plain English.

With its full-time assurance of operational readiness, Dataphone II service is the ideal link to integrate your system. It is a product of the world's most advanced information management system—the nationwide Bell System voice and data network.

Applying our knowledge to your information management needs is a process that begins with one call to your Bell Account Executive.

The knowledge business
GENERAL ELECTRIC COMPANY
3135 Easton Turnpike
Fairfield, CT 06430
(203) 373-2211

General Electric, not known as a dp company, is quickly becoming important in many subsectors of the industry. Dp revenues approached the half-billion dollar level. Growth in 1980 is attributed to continued gains in the General Electric Information Services Co. (GEISCO), which accounts for 63% of total dp revenues; the Data Communication Products Business Dept. and its line of TermiNet terminals and printers (25% of dp revenues); and the recently purchased Calma CAD/CAM subsidiary (12% of dp revenues).

General Electric has brought microelectronics and the related information-based technologies in-house. GE is investing hundreds of millions of dollars, and has established an Industrial Electronics Group as well as an Information and Communications Systems Group. GE’s investments (excluding Calma) in interactive graphics in 1980 is estimated at $70 million. During 1980, GE also acquired Intersil, a semiconductor supplier, which adds to its dp presence, although not to the DATAMATION 100 revenue.

GE’s data communications business grew at 20% in 1980, but equally noteworthy was its TermiNet product line extensions. GE introduced a 200-line per minute forms access printer, and a family of matrix printers ranging in speed from 30 to 120 characters per second. The TermiNet product line has traditionally been sold directly to oems, but in 1980 the division established an authorized distributor program which complements existing sales channels and provides a more effective way to reach the end-user market.

GEISCO continues an intensive program to expand its value-added services in a drive to become a single-source supplier of a full line of computing services. Among the new services announced last year was a capability for retailer/vendor order processing, called the EPO (Electronic Purchase Order) System. As part of an improved graphics and plotting capability, software for contour mapping of geological formations was added. In the making important in many subsectors of the industry. Dp revenues approached the half-billion dollar level. Growth in 1980 is attributed to continued gains in the General Electric Information Services Co. (GEISCO), which accounts for 63% of total dp revenues; the Data Communication Products Business Dept. and its line of TermiNet terminals and printers (25% of dp revenues); and the recently purchased Calma CAD/CAM subsidiary (12% of dp revenues).

General Electric has brought microelectronics and the related information-based technologies in-house. GE is investing hundreds of millions of dollars, and has established an Industrial Electronics Group as well as an Information and Communications Systems Group. GE’s investments (excluding Calma) in interactive graphics in 1980 is estimated at $70 million. During 1980, GE also acquired Intersil, a semiconductor supplier, which adds to its dp presence, although not to the DATAMATION 100 revenue.

GE’s data communications business grew at 20% in 1980, but equally noteworthy was its TermiNet product line extensions. GE introduced a 200-line per minute forms access printer, and a family of matrix printers ranging in speed from 30 to 120 characters per second. The TermiNet product line has traditionally been sold directly to oems, but in 1980 the division established an authorized distributor program which complements existing sales channels and provides a more effective way to reach the end-user market.

GEISCO continues an intensive program to expand its value-added services in a drive to become a single-source supplier of a full line of computing services. Among the new services announced last year was a capability for retailer/vendor order processing, called the EPO (Electronic Purchase Order) System. As part of an improved graphics and plotting capability, software for contour mapping of geological formations was added. In the making important in many subsectors of the industry. Dp revenues approached the half-billion dollar level. Growth in 1980 is attributed to continued gains in the General Electric Information Services Co. (GEISCO), which accounts for 63% of total dp revenues; the Data Communication Products Business Dept. and its line of TermiNet terminals and printers (25% of dp revenues); and the recently purchased Calma CAD/CAM subsidiary (12% of dp revenues).

General Electric has brought microelectronics and the related information-based technologies in-house. GE is investing hundreds of millions of dollars, and has established an Industrial Electronics Group as well as an Information and Communications Systems Group. GE’s investments (excluding Calma) in interactive graphics in 1980 is estimated at $70 million. During 1980, GE also acquired Intersil, a semiconductor supplier, which adds to its dp presence, although not to the DATAMATION 100 revenue.

GE’s data communications business grew at 20% in 1980, but equally noteworthy was its TermiNet product line extensions. GE introduced a 200-line per minute forms access printer, and a family of matrix printers ranging in speed from 30 to 120 characters per second. The TermiNet product line has traditionally been sold directly to oems, but in 1980 the division established an authorized distributor program which complements existing sales channels and provides a more effective way to reach the end-user market.

GEISCO continues an intensive program to expand its value-added services in a drive to become a single-source supplier of a full line of computing services. Among the new services announced last year was a capability for retailer/vendor order processing, called the EPO (Electronic Purchase Order) System. As part of an improved graphics and plotting capability, software for contour mapping of geological formations was added. In the major industry and functional management groups served by GEISCO, software systems have been added to further extend the value of MARK III service.

A custom applications staff of programming specialists is in place in key domestic and international locations. When acquisition of Lambda Technology, Inc., becomes final in 1981, the custom programming staff will number more than 1,500 worldwide. Lambda Technology specializes in data processing professional services on customers’ in-house equipment.

Processing service include interactive and remote batch processing on both Honeywell and IBM equipment, as well as distributed data processing via the MARKLINK Intelligent Terminal. MARK III dpd includes data entry, local processing, and direct interfaces to the full line of MARK III remote computing services.

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

EDS’s ventures into new business areas began to pay off in 1980. Corporate revenues rose to $413.9 million, up 27.4% over last year. The company remains in third place in the services industry, behind CSC and ADP.

In the wake of retrenchment last year in which the company scaled back its entry into the “home of the future” market, EDS consolidated many of its new business ventures into its Information Technology Group. ITG is spearheading the company’s thrust into the government services and small systems markets, as well as its expansion overseas. The group now has 2,300 employees and operates nearly a quarter of the company’s revenues, over four times what these markets contributed two years ago.

Last year’s acquisition of Potomac Research, a $20 million government research and development firm, and CompuSource, one of the biggest Data General systems houses, were significant factors in this growth. EDS continued its recently invested strategy this year with two purchases aimed at strengthening its position in industry markets. Application Programming Service, Inc. (APSI), Indianapolis, was added to EDS’s banking and thrift division. APSI gives EDS a low-end, IBM Systems/34 based product for banks, with under $100 million in assets. EDS believes it now has products that address specific applications in 14,000 financial institutions in the U.S.

EDS also acquired Information Resource Electronics Corp., a St. Louis firm specializing in hospital management information systems. IRE adds diversity to the claims processing now performed by the company’s health care group. It also moves the company into a new competitive arena, where the leaders are Shared Medical Systems and McAuto.

Of special interest during 1980 were two new activities substantially different from EDS’s traditional services business. A system software products division puts EDS into the packaged software business, with products it had used internally for many years. It remains to be seen how aggressively EDS will commit investment funds to third-party software development.

The acquisition of the $7 million Centurion Computer Corp. of Richardson, Texas, in early 1981 was another interesting diversion. Centurion markets a minicomputer system through a dealer network. With this purchase, EDS joins Tymshare, McAuto, Reynolds & Reynolds, and other services companies that no longer believe hardware assembly is inconsistent with a services marketing strategy.
Do your computer-generated mailings run into these five costly obstacles on their way to the post office?

Bursting, trimming and folding are necessary processing operations in computer-generated mailings. But it's no longer necessary to perform them in an interrupted sequence of labor-intensive steps—manually loading and unloading a series of processing machines and carting the work-in-process from point to point. Now there's a better way—the Pitney Bowes Computer Output Mailing System—specifically designed to handle computer-generated mailings with computer-age efficiency.

This cost-effective system handles the entire range of processing, inserting and mailing operations in one uninterrupted sequence. The computer-output web is simply threaded into one end of the unit and ready-to-mail envelopes are removed from the other end. It's as simple as that. Processing operations are all performed at web-fast speed, without a single interruption. Single or multiple insertions...imprinting...check signing...electronic scanning...document verification...selective collating and zip-code-sorting can all be performed with automated precision.

And with a single pair of hands. With this sensible method, your mailings will no longer have to run a stop-and-go obstacle course en route to the post office. They can sprint their way, virtually non-stop. For complete details fill in and return the coupon to Pitney Bowes,

2193 Pacific Street, Stamford, CT 06926. Or call toll free anytime (except Alaska and Hawaii) 800-621-5199 (in Illinois 800-972-5855).

I'd like more information about the Pitney Bowes Computer Output Mailing System.
Name ____________________ 
Title ____________________
Company ____________________
Address ____________________
City, State, Zip ____________________

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

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

First, Amdahl was adversely affected by IBM’s 1979 price reductions and the computer users’ general shift toward leasing instead of purchase in anticipation of IBM’s 3081. In addition, interest rates have been at record levels. Thus, Amdahl saw its customers begin the shift toward leases in the second quarter of 1979, a trend which continued through much of 1980. Despite Amdahl’s high shipment levels, this development, coupled with the firm's own price reductions, had an impact on 1979 and 1980 revenues and earnings. While total 1979 revenues declined from $320.9 million in 1978 to $319.9 million, 1980 revenues rebounded to $394.4 million, up 23%. But net income was off for the second straight year, from $48.2 million in 1978 to $15.3 million in 1979 and $15.2 million in 1980.

Still, IBM’s 3081 has now been announced, and delivery cycles will be long. Thus, it is reasonable to expect that in 1981, both revenues and net income will rebound, the latter more sharply. In anticipation of strong demand, Amdahl will substantially increase its capital spending later this year, while maintaining a sharp growth in R&D spending. For example, on top of Amdahl’s 1979 R&D increase of 68%, to $41.9 million, came another 49% increase, to $62.5 million, in 1980. A growing percentage of this is in the software area.

Amdahl announced several new System 470 models and product enhancements, and several new software products. These new offerings are directed toward areas where Amdahl’s large-scale systems users have indicated various needs. They include an increase in the maximum number of system input/output channels, the availability of high-speed channels, and an Extended Performance Accelerator, for the V7/B. Compatible processors and two new software products, MSCC and UTs, are perhaps typical. By closely coupling two processors, MSCC provides the resources of two processors while preserving the operating simplicity of a single system. UTs is a version of the widely used UNIX Timesharing System modified to operate on a large mainframe. But most important during 1980 was Amdahl’s 580 series, its response to IBM’s 3081. Substantial amounts of 580 Series components will come from Fujitsu, which increased its position in Amdahl to about 32%.

The acquisition of Tran Telecommunications Corp., a supplier of digital data communication networks, was completed in July. Tran designs, produces, installs, and services equipment (excluding transmission facilities) and software that constitute digital communication networks. Amdahl expects to offer Tran’s communications networks in combination with Amdahl’s 470 Series computers.

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

TRW, a diversified multinational company, had 1980 revenues that were less than 10% of total revenues.

The TRW Customer Service Div., purchased from Singer in 1976, brought in $120 million. Its 3,000 employees, 2,200 of whom are in the field, maintain and service 800,000 pieces of equipment for a dozen vendors, including Dataproducts, Hazeltine, Docutel, ADDS, and Pitney Bowes. In October, TRW purchased Raytheon’s IBM mainframe service operation. This will help prepare it for its future role as the service and maintenance arm for TRW-Fujitsu, a new joint venture.

The Information Services Div. had estimated 1980 revenues of $80 million and employs 1,375 people. TRW Credit Data, its consumer credit reporting group, is the largest automated consumer credit reporting company in the U.S., with a 33% market share.

TRW Business Credit is a smaller but growing part of the Information Services Div. Revenues doubled in 1980 and are expected to double again in 1981. Using an automated system and a database of over 7,000 businesses, TRW has successfully challenged Dun & Bradstreet by offering less comprehensive reports at a lower price.

In early 1981, the Information Services Div. installed the nation’s largest private telecommunications network. Built by Tymshare, the network has 30 nodes supporting 2,000 ports that support 12,000 to 15,000 terminals.

In 1980, TRW sold Datapoint to a network of 10 foreign distributors. TRW Datacomm International, which derived a major portion of its revenues from sales of Datapoint Equipment, will represent other suppliers, including Centronics, NBI and Azurdata. Revenues in 1980 were an estimated $110 million to $120 million.

TRW Operations manufactures point-of-sale (POS) equipment. This division has not performed particularly well—it is unprofitable, and we estimate 1980 revenues at only $15 million to $20 million, down from $60 million in 1979. TRW will end production of POS equipment in 1982 or 1983, but will continue to make automatic teller machines until 1987. POS equipment will be sold by TRW-Fujitsu instead, and the venture will buy this aliasing division from TRW.

The TRW-Fujitsu Co. (TFC), a joint venture, was announced in mid-1980. TFC will be 51% Japanese owned, and 49% TRW owned. The company’s first product will be a Fujitsu retail POS terminal, to be followed by Fujitsu’s small business computers, and eventually by peripherals, data communications gear, and mainframes. TRW-Fujitsu is a good fit—Fujitsu gains easy entry to the U.S. market, and TRW gets a strong product line and financial backing.
DON'T PRINT A LETTER A LETTER AT A TIME.

Printing word processor output can be a time-consuming process. Because most word-processing printers print a page a character at a time.

But the Xerox 5700 Electronic Printing System prints a page a page at a time. And that can be up to 40 times faster than typical printers.

CHANGE THE TYPE STYLE TO SUIT YOUR STYLE.

The 5700 lets you control how the printed word will appear. You can select from virtually unlimited type styles and sizes, or print certain words bold or in italics. It will even reproduce your signature or your company logo.

The 5700 can print reports, documents, proposals, or specifications directly from magnetic media. And it accepts input from communicating word processors. But it's much more than just a word-processing printer.

It can send or receive pages of text over telephone lines. And each page is a high quality xerographic original. It can print forms and computer output with charts, graphs, and variable data.

And it can deliver output collated, stacked, and stapled.

To learn more about electronic printing, talk to the people who wrote the book on the subject. Write to: Keith Davidson, Xerox Printing Systems Division, 880 Apollo St., P1-60, El Segundo, California 90245.

And start printing your letters an entire letter at a time.
With its announcement of a voice/data PBX in April, Datapoint advanced beyond its minicomputer peers in breadth of office automation products, offering electronic mail and filing and a line of communications management, cost control, and switching products. The company will also soon introduce voice mail.

Datapoint continued its strong performance in 1980—revenues were up 34% and earnings were up 29%. This growth, however, was slower than in 1979, when revenues grew 41% and net income soared 54%.

One of Datapoint’s primary strategic weaknesses, the lack of its own overseas distribution channels, was resolved in 1980. Through its 39%-owned Flex affiliate, the company acquired Inforlex, the bankrupt Burlington, Mass., terminal manufacturer. The acquisition included Inforlex’s eight foreign marketing and service subsidiaries. Datapoint also made an agreement with TRW to buy its international distribution network, which had been handling Datapoint’s foreign sales since 1970. The transaction will be completed next month, and Datapoint will gain at least partial ownership in 10 foreign distributors and a direct sales relationship with 21 additional independent distributors. With its new international sales capability, Datapoint may be able to double its export revenues, which amounted to $69.6 million of $318.8 million total revenues in FY80 (ended July 31, 1980).

Other significant developments last year were the addition of manufacturing space and the announcement of a major facilities expansion plan which includes the construction of a 1 million sq. ft. complex in San Antonio. This will consolidate operations which are now scattered throughout San Antonio in 37 separate buildings.

Management was reorganized and decentralized at the beginning of the year, resulting in two main divisions: the computer systems group, headed by W. C. Warren, and the office systems group, headed by Don Hosage. The two groups report to the new four-man office of the president, and share common marketing and service organizations. The office systems group includes the Infoswitch communications product line, an indication of the integrated approach to office automation.

New products announced in 1980 include the 8800 computer and the RMS operating system. The 8800 is Datapoint’s largest processor and the first to be offered with a separate CRT. It operates standalone or as part of the ARC network. RMS (Resource Management System) is the 8800’s operating system. It can also run on any other Datapoint processor with at least a 64K main memory.

Also in 1980, Datapoint entered into a venture with Tandy to jointly manufacture 5¼” disk drives. While Datapoint denies plans to enter the very small computer market, it does state that the Tandy relationship could “lead to other things.”

TRIUMPH ADLER, INC.
PERTEC COMPUTER CORPORATION

12910 Culver Boulevard
Los Angeles, CA 90066
(213) 822-9222

After a bidding war that included North American Philips, Pertec was purchased by Triumph Adler, a U.S. subsidiary of Triumph Werks Nurnberg AG of West Germany, in a deal that closed in January 1980. Pertec’s management now handles all of Triumph’s international OEM activities, Royal Computer Systems, part of Triumph’s engineering facility in Nuremberg, and Triumph’s printer products. Decisions about future products and operations, R&D, and joint marketing are made by Triumph’s management board with Ryal Poppa, former president of Pertec, and Robert Haggay of Royal Business Machines added to the board.

Sales of the old Pertec in 1979 were $171 million; sales of the new Pertec with that portion of Triumph’s operations were $325 million in 1980. Revenue growth compared to restated 1979 figures was only 13.6%, however, and the new Pertec suffered a net loss in 1980 of $4 million. U.S. sales of $175 million were 38% greater than restated 1979 figures.

Despite 1980 performance, this merger of U.S. and West German capabilities will eventually provide Pertec with cash for product development and technology to enhance its entry into the automated office market. Triumph has several products for the office, including multitasking WP systems and copiers.

Pertec complements Triumph Adler’s office product line with systems and a line of peripheral products. End user products include small business systems and general DP systems. Peripherals include a family of tape transports for minis and micros, rigid disk drives, floppies, and printers.

Products from Pertec in distributed DP systems are the XL40 and the XL20 which is a smaller scale, floppy disk-based version of the XL40. XL40 systems accommodate up to 16 workstations, and can operate independently or as part of a larger DP network with Pertec’s remote on-line subsystem, additional XL systems, and a host computer. Sales of its DP systems increased 29% to $49 million in 1980.

Pertec’s business began in 1967 as a manufacturer of tape drive peripherals for the mini market. It now offers a line of drives with three recording technologies: PE, NRZ1, or the high-density Group Code Recording (GCR). Its tape drives and interface are used for many applications involving data transfer and interchange; key-to-disk and data output requiring tape-to-printer; tape-to-plotter; tape-to-microfilm or to another peripheral device; and as backup storage for on-line disk drives. To meet small business system needs for a high-performance, high-density, compact mass storage device, Pertec offers a 20MB 8-inch rigid disk drive. Pertec also sells 8-inch and 5¼-inch floppy disk drives. In printers, the company markets matrix printers, and in 1980, it introduced daisywheel printers. Peripherals products did not do well in 1980—sales were up slightly, but still accounted for over two-thirds of its revenues.
Help users help themselves. That's the idea behind IBM's Information Center, where the data processing department will provide and maintain tools to allow users to retrieve, analyze, manipulate and present data (including textual material) more effectively.

They've got the right idea, but the wrong tools.

When productivity is all-important, why buy, learn, and support a hodgepodge of ever-changing systems in your Information Center?

With a single non-procedural language easily learned in a few hours, INQUIRE can boost user productivity, DP productivity, and support the entire decision-making process.

*INQUIRE is a registered trademark of Infodata Systems Inc.
MANAGEMENT ASSISTANCE, INC.
300 East 44th Street
New York, NY 10017
(212) 557-8310

Revenues of Management Assistance, Inc., increased by 13% to $310.4 million, the lowest growth rate in three years. Sorbus, its maintenance division, now maintains over 95,000 pieces of information processing equipment, which are used by over 20,000 customers. During fiscal 1980, approximately 41% of its revenue from sales to unaffiliated parties was derived from servicing equipment manufactured by IBM, while 35% was derived from servicing equipment manufactured by MAI. It has 12 service depots for terminal repair. Considering that Sorbus now accounts for 31% of MAI's revenues and grew at 30% in 1980, it is apparent that MAI's small systems subsidiary, Basic Four, had a very disappointing year. The turnaround, however, may have started: backlogs increased 25% to $75.7 million; aftertax income from continuing operations decreased 63% to $13.3 million; total operating margins declined from 16% to 9% because of decreased employee productivity, a recession-induced order slowdown, changes in foreign exchange rates, and a higher sales mix of lower priced systems.

During the year, operations associated with the Wordstream dedicated word processing segment were discontinued. Wordstream had been losing money since its 1977 acquisition. MAI refocused its word processing product strategies in late 1979 by introducing Dataword, an add-on to its Basic Four small systems lines consisting of a full page ctc terminal with an embedded text editing program and a Diablo daisywheel printer. Originally priced at $12,500, it now sells for $9,900.

October saw the introduction of the new multiprocessing Basic Four/S80 Information System, a microprocessor-based system that performs both word and data processing. Although not ready for volume shipments, an initial order for 45 systems has been filed by a security organization. The system is intended to be the lowest priced in the line. Its cost and its flexible architecture, which allows a multiplicity of intelligent terminals and printers, may attract a broad market of small users and large companies interested in a decentralized dp capability.

International revenues accounted for almost half of 1980 revenues, but were up only 8%. Sales in France improved; those in Germany weakened. At fiscal year-end, the international direct small systems sales force numbered 285, slightly more than MAI's U.S. force. The company also has 15 international subsidiaries and nonaffiliated distributors in 18 other countries.

MAI intends to rely primarily on independent software vendors for international software development, and plans to open no new international subsidiaries in 1981. In 1980, however, it did establish a new subsidiary in Stockholm for marketing and service activities. In October, the company obtained a $3 million contract to provide Citibank's Latin American operations with small systems.
The Supermux 480 is Smarter Than Your DEC or Data General

Your minicomputer does a good job of computing. But it's not nearly as smart as the Supermux 480 Statistical Multiplexer when it comes to talking to remote terminals. No matter which brand you're using, the Supermux 480 can cut your communications costs, make your dumb terminals appear smart and help diagnose system problems.

The Supermux 480 Statistical Multiplexer allows up to eight remote terminals to share a single telephone line. You save the cost of the lines and modems and you improve system efficiency and performance. The Supermux 480 solves the problem of those line "hits" that show up as trash. Data is temporarily buffered, checked for errors and retransmitted, if necessary, all transparent to your terminals, CPU and software.

Microprocessor-controlled Supermux 480s mix up to eight dial-up and dedicated asynchronous inputs at speeds to 9600 bps. With our optional "bandsplitter" you can even add two remote synchronous terminals, concentrating a total of ten inputs down a single output line that operates at a fraction of the speed (and cost) of the combined inputs.

The Supermux 480 puts you in control of your entire network with features that include switch reconfiguration when needed, automatic down-line loading to remote, unattended sites and built-in diagnostics that pinpoint problems. For all the details on Infotron's "Smarter Than Your Mini" Supermux 480, write or call today.

Infotron Systems Corporation
Cherry Hill Industrial Center
Cherry Hill, New Jersey 08003
Telephone: 800-257-8352  609-424-9400
TWX: 710-940-1247

Infotron Systems Ltd.
Poundbury Road, Dorchester,
Dorset DT1 2PG England
Telephone: (0305) 66016  Telex: 417276

Infotron Systems
First in Performance and Reliability

Distributors in: • Buenos Aires, Argentina KRM Ingernima. S.A. Tel: 45-8478 • Liverpool, Australia Phillips Electronic Systems. Tel: 602-2000 Telex: AA28897 • Vienna, Austria Gebhardt Schmeier. Tel: 849251 Telex: 124372 • Brussels, Belgium Ny Eurotech Bongiun S.A. Tel: 699-4950 Telex: 61091 • Santiago, Chile Empornadora Tecnica Ltda. Tel: 43101 • Helle Denmark Aboger and Luftings A.S. Tel: 241711 Telex: 32176 • Espoo, Finland Technopan Tel: 605192 Telex: 813524 • Paris, France Eurotechnica SA. Tel: 730-3550 Telex: 510997 • Cologne, Germany TGS Telekom. Tel: (2201) 525601 Telex: 8074552 • Athens, Greece Eccomp Ltd. Tel: 954-4344 Telex: 210323 • Rhein Netherland DatAD Commercieel. Tel: 75718-3000 Telex: 72800 • Hong Kong General Electric Co. of Hong Kong Tel: 792888 Telex: 72948 • Milan, Italy Euronet Italia S.P.A. Tel: 8290-015 Telex: 338451 • Tokyo, Japan Japan Direct Corporation Tel: 596-8515 Telex: 2424247 • Seoul, Korea Hynix & Young Systems, Inc. Tel: 783-2953 • Kuala Lumpur, Malaysia General Electric Co. of Malaysia Tel: 771888 Telex: MA61086 • Mexico City, Mexico Saldo En Linea Internacional S.A. Tel: 5460-3358 • Wellington, New Zealand Phillips Electrical Industries of New Zealand, Ltd. Tel: Bell 20 Fair 3XZ 13011 • Oslo, Norway Hugo Nide A.S. Tel: 92-28-18 Telex: 18716 • Lisbon, Portugal Softel Tele. Tel: 6728401000068 Telex: 168199 • Singapore General Electric Co. of Singapore, Pte. Tel: 663101 Telex: RS54011 • Madrid, Spain Control SA. Tel: 743-45-22 Telex: 41385 • Jaffaria, Sweden Philips Electronikfabriker AB. Tel: (758) 19000 Telex: 119405A • Lyons, Switzerland B. Hugel. Tel: Sg-488 Telex: 3491448 • Saip, Taiwan Victory Technology Corporation. Tel: 797-4954 Telex: 206975 • Caracas, Venezuela Informatica Data Center C.A. Tel: 3365290 Telex: 23584

CIRCLE 103 ON READER CARD
Beyond sheer performance.

While VAX™ has built its reputation on performance, that wasn't Digital's only design goal. Our goal was a computer family that would make that performance easy to use. Wherever you needed to use it.

The VAX family does just that. For example, both the VAX-11/750 and 11/780 run the same VAX/VMS™ Performance Software, with the same 32-bit addressing, virtual memory, and 2 gigabytes of user program space.

So whether you want the VAX-11/750 for just a few users, or the VAX-11/780 for many users, you'll have all the capacity you're ever likely to need.

You'll also have the simplicity of working with one operating system. Because VAX not only comes in a wide range of prices and configurations, it's also versatile enough to go into both real-time and data processing. So for most applications, you only need one programming staff.
And since the VAX-11/750 and 11/780 are the beginning of a whole new family from Digital, you'll be able to build on your software investment clear through the 1980s, instead of starting over with every new application.

But the only way to truly appreciate VAX/VMS software is to work with it.

Every VAX language shares the same symbolic debugger and Common Runtime Library. You can even mix different language routines within a single program. Which means you can optimize every line of your software, because you always get to work with the language you want.

You won't have to sacrifice performance, either. Through a unique integration of hardware and software design, Digital's engineers have developed a COBOL that performs like FORTRAN. With BASIC close behind.

And because the future of computers lies in communications, Digital has equipped VAX with some of the most extensive networking options in the industry.

With DECnet software, VAX can interact and share resources with all of Digital's computers in an integrated network.

That network, in turn, can be linked to other computers you may already be using, through 2780, 3780, and MUX200 batch bisync, as well as 3271 interactive bisync.

You can even merge two VAX systems with a high-speed data link that effectively makes them a single super minicomputer.

The VAX family offers a lot more than performance.

It also offers an ideal combination of versatility, ease of use, and almost unlimited program capacity.

Because at Digital, we've always believed that the best computer performance is the kind you can use.

I'd like to know more about the VAX family.

☐ Please send me literature.
☐ Please have a Sales Representative call.

My application is:
☐ Education
☐ Medical
☐ Laboratory
☐ Engineering
☐ Government
☐ Business data processing
☐ Resale
☐ Other

Name ___________________________
Title ___________________________
Organization ______________________
Address __________________________
City __________ State _____ Zip ______
Phone ___________________________

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

McDonnell Douglas would be a good deal higher in the 1980 rankings if it weren't its own best customer. McDonnell Automation (McAuto) contributed $179.6 million in commercial revenues, which, combined with Microdata's $100.4 million, places the corporate dp revenues at $279.96 million, up 14.2% from 1979. However, total captive revenues for McAuto were an additional $227 million.

McAuto recently opened the world's largest computer center in St. Louis to serve its 3,000 commercial customers (Data-Mation, May, p.75).

Rather than providing general computing capabilities, McAuto specializes in application services specific to industry. McAuto both builds its own applications packages, and acquires them from other software vendors. During 1980, McAuto licensed or acquired 15 application software products, including a number of structural engineering and construction packages, and several hospital-oriented financial packages.

McAuto's largest commercial market is the medical hospital industry, which accounts for about 46% of total noncaptive revenues, or over $82 million. Other major markets are discrete manufacturing (13%); utilities (12%); and construction, architects, and engineers (7%). All other markets account for the remaining 22% of revenues, but none for more than 3% individually. Because McAuto's largest customer is McDonnell Douglas, McAuto's largest market overall is probably in manufacturing and structural engineering applications. The marketplace for manufacturing applications is anticipated to grow rapidly, and McAuto is likely to be one of the major vendors.

Microdata increased its commercial revenues by 6% over 1979 revenues of $94.4 million, but the subsidiary was not profitable in 1980, largely because it opened nine new branch offices. Microdata now has 14 branch offices, augmenting its dealer network. Microdata plans to continue the expansion of its sales offices, but at a slower rate than in 1980.

The major new Microdata products include a line of generalized business programs. This package, called "Results," contains the standard financial applications of payroll, accounts receivable, general ledger, etc.

During 1980, Microdata shipped more than 947 Reality systems, raising its installed base total to over 4,000. These figures include the first shipments of the new Reality 8000 series, which has improved processor speed of 30%, and more than doubles the memory and on-line storage capacity of previous Reality computers.

Microdata recently signed a major oem contract with ADP to supply computers to large systems houses that custom package to vertical markets. Microdata will probably continue to concentrate on oems, and is not likely to expand into end user vertical markets.

MOHAWK DATA SCIENCES
7 Century Drive
Parsippany, NJ 07054
(201) 540-9080

Mohawk made steady progress in 1980, still without demonstrating any capability to expand except through acquisitions. Nonetheless, the company has established itself as an accomplished turnaround, with potential for improvements in profitability. The company's near-disastrous losses in the mid-'70s of $41.3 million cut shareholders' equity to $13.4 million against $163.3 million in debt. By January, 1981 equity was $151.9 million (after an offering of 2 million shares) compared to debt of $47.2 million.

Moreover, Mohawk succeeded in shifting its emphasis on key-data entry equipment into more promising markets with its Series 21 general purpose terminal products and the acquisition of Qantel's small business systems. The Mohawk Series 21 was originally introduced in 1977 in two versions: the System 21/20 for basic data entry ($12,000 to $14,000 in typical configurations) and the 21/40 ($20,000 to $22,000) for customized data entry with a COBOL-like language (MOBOL) for programming. Later, a multiprogramming 21/50 was added in the $30,000 to $60,000 range. Two years ago, about 70% of the Series 21 orders were for the model 20 nonprogrammable data entry systems, with 30% for the model 40 and 50 multifunction systems. Today, the reverse is true; now approximately 70% of incoming orders are for the larger 21/40s and 21/50s. The changing mix contributed to an increase in average system value over the period.

Product enhancements included a downward push to a single station Series 21/10 intelligent terminal, as well as an upward drive. April '81 announcements include a larger Series 21/44 providing for a greater number of workstations, multiprogramming, and enhanced communications links for multiple Series 21 Systems. The company is committed to X.25 and SNA protocols, with 3274 emulation to be incorporated in the Series 21.

The acquisition of Qantel complements Mohawk's traditional strength in small-scale systems. Qantel sells small general purpose systems with the UV Series 100 system's price averaging $12,000, the Series 200 averaging $38,000, and the Series 300 averaging $90,000.

So far, Mohawk integrated only service functions for its traditional products with the Qantel service force. Any programs to cross-sell Qantel or Mohawk products through the separate distribution arms have yet to be announced. Further, the potential adverse reaction that might derive from Qantel's established independent marketing groups might preempt such a move. As a result, the potential for improved marketing productivity through cross-selling products remains unresolved.

Through the year, Mohawk's consolidated results remained steady but unimpressive. In addition to relatively modest revenue expansion, backlogs actually declined to $210 million for the last half of 1980 from $222 million in January. Perhaps Mohawk will be able to capitalize on its improved product position with enhanced growth in revenues and earnings in the future.
PRIME COMPUTER, INC.
Prime Park
Natick, MA 01760
(617) 655-8000
Prime, one of the hottest stocks on the NYSE last year, more than trebled from a low of $9 in the first quarter to over $40 by year-end. Per-share earnings shot up 67%; revenues climbed 75% to $268 million.

Good software has helped drive up revenues. Early on, the "Primos" operating system benefited from software development by NASA and MIT. An emphasis on expanded functions and compatibility has protected both the end user and the company’s investment in software. However, by locking the products into an old system architecture, the emphasis also extracts price/performance penalties. Yet, Prime created a product line with only $4.14 million in cumulative product and development engineering expenditures through 1978—a fraction of the development cost usually spent by the industry for equivalent product capability.

It was the combination of marketing and good systems that finally opened the markets, under the leadership of president and CEO Kenneth Fisher who joined Prime from Honeywell in 1975. With a repackaged system and an aggressive market expansion strategy, Prime became one of the early exploiters of the end user mini commercial market. While marketing managers at Prime’s Boston-based rivals initially shook their heads at the hiring of non-engineers to sell minicomputer systems, Ken Fisher has recently taken satisfaction from the efforts of those same rivals to duplicate his programs.

The real Ken Fisher, however, paradoxically adopted a hitherto uncharacteristic low profile in 1980 as his team took center stage. With Fisher ensconced in his newly constructed Prime Park headquarters (leased for $1.2 million a year), his top executives individually reviewed their functional responsibilities before a group of over 200 members of the financial community. Indirect comparisons with the company’s larger nearby rivals did not stop with the consideration of old textile mills at DEC serving as a head office. The message that Prime "ships what the market wants" drove home the contrast with "suppliers whose focus is on hardware production rather than its use."

Prime started the year with two new low-end models—the model 150 for systems builders and software houses and the model 250 for end users. The move cut Prime’s low-end entry-level systems list price by 35% to $49,000 and $59,000, respectively. Office automation products followed in the spring, although the products were pitched too high—with systems cost in the hundreds of thousands of dollars in a market that is concentrated on workstations with more flexible systems packaging.

Since then, the company has been remarkably quiet in the face of the new VAX 11/750 from DEC, and rising competition from no less than six competitive systems alternatives from IBM. As VAX software gains maturity and closes the gap with existing Prime software, Prime appears vulnerable.
The year 1980 was significant for Teletype: it marked its 50th anniversary as a Western Electric subsidiary; it was the year in which restrictions on AT&T's activities in data processing began to be lifted, and it was a strong year financially, with sales of $416 million, up 27% over 1979 sales of $327.5 million. Data processing revenues soared as a full sales year in 1980. We estimate Teletype's 1980 dp revenues at $250 million, based on the fact that sales and maintenance of 4540 systems (terminal, display, printer, etc.) account for more than half the total revenues.

Spurred by high demand for its model 43 teletypewriter and its new 4540 data communications terminal, Teletype modernized and added to its manufacturing facilities in 1980. It expanded its plastic molding and circuit board shop by 25%, enhanced its abilities in custom logic devices, and added new metal oxide semiconductor (MOS) capabilities. These new facilities resulted in a manufacturing cost reduction of $10 million.

Teletype's presence in the DATAMATION 100 is somewhat ironic: the products that qualify it for inclusion in a data processing survey have actually been classified as communications gear by AT&T in order to comply with regulations that currently prohibit the Bell System from offering dp equipment. As a subsidiary of Western Electric ($12 billion), which is the manufacturing arm of AT&T ($50.8 billion), Teletype is in a position unlike any other terminal manufacturer. Despite its efforts to increase the percentage of sales to the "outside" to 70%, Teletype still sells more than half its production through the Bell System and is thus subject to FCC regulation and tariffing. This has held it back in the past: when Teletype introduced the Dataspeed 40/4 intelligent terminal in 1976, the FCC almost barred the tariff. AT&T eventually won the debate over whether the product performed communications or data processing, and it was officially declared a communications terminal. The company has since introduced printers and terminals of increasing sophistication with bit- or character-oriented protocols, such as IBM's SDLC. The 40/4's replacement, the Dataspeed 4540, is a 3270-compatible KS, Z-80 microprocessor-based system with a controller that handles eight to 32 displays and/or printers.

The FCC's Computer Inquiry II decision, released in 1980, permits AT&T to legally enter data processing through separate and unregulated subsidiaries. Teletype Corp. will likely be one of the driving forces behind this move into computing and office-oriented protocols, such as IBM's SNA. These last three products are manufactured by two AT&T subsidiaries—ITT-Courier Terminal Systems and Qume—which, while only a small part of AT&T, are major forces in the dp industry.

Courier and Qume, both purchased in 1978 as part of AT&T's expansion into computer and communications equipment manufacturing, brought in combined revenues of $250 million in 1980. Courier's sales approximated $120 million, down from 1979 levels. Qume's sales of $130 million were up 13%. Margins were higher for Qume than for Courier, reflecting competitive pressures. Qume, its profits up, expects to double its R&D expenditures in 1981 and to increase its work force by 17%.

Qume manufactures and markets character printers to the oem market, data terminals to dealers, and printwheels and ribbons to the distributor market. It also sells memory products, including 5½-inch and 8-inch double sided/double density drives, to oem manufacturers such as Texas Instruments. In 1980, Qume made its first move into the international market by establishing sales offices and service depots in London and Dusseldorf.

No new products were announced by Qume in 1980, but in March 1981, it introduced a new printer and a new printer/terminal, the SPRINT 7 and SPRINT 9, respectively.

ITT-Courier Terminal Systems, Tempe, Ariz., also manufactures computer terminals and printers. Its primary business is the provision of plug-compatible IBM devices, but it also sells a line of Honeywell-compatible products. Both product lines consist of printers, terminals, and terminal controllers (boxes that are installed between a terminal and a computer or modem). There are six printers of various speeds and types, including a letter-quality model made by Qume. Courier announced two new products in early 1981, both compatible with IBM products. The Courier 2700-16 and the 2790-2A terminals emulate the IBM 3278 and 3279, respectively. The 2700-16 is a 32-column terminal, and the 2790-2A is the color version.

Courier has sold over 150,000 terminals. As of January 1981, it had established a new marketing and service arm, ITT Business Communications Systems, to sell Courier equipment and "future data communications products." These "future" products indicate a continued push by ITT into office automation.

While dp is a relatively small factor at ITT, the company is extremely active in telecommunications. In 1980, ITT's telecommunications and electronics group had revenues of $7.2 billion. ITT is the second largest telecommunications equipment company in the world, particularly in switching equipment, which accounts for half the group's sales.
INCREASED PRODUCTIVITY BY WORKING TOGETHER

Register Early! 1979 and 1980 Conferences sold out weeks in advance! Don't miss the new technology and systems applications featured in this Fifth Annual Conference presented by the undisputed experts in the field. These sessions will be indispensable to material handling project teams, system designers and project managers in automated handling & storage systems.

Attendees will learn what's new in equipment and controls and how the various system elements are practically integrated into functional systems. This is the opportunity for users and suppliers to work together to learn how to increase productivity. Circle number below for program and registration materials or write:

The Material Handling Institute, Inc. 1326 Freeport Road Pittsburgh, PA 15238

CIRCLE 105 ON READER CARD
While 1979 was a difficult year for Dataproductions because of its costly product line expansions, 1980 was satisfying as plants came on-stream and progress was made with band and matrix printers.

Dp revenues (which now include communications revenues stated retroactively) increased 44% to $248.3 million. Operating margins improved dramatically to 8.4% from 4.5% as overhead expenses of new plants were absorbed by volume shipments.

The family of band printers was expanded in 1980 with the introduction of a 1500 line per minute (lpm) printer and a 900 lpm printer. These band printers will eventually replace Dataproductions' bread-and-butter drum printers, although the transformation has been slower than expected since oem customers are comfortable with the drum printers and are reluctant to change because of the heavy startup investments (training, spare parts, etc.). Band printers, however, offer cost advantages and are easy to maintain. In 1980, band printers accounted for approximately $50 million, down from $70 million in 1979.

The matrix printer product line also progressed in 1980, although these printers are not expected to become profitable until this year, when monthly shipments will exceed 1,000 a month.

Revenues, less than $4 million in 1979, almost tripled in 1980 and should easily exceed $30 million in 1981.

The company's daisywheel printer division has not been as successful in turning around its production problem as its band and matrix printer operations have been, and it contributed a $5 million loss in 1980. This division continues to be under pressure because of increasing competition from Japanese and European vendors.

Although traditionally an oem company, Dataproductions is attempting to expand its distributor network. In August, it signed a national distribution contract with Kierulf Electronics. In September, it signed a five-year contract with the customer service division of TRW as the exclusive authorized U.S. representative for field maintenance service.

Capital expenditures were $12.2 million, down from $14.2 million in 1979. In 1980, these were directed toward expansion of the domestic matrix printer facility and expansion of the European manufacturing plant. The Dublin plant has been doubled in size, to over 200,000 sq. ft.

Several senior management changes were consummated following the retirement of the company's chairman and founder, Erwin Tomash. Charles Dickinson, senior vp of operations, was promoted to president and ceo, and Graham Tyson, previously president, has assumed the chairmanship.

**NATIONAL SEMICONDUCTOR**

2900 Semiconductor Drive
Santa Clara, CA 95051
(408) 737-5262

National Semiconductor designs, manufactures, and markets semiconductor devices and is one of the largest merchant manufacturers of integrated circuits in the world. National also produces and markets digital systems based on semiconductor technology: electronic watches, calculators, point-of-sale systems for supermarkets, and IBM-compatible computers and memory systems. The company recorded total sales of $1,159 billion in calendar 1981, of which roughly $310 million can be classified as digital systems. Since digital systems include certain consumer products, we have estimated that $245 million can be considered dp memory systems, ibm-compatible systems, and intelligent point-of-sale systems. This is up slightly from 1979.

The IBM-compatible business is conducted through a wholly owned subsidiary, National Advanced Systems Corp. NAS was founded in October 1979, the result of a combination of Itel's Data Products Group sales, service, support, and administrative activities with NatSemi's computer manufacturing and research and development.

The company presently has approximately 600 cpu installations worldwide and a total of approximately 2,000 sites including peripheral equipment. It presently sells products from multiple locations in the United States and Canada, and maintains direct-selling organizations in 11 European countries.

When Itel encountered financial difficulties in mid-1979, it became advantageous for NatSemi to accelerate its program to directly market and service its mainframes. It did this by transferring Itel's IBM-compatible sales, marketing, service, and support groups to the new subsidiary. For the total fiscal year 1980, computer sales were down sharply from the prior year, and a significant loss was incurred in place of the profits realized in 1978 and 1979. This change more than offset the improvements made in consumer products and point-of-sale systems, and the digital systems segment as a whole incurred an operating loss of $10.8 million in fiscal 1980. Since May, however, there has been a positive turnaround. National's second quarter report, dated Jan. 8, 1981, confirms that its computer business achieved a solid profit just one year after beginning its direct sales and service activities.

Most noteworthy is the change in emphasis from production of intermediate-scale systems which are sold by a different company to the marketing of large-scale systems which are produced by a different company. The old marketing outlet was the now-defunct Itel, while the new producer is the very vital Japanese firm Hitachi. The primary Hitachi models are the 7000 and 9000, both of which have been price adjusted and performance enhanced since the IBM 3081 announcement last November.

In R&D, National spent $20 million of a corporate total of $100 million on digital systems.
Dear Ma:

Now Racal-Vadic has an Originate/Answer Triple Modem with Multiline Dialing!

The two PC boards at the right are making it easy for computer sites to standardize on a single modem for all full duplex 1200 and 0-300 bps data transmission over your dial-up network.

Originate/Answer Triple Modem

First there’s Racal-Vadic’s new VA3480 triple modem. Actually, Ma, it’s six modems in one... a VA3400, a 212A and a 103 with automatic originate and answer. Thanks to the built-in microprocessor, the VA3480 can automatically call any VA3400, 212A or 103 remote modem, with the central computer maintaining complete control, including selection of high or low speed modes, and modem ID. In the auto answer mode, the VA3480 changes into a VA3400, 212A or 103, depending on which type modem is calling. It’s really a “do everything” modem, Ma.

Single/Multiline Automatic Dialer

The other card is the new VA811 Multiline Automatic Calling Unit. You can house one of these dialers and up to 7 triple modems in Racal-Vadic’s VA1616 chassis, which takes up only 7 inches of rack height. 4 of these chassis mount in a 7-foot rack cabinet, making it possible to control 28 triple modems from a single RS366 dialing port or, via an RS232C interface, using the VA831 adapter. It would take 28 of your dialers, and many racks of equipment to do the same thing. Hardly a fair comparison, is it, Ma.

Available from these stocking reps...

[List of stocking reps and their contact numbers]
Our new B-900 helps keep the DP department ahead of a growing demand for printout. It's the fastest member of our reliable B Series family of band printers.

Like the B-300 and B-600 models, it has Dataproducts' patented Mark V hammer system at its very heart. The system is virtually friction-free. The result is a remarkable level of reliability.

That reliability is proven, too. With over 20,000 units in the field, our B Series printers have become the industry standard for excellence.

Fast and easy.

The B-900 was designed for high performance, printing up to 1100 lpm with a 48 character set. It prints out 900 lpm with 64 characters and 670 lpm with a 96 character set.

All the B Series were designed with the operator in mind. The long lasting ribbon cartridges are easy to load. The bands can be changed in less than a minute. Sophisticated self diagnostics let the operator identify problems and often correct them without a service call.

The quiet type.

With fully sound-insulated cabinets, the printers operate at only 60 dbA — even less than the noise level of a

With Dataproducts' B-900 Band Printer, every department gets what's coming to it.
typewriter. These cabinets are available on the B-300 and B-600, standard on the B-900.

A name you can trust.
Dataproducts is the world's largest independent printer manufacturer. For 19 years, we've built printers for the biggest OEMs in the business, putting their names on our machines. These customers make sure our printers live up to some pretty tough standards.

Now our B Series band printers are available with our name on them. Or with your name.
We're here to help.
We have distributors and sales representatives throughout the world.

We'd love to show you how our printers can improve your systems. Call for more information. Or write our Marketing Department at 6200 Canoga Avenue, Woodland Hills, CA 91365. Telephone: (213) 887-8451.

Toll Free—Calif., (800) 272-3900 ext. 201
Rest of U.S., (800) 423-2915 ext. 201
European Marketing Headquarters: Ascot, England, 990-23377, telex: 849426
The data systems group of Perkin-Elmer boosted growth and profit margins following a period of subpar performance. Revenues were $226 million for the fiscal year ending in July, the latest available period for profit results. Overall, the group has made significant competitive progress against its minicomputer rivals in both growth and profitability. The gains in revenues and earnings, however, have yet to show up in capital spending—a key indicator of management's growth expectations. Indeed, capital expenditures for dp have declined in the past two years.

Three divisions are in the data systems group. The largest, the computer systems division, splits its business evenly between end users and oem—a sharp contrast to the predominantly oem business Perkin-Elmer acquired with Interdata. The memory products division, formed from the 1976 acquisition of Wangco, a manufacturer of disk drives and magnetic tape transports, contributed about 21% of revenues in 1980, marking a return to profitability. The terminals division contributed less than 10% of revenues. Growth for these smaller operations will be subordinated to profitability until they show an acceptable rate of return.

A target market approach at Perkin-Elmer concentrates on five markets: training simulation, CAD/CAM, seismic analysis/exploration, scientific computing, and transaction processing. In training simulation, the award of the B-52 contract, with the potential for over 200 systems, buttresses Perkin-Elmer's strong position, with participation in 27 programs.

In seismic analysis, Perkin-Elmer has several applications with a common requirement for high performance hardware with speed, large memory addressability, and high I/O capabilities. Perkin-Elmer has positioned itself as a specialty supplier of high performance, 32-bit minicomputers; in this market, the company has a respectable 18% share. For 1980, the company booked orders for over 1,000 32-bit computers, and claimed an installed base of over 3,500 units.

In a notable departure for a conservative company, Perkin-Elmer published impressive performance results throughout the press last year. An update to include the new (March 1981) peak gain of 42% for the April 1980 period.
Memorex re-defines the word "savings."

With the 2078 Display Station and the 2076 Remote Cluster Controller, Memorex re-defines savings four ways.

**We save you space.** The monitor of our 2078 can be removed from its stand and put on a shelf or bookcase for more room at your workstation. And since the 2078 weighs just 55 pounds (including keyboard), it's easily portable.

You can save even more space with our 2076. It supports up to 8 display stations and/or printers up to 4320 feet away — yet it's small enough to fit under the pedestal of a desk. One 30-pound 2076 can control Models 1 through 4 of our 2078 — you'll never have to worry about upgrading when you add larger screen sizes.

**We save you energy.** Our 2078 consumes less power and generates less heat than many other display stations on the market. There's even an automatic dimming feature that prevents screen burn and extends CRT life.

**We save your operators from discomfort.** You've probably read that many CRT operators complain of eye strain, back pain and other discomforts from working on display stations that have not been "ergonomically designed." Our 2078 helps solve the problem. It's been designed with a tiltable, fingerprint-resistant screen that allows for sharper image contrast. And it's been convenience-engineered with features that help insure operator comfort, improve productivity, and lessen chance for error.

**We save you money.** Add it all up. You save space, you save energy and you save your operators from discomfort. You also save time — because both the 2078 and 2076 are available now. The bottom line? You save money.

There are other ways Memorex re-defines savings with the 2078 Display Station and 2076 Remote Cluster Controller. For all the information on the Memorex family of terminal controllers, communications processors, display stations, controllers and printers, call Laurie Schuler at (408) 996-9000, or write Memorex Communications, 18922 Forge Drive, Cupertino, California 95014.

MEMOREX
TWENTY YEARS OF LEADERSHIP AND THE EDGE ON TOMORROW.

© 1981 Memorex Corporation.
Memorex is a registered trademark of Memorex Corporation.

CIRCLE 108 ON READER CARD
TANDY CORPORATION
1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

Tandy broke into the DATAMATION Top 50 in 1979 and continued its progress in 1980 with a 47% revenue increase to $220 million. U.S. revenues increased 30%, to $175.5 million, while foreign revenues increased almost 200%, to $44.5 million.

Although Tandy is quickly becoming one of the more important dp companies, it is foremost a marketing company. Its 8,012 worldwide retail outlets are up from 7,607 in 1979. Of these, 6,117 were in the U.S. Included in these outlets are 121 dedicated computer centers. Most of these centers were established in 1980. In addition to the domestic centers, Tandy has 16 centers in Canada and 28 centers in seven other countries.

With numerous product introductions in 1980, Tandy probably has the fullest product line among microcomputer vendors. At the low end, Tandy announced the TRS-80 pocket computer, the first handheld computer that offers BASIC programming. In addition, it introduced the TRS-80 color computer, which retails for $399 and has been designed primarily for the educational and recreational markets. Also in the low end, the TRS-80 Model-III was announced.

Tandy has taken several large steps to manufacture more of its own products. In May, Tandy started a floppy disk manufacturing joint venture with Datapoint, and by year-end, the plant was shipping product. In July, Tandy purchased Lika Corp., a printed circuit board manufacturer, for $4.5 million. Tandy does not now plan to build printers inhouse, since a Japanese vendor is supplying a daisywheel model that retails for $2,000. The entire printer line is expected to be supplied by Japanese vendors by the end of 1981. Tandy is also committed to developing software in-house (currently 40% is done in-house), primarily to improve quality control.

Tandy has aggressively developed communications capabilities to serve the home and office markets. In May, Tandy announced the Videotex terminal, a two-way information retrieval system. In conjunction with Videotek, Tandy signed a marketing pact with CompuServe to sell software that enables users to gain access to the CompuServe Information Service network. Tandy has initiated the "Express Information" bank-at-home service, a joint venture of United American Service Corporation (USAC), Tandy, and CompuServe.

Tandy has named Random House, the New York-based book publisher, as distributor of its TRS-80 computers to the educational market. It is also pursuing the small business market by offering vertical packages. Tandy is encouraging purchases by larger businesses by offering volume discounts (ranging from 12% to 18%) for purchases in excess of $75,000.

John V. Roach was named president in October, and Robert Keto and Bernard Appel were appointed executive vps. Interestingly, Mr. Roach had been closely associated with the development of the computer line.

NORTHERN TELECOM, INC.
Electronic Office Systems
P.O. Box 1222
Minneapolis, MN 55410
(612) 932-8000

While Bell Canada owns 55% of outstanding common stock, its relationship to Northern Telecom is analogous to Western Electric and AT&T. Northern provides most of the hardware to Bell Canada: 1980 sales to Bell Canada were $450 million (U.S.), or 32.5% of NT's worldwide sales.

Northern Telecom's Electronic Office Systems has been a sticky problem to the parent. It was created in 1978 with the acquisitions of U.S.-based Data 100 and Sycor. The two companies were merged and now share one sales and service organization. Management turnover has been high. All U.S. operations have been reorganized under the name Northern Telecom Inc. and report to new president Edmund Fitzgerald.

Products of EOS include remote data entry systems, on-line plug-compatible and remote batch terminal systems, and distributed data processing to which a word processing capability was added in early 1981.

In 1980, Electronic Office Systems revenues slumped 26% to $217.1 million. Operating profits plunged from $21.8 million in 1979 to an operating loss of $72.7 million in 1980. The losses can be attributed to slow shipments, inventory write-offs, and restructuring costs. The parent company took a $50 million in technology investment in Sycor and Data 100, an extraordinary loss of over $10 million in technology investment in Sycor and Data 100, and operating expense provisions of about $50 million for NTSC.

Management closed manufacturing plants in North Carolina, Michigan, and Ireland. Consequently, corporate employment has dropped 29% to 4,100. EOS sales in the U.S. continued to account for about two-thirds of total sales; regional sales offices were expanded from four to seven.

The company has nine subsidiaries in Europe and one in Australia. Under a new agreement, Olivetti will market on-line products, with expected sales of $13 million, and Redifon-CMC will market ddp products in Europe and North Africa, with expected sales of $15 million. EOS and other NT operations ceased third-party lease financing in spring 1980.
Ectype™ computer tape. A computer tape this good shouldn't need to be certified. But we do it anyway.

First, we inspect the sides to be sure there are no variances in width. If a tape’s too wide or too narrow, tape-to-head contact suffers and you can lose data.

Then, to make sure every inch gives uniform output level, we electronically signal-test every inch of tape with test equipment settings consistent with the NBS master tape (SRM-3200).

If we can't read back this signal within the test parameters, the tape’s not certified.

And not for sale.

Ectype computer tape. First we make it better. Then we make sure it's better. Call 1-800-843-9862 (In Canada call 605-996-8200) for the name of your nearest distributor.

©1981 Syncom, division Schwan's Sales Enterprises, Inc.
P.O. Box 130, Mitchell, SD 57301

CIRCLE 109 ON READER CARD
RACAL CORPORATION
8600 N.W. 41st Street
Miami, FL 33166
(305) 592-8600

Racal's two U.S. dp companies, Milgo and Vadic, are managed separately. With combined sales of $212 million in 1980, they accounted for more than one-third of total revenues of the parent.

When purchased by Racal, Milgo had sales of $64 million and pretax profits of $2 million. Revenues grew to $164 million in 1980, and operating margins improved to 20%. International sales increased 10% to $44 million. Milgo sells through Racal Milgo Ltd. in Europe and the Far East and directly in the rest of the world. In 1981, a new sales and installation subsidiary was opened in New Zealand.

In August 1980, Racal-Milgo entered the statistical multiplexor market with the introduction of omninux. Through its July purchase of Telesystems Network, Inc., Racal-Milgo acquired another data communications product and improved its position in the automated market. Chicago-based Telesystems has a unique protocol and code translator that enables incompatible word processors, computers, and typesetters to exchange data.

In 1980, Racal-Milgo entered a cooperative marketing plan with Diebold to offer a series of combined products to financial institutions.

Milgo also manufactures the 4270 terminal through its computer products division. The terminals are marketed both as standalones and as part of its systems. Although sales are relatively small, Milgo is committed to this product, and has recently increased the management staff.

The 12-year-old Racal Vadic is doing well, with a 55% growth rate to $48 million in 1980. Racal-Vadic's only current products are modems: 35% are sold directly to end users; 35% are sold internationally. In 1980, Vadic surpassed the Bell System as the largest supplier of small and medium-sized modems. Vadic introduced 30 new modem models in 1980, including a triple full duplex model and a 300bps full duplex modem built into a standard telephone. The company has geared up for big production increases by opening a new 45,000 sq. ft. manufacturing-plant in California and by increasing manufacturing employment 23%.

Vadic's international sales grew 84% to $6.7 million. This is due in part to the international “catch up” demand which has profited many American companies; for example, Vadic received its first order from the People’s Republic of China. It is also due in part to liberalization of the tight national buying policies of the government monopolies that control all telephone-related equipment in most countries. In 1979, for instance, Nippon Telephone & Telegraph began to allow importation of 1200bps full duplex modems because Fujitsu, Oki, and NEC do not produce them. Regulation of the U.K. and German markets has also been relaxed lately.

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

Perhaps the most technically grounded of the major computer service companies, Tymshare invested heavily during 1980 in new products for its major markets and in maintaining its leadership in commercial applications for communications technology. Dp revenues grew 22% to $211.0 million. Major facilities expansion, two joint development agreements, four acquisitions, various new product announcements, and two public financings were among the events which highlighted the year at Tymshare.

Several noteworthy developments during 1980 exemplified the specialized product development activities in the company's Computer Services Group, which accounts for approximately 70% of revenue. Early in the year, the company formally announced AUGMENT, its “electronic briefcase,” which offers online access to document preparation, electronic filing, and electronic message facilities. Acquisition of the $4 million Medistat subsidiary of Wisconsin Blue Cross/Blue Shield provided a midwestern base to Tymshare Medical Systems. Later in the year, Tymshare Travel Management Services announced an agreement to provide TWA with a multiaccess terminal service through which travel agents can access the passenger reservations systems of multiple air passenger carriers.

Among the largest of Tymshare’s specialized services is credit card processing, where it currently holds 8% of the market shared by independent processors. There were several moves aimed at deepening the company’s involvement in this and other strategically important Electronic Funds Transfer Service (EFTS) markets. Two acquisitions were directly EFTS related: the Bank Association of Rhode Island, a $2 million processor of VISA and Master Card transactions, and Telecheck Services, Inc., a Denver-based check guarantee service organization. The company also announced OPTION, the first automated teller network to be owned and operated totally by an independent third party.

Communications capability underpins all of Tymshare’s business. Tymnet unveiled OnTyme II, its second generation electronic mail service. It also announced an important joint demonstration project with Satellite Business Systems in which Tymnet will test the feasibility of using high-frequency radio transmission and/or cable television facilities for local distribution of data communications traffic. Reinforcing the company’s technical competence in local data transmission was the 1980 acquisition of Microband Corp., which owns and operates microwave transmission stations in numerous U.S. cities.

Despite Tymshare’s investments in R&D, which rose 27% to $12.2 million, it was able to increase its operating margins to 15.7%, from 15.3% in 1979. With its heavy emphasis on communication services, Tymshare should easily be able to maintain a revenue growth in excess of 20% during the decade.
At last.

A new system that does everything the Tandem NonStop system does, and then some...
NonStop II. An enormous

The original NonStop™ System:
The original system set a whole series of breakthrough standards for high availability in a transaction processing system. With a level of up-time never before experienced in computer systems because no single module failure will stop the system, plus modular expandability which allows a system to increase processing power when needed, without changing any of the original hardware and without any software modification.

All this and more:
NonStop II is a brand-new system which builds on the original design and includes an enormous expansion of the system's potentials.

The keys are flexibility, for now and for the future; ease of support and service; and compatibility that puts other system evolutions to shame.

The new system utilizes 32 bit addresses, to give the user access to virtually unlimited data space. Up to one BILLION bytes of data per processor under the direct control of the Operating System.

With this extended addressability, Tandem NonStop II systems easily provide both hardware and software support for very large applications. NonStop II can handle many hundreds of terminals and communications lines interactively. With remarkable efficiency. With no down time because of a module failure.

Full serviceability:
Fault isolation and error detection have been enhanced in NonStop II as well. A new Operations and Service Processor, the OSP, is a separate, self-contained processor which can reduce hardware mean-time-to-repair by detecting and reporting problems on-line, plus providing service personnel with local and remote on-line system diagnostic capability.

A memory for the future:
Recognizing the potential user needs for larger memories, NonStop II has been designed so that each of the 2 to 16 processors per system is ultimately capable of addressing 16 megabytes of physical memory, eight times the current limit.
expansion of the system's potentials.

It was a powerful memory to begin with. The architecture can now handle even the largest, most demanding business and communications requirements.

The flexibility to offer additional capabilities in the future is provided by the new loadable control store, which allows the addition of functions to microcode as part of continuing standard software updates.

Full compatibility with existing installations:

This is not the tongue in cheek compatibility systems users are accustomed to. NonStop II is application software compatible with existing Tandem NonStop system installations and can be integrated into a Tandem EXPAND communications network without any software modification. And customers will be able to upgrade to a NonStop II system without any application software changes.

For high volume on-line transaction processing, there isn't a system out there to touch the Tandem NonStop II system.

In terms of continuous system availability, data base integrity, protection against loss or duplication of transactions in process, expandability without penalty in hardware and without reprogramming or recompiling software, and a level of on-line performance that rivals the cost effectiveness of any other machine on the market—in all of these considerations, no one else even comes close.

You'll want the complete story.

For full information and a demonstration of our unique capabilities, call or write Tandem Computers Incorporated, World Headquarters, 19333 Vallco Parkway, Cupertino, California 95014 U.S.A. Offices throughout the U.S.A., Canada, Europe, United Kingdom, Hong Kong, Mexico and Japan. Distributors in Australia, Finland, Greece, Korea, Taiwan and Venezuela. TOLL FREE: 800-538-3107 or (408) 725-6000 in California.

A whole generation ahead.

CIRCLE 110 ON READER CARD
Because it works.

"...Thanks to Epoch 480 computer tape, I can spend my free time with my family-instead of the computer."

People who use Epoch 480 computer tape tell us there have been significant improvements in their company's computer operation after they started using it.

Fewer errors, more throughput and less downtime, just to name a few.

All that talk you hear about Epoch 480 running cleaner and longer is a lot more than just talk.

Epoch 480's modulus of toughness is superior. Its coating is smoother and more uniform. And it does have better signal strength.

Once you've used Epoch 480, we don't believe you'll ever go back to conventional computer tapes.

After all, there's nothing conventional about spending your free time with tape problems instead of with your family.

GRAHAM MAGNETICS

CIRCLE 115 ON READER CARD
3M COMPANY

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

3M doesn’t break out its dp revenues. For 1980, we have estimated them at $205 million, up 28% from 1979 (our 1979 estimate of $310 million has been revised downward, to $160 million). Domestic revenues were about $145 million, or approximately 70% of total dp sales.

The bulk of 3M’s dp revenues come from disk and tape media. Its domestic tape business grew to $60 million, for a 25% share of the non-captive market. Most of the gain can be attributed to increased prices. Disk packs, 3M’s next largest domestic business, are estimated at $50 million. The company has also been active in flexible disk media, where it has increased its market share to around 10%. During 1980, over 9 million pieces were manufactured, for $23 million in domestic sales. Finally, 3M manufactures data cartridges and small amounts of other disk drive products.

The Data Recording Products Division has enjoyed a strong turnaround the last couple of years because of its increased commitment to marketing and customer support. Although 3M does sell to oems, its main focus is the end user market, which it reaches through distributors—a cost-effective alternative to direct sales. Customer support had suffered badly, but since 1979 3M has improved its service and distribution, and this is reflected in increased market share. In 1980 it became possible for retailers of personal computers to order magnetic media and other products directly from 3M. Retail marketing support programs such as point-of-purchase displays and counter cards with free handouts have also helped, as has 3M’s practice of providing retailers with preprogrammed diskettes for demonstration purposes.

3M’s major products include adhesives, copiers, micrographic equipment and supplies, consumer products, and electrical supplies. Corporate revenues (which rose 12% last year, to $6.1 billion) dwarf the contribution by dp products. 3M has made several forays into data and word processing, but hasn’t met with much success. Still, 3M’s active participation in copiers and facsimile transmission and its established marketing channels give the company an enviable position should it decide to expand its standalone office products to a systems approach employing dp and wp technologies. 3M already employs several new communications technologies, including fiber optics. With its considerable resources and its low debt-to-equity ratio, 3M is capable of becoming an even more powerful force in the office.

Four-Phase Systems, Inc.
10700 North De Anza Boulevard
Cupertino, CA 95014
(408) 255-0900

Four-Phase growth rate slowed in ’80, due to stiff competition in distributed processing and an unfavorable economic environment. Revenues were up only 10% and there was a small decrease in the order backlog. Four-phase had a year-end 1980 backlog of orders of $27.9 million compared to $28.2 million in 1979. Total net income declined to an estimated $3.5 million in 1980 from approximately $16.7 million in 1979.

The Four-Phase product line came under heavy competition from IBM, Wang, and Prime. Among these rival sellers, IBM provided the toughest competition.

In late 1980, Four-phase responded to the competitive environment with the acquisition of Two Pi Corp. Two Pi manufactures IBM-compatible computers in the range of IBM System 370/138-148 and 4331 systems.

According to Lee Boysel, president of Four-Phase, the integration of the PCM systems from Two Pi into the Four-Phase product line will provide customers with IBM software-compatible batch processing in addition to the field-proven interactive capabilities. According to the Four-Phase 1980 annual report:

“This move establishes Four-Phase as the only non-IBM distributed dp supplier to offer IBM-compatible back-end processing combined with front-end interactive data and text handling.”

Four-Phase has stressed the fact that the Two-Pi product will complement planned Four-Phase systems at the higher end of the IBM 4300 range. This new family of Four-Phase products is expected to be announced in 1983/1984.

In 1980, spending on research and development increased to $15.9 million, 39% greater than 1979. 1980 results of this labor included two new high end systems products: the IV/95, a new video display and a new software offering called the Office Management System (OSM/IV).

Other 1980 developments included (on enhancements the following software products: Data IV, Vision, Multifunction Executive (MFE/IV) and Fore Word. The Four-Phase communications offerings were also expanded to include SNA/SDLC capabilities, DATA N, and VISION software products.
Continuing in its high growth mode, Computervision exploded into the Top 50 with a dp revenue increase of 85.5% to $191.1 million. Not only did it continue as the leading supplier of computer-aided design and computer-aided manufacturing (CADCAM) systems, but it increased its market share to an estimated 38%. Most companies would be satisfied to maintain the leading market share in an industry projected to grow at 40% per year over the next five years, but Computervision aims to capture a larger share.

Unlike its competitors, Computervision designs and manufactures its own computers, most of its peripherals, and its own software. Competitors such as Applicon, Calma, Intergraph, Auto-trol and Gerber buy general purpose computers and combine them with their software packages, while hardware vendors such as IBM, Prime, Digital Equipment, and Control Data buy software packages and combine them with their general purpose computers. By being the most vertically integrated supplier, Computervision can control its CADCAM systems architecture as well as improve profit margins.

Computervision had an active year in bringing new products to market. It began shipping its newest and most powerful computing system, the Designer V, in June. Its new terminal, Instaview, uses a dual-bit map raster technology, which allows three-dimensional dynamics such as an on-line rotation of a complex mechanical part. Computervision also announced a color raster terminal, a graphic network architecture, and its Designer R system, which is a remote system that can support two workstations when supported by a host system.

To support its growth, Computervision more than doubled its dp capital expenditures to $30.1 million.

Although Computervision does not run a capital-intensive business, its rapid growth does require significant resources. In August, it issued 990,000 shares of stock to supplement its capital base. The equity sale permitted the company to eliminate expensive bank debt.

Since Computervision does not lease its equipment (and therefore requires cash to support a lease base), has good asset management, and probably close to $100 million between cash reserves and bank lines of credit, it is unlikely that the company will require additional equity financing until at least 1982.

C. Itoh Electronics is the American subsidiary of one of the three largest trading companies in Japan. C. Itoh & Co. has assets in excess of $14 billion and sales in excess of $36 billion, and it accounted for over 6% of Japan's total imports and exports. With sales of $189 million, the U.S. subsidiary is hardly more than a decimal point to its parent, but it is still an important U.S.-based dp company. Started in 1973, C. Itoh Electronics (CIE) did not become a dp force until 1978, when it began importing computer peripherals. In addition, CIE exports U.S.-manufactured dp products to Japan and other Asian countries through its wholly owned subsidiary, C. Itoh Data Systems of Tokyo. Among others, CIE represents Qantel, Control Data Peripherals, Inforex, Wang Labs, Calma, Xynetics, and Cray Research. Most of its exporting relationships have exclusive marketing rights; its Japanese subsidiary performs all the marketing, market support, and maintenance activities. Interestingly, CIE plans to be the pioneer for U.S. dp manufacturers in China, where it expects much of its future foreign revenue growth. In 1980, international revenue represented 53% of its total dp revenues, down from 66%

The company does not limit itself to imports and exports; it is also engaged in R&D, licensing, and venture capital investing. The company is currently invested in a laser disk research program that is being sponsored by the Stanford Research Group. CIE has also arranged a license agreement between Xynetics and Seiko for Seiko to manufacture in Japan.

Through its Century Research Center, C. Itoh Data Systems is the largest software house in Japan, employing over 400 workers, including 250 programmers. Although CIE is very active internationally, its U.S. markets deserve greater focus. Its 1980 growth rate was a very impressive 70%. CIE sells mainly peripheral products that are targeted for the small business systems and microcomputer markets. It sells matrix and daisywheel printers manufactured by Tokyo Electric; 5½-inch and 8-inch floppy disk drives manufactured by Toshiba; and crts that are plug-compatible to Digital Equipment’s VT-100. In addition, it is anticipated that it will introduce a low-end word processing system in 1981 that will be manufactured by Hitachi. It is also discussing with Hitachi the possibility of selling 5½-inch and 8-inch Winchester disk drives.

CIE is in a good position to expand its market share in the U.S. because its Japanese-made products are extremely reliable. Moreover, many of its products, particularly disks, will continue to be in short supply as the microcomputer industry continues its exponential growth. Strategically, CIE plans to establish deeper roots within the United States. In addition to continuing its marketing and service expansions, the company might not only begin to manufacture its own products, but to manufacture these products in the United States.
Systel is a unique teleprocessing system that will revolutionise the American mini-computer market.

Manufactured by Systime, the UK's largest supplier of turnkey computer systems, Systel provide interactive transaction processing on up to 256 terminals per processor (VAX*).

At present Systel is available for DEC*PDP 11 44-70 or VAX* 11/750-780 systems and will give transaction processing concurrent with other applications and a distributive processing network.

CIRCLE 116 ON READER CARD

Systel's advanced features provide:
- Efficient memory management and usage. All transactions employ multi threading.
- Systel's advanced transaction control language increases your processing capability while decreasing application development and implementation.
- Access security on individual terminal locations, files and records.
- File journaling and recovery.
- Forms generation.
- Message handling.
- On-line program development.
- System supplied transaction and external utility programs.
- Advanced T.P. monitor features.

If you have a DEC* PDP 11/44-70 or VAX* 11/750-780 and want to revolutionise its capability then contact:

JOHN N. WARD SYSTIME INC.
8880 ROUTE 108, COLUMBIA, MARYLAND 21045
Tel: 301-730 4424 Twx: 230-908273
Next year, SDC will appear in the Datamation 100 as a subsidiary of Burroughs. The largest domestic privately held dp company, SDC was purchased by Burroughs for $98 million on Jan. 5, 1981.

Not only does the acquisition allow SDS’s stockholders to cash in, but it provides Burroughs with additional financial and marketing clout in the software and services market. SDC had revenues of $186.8 million in 1980, a 14% gain over 1979. Operating income rose 13% to $19 million. Despite these healthy figures, SDC did not have the money to handle the distribution and servicing of its first office product, the Records Manager.

The products group that sells the TEXT II Electronic Publishing System for newspapers has marketed the Records Manager. The product has its origins in the company’s R&D division. It is an electronic filing system that will store 75,000 pages of text and allow access to any document by key words or phrases.

What does Burroughs gain from the acquisition? First of all, it gets Record Manager. It also expects SDC to help increase its government business, which only accounts for 5% of Burroughs’ revenues. Burroughs will also use SDC to strengthen its tiny computer services operation.

The question that arises is whether the deal will work. Burroughs is not doing well, and has a poor track record with acquisitions.
The Construction Machinery Division of Clark Equipment Company has used Series 80 MANTIS, the most advanced application development system, to put productivity where it really counts—at the bottom line.

"In our first four years of on-line processing we built only 150 applications. But, more and more, our ability to build new on-line applications to meet increasing demand was diminished by the never-ending requirement to maintain existing systems.

"After installing Series 80 MANTIS, our ability to build applications increased 180%, resulting in 50 new applications in nine short months. Today, we're not only keeping pace with demand, but seeking new cost saving on-line applications to build for the future. For any corporation, this is where data processing can improve productivity."

Series 80 MANTIS is Cincom's dramatic breakthrough in application development technology. Only MANTIS provides complete beginning-to-end on-line application development, without the need for batch processes.

For many companies like Clark Equipment, application backlogs are becoming a thing of the past. Programmer morale is up. End-users are happier. And most important, data processing productivity is helping the corporation where it counts most—at the bottom line.

MANTIS is an integral component of Cincom's Series 80 family of data base/data communications products. To see how MANTIS can help improve your productivity, contact our Marketing Services Dept. for a demonstration. At your site or at a Cincom Service Center.

User Information Hotline:
800-543-3010.
In Ohio: 513-661-6000.
A powerful display of innovative thinking.

Introducing TI's new OPTI 900 Model 940 Electronic Video Terminal.

The OPTI 900* Model 940 is the first in a family of electronic video terminals from Texas Instruments. Combining the power of an editing terminal with the convenience of video display, the Model 940 brings new perspectives to applications including data entry, electronic mail, commercial timesharing and data base management.

The 940 offers state-of-the-art human-factor design features to help reduce operator fatigue, and a variety of versatile characteristics to enhance any business application requiring high performance editing.

Standard display features on the Model 940 include a 12-inch diagonal screen with an operator-selectable format of either 80 or 132 columns by 24 lines. A 25th status line displays information in three selectable modes for functions like tabs, margins, errors or host computer messages.

The 940's display can be split both vertically and horizontally into separate data regions allowing a user the flexibility to operate within one region without disturbing another. And for applications like process control, the Model 940 features scrolling regions for quick, effective data comparison.

There is also a transparent print feature that permits a host computer to bypass the screen and transmit data to an optional local printer, allowing the operator continued use of the screen during the printing cycle. And the Model 940's memory can store up to 1,920 characters of data.

Featuring 128 displayable ASCII characters, the versatile Model 940 includes a unique combination of double high, double wide and double high/width characters for display emphasis and reduced visual strain. Additional video features include 7 x 9 dot matrix characters with true underlining and true descenders.

The Model 940's detached keyboard, designed to increase operator comfort and productivity, is connected to the display monitor with a 6-foot coiled cord and features operator-oriented functionally clustered keys. For added user convenience the Model 940 also offers detachable nonglare screen filters and a tiltable display monitor as options. Other available application-oriented options include international or graphic character sets and additional memory of up to 5,760 characters to give the 940 added versatility for data entry applications.

TI is dedicated to producing quality, innovative products like the new OPTI 900 Model 940 Electronic Video Terminal. And TI's hundreds of thousands of data terminals shipped worldwide are backed by the technology and reliability that come from 50 years of experience.

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

For more information on the new OPTI 900 Model 940, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 202145, Dallas, Texas 75220, or phone (713) 373-1050.

We put computing within everyone's reach.
GENERAL INSTRUMENT CORPORATION
1775 Broadway
New York, NY 10019
(212) 974-8700

General Instrument’s Data Products Div., which manufactures gambling and lottery systems, point-of-sale (POS) equipment, and military electronic gear, recorded a 23% revenue gain in 1980, down from 28% in 1979. Wagering systems gains suffered a slowdown due to increased competition and political resistance to further legalized gambling. Point-of-sale systems orders were reduced by the recession, which cut department store capital expenditures.

General Instrument’s primary on-track gambling product, the AmTote 300 Totalisator System, permits selling and cashing of all bet types at any pari-mutuel window. The company operates and services pari-mutuel systems at approximately 200 racetracks and associations in North America. Service is performed in exchange for a percentage of the total amount wagered (the “handle”).

In January, the Royal Hong Kong Jockey Club signed a $6.4 million contract for its second AmTote 300; a similar system was selected by the Trinidad and Tobago Racing Authority. New Zealand awarded a $7.5 million contract for 300 plus AmTote TIM 360 wagering terminals for an integrated off-track and on-track nationwide system, the first of its kind. An installation has also been made in Buenos Aires. The company has also formed a new company in Sydney, Australia, responsible for business down under.


The Data Products Div. contributes only one-fifth of General Instrument’s total revenues. The other divisions, which are in related businesses, are Cable TV Products, Semiconductor Products, and Component Products. According to Frank G. Hick- ey, chairman of the board and chief executive, General Instrument is a ‘communications systems company.’ Its objective is to become “a large factor in digital transmission over broadband systems,” and its “semiconductor and other components businesses are now aimed primarily at communications applications, especially in the telecom and computer markets.”

In early 1981, General Instrument announced its entry into the satellite earth station market. Through a licensing agreement with SED Systems, of Canada, GI will manufacture and sell receive-only and direct broadcast home earth stations to the CATV, MATV, industrial, and consumer markets.

AMPEX CORPORATION
401 Broadway
Redwood City, CA 94063
(415) 367-2011

In January 1981, after more than a year of courting, Ampex became Signal Corp’s first dp subsidiary. A few management changes were announced: William B. Patton, Jr., formerly with MSI Data Corp., is now vp of business development, and Robert McAdams, Jr., was promoted to vp of finance.

Ampex’s audio and visual products account for two-thirds of total corporate revenues. Also, the company has expanded its tape drive and core memory product lines, which account for the remaining one-third of revenues. Corporate growth rate in 1980, however, barely kept pace with inflation, increasing 13% to approximately $170 million.

Part of Ampex’s turnaround since its near bankruptcy in ’71 is due to the development of a cheaper process to produce a faster core memory. Still, the core memory market is expected to decline because of advances and cost savings in semiconductor technology, rendering core obsolete except in situations demanding extreme memory reliability. Dataram and EM&M are Ampex’s most substantial competitors.

In 1980, the company signed a manufacturing licensing agreement to produce core memory products for Control Data in Taiwan and Hong Kong. Ampex will also establish a repair and refurbishment program for the installed base of Control Data core memory products, and will purchase selected Control Data capital equipment and parts inventories related to the core memories.

Ampex has other products it hopes will take up the slack of the declining core market. Four years ago, it introduced a high-speed all-electronic alternative for fixed head drives designed to fill the “access gap” between the main memory of the Nova and Eclipse minicomputers and peripheral storage devices. Sales are good. In 1980, Ampex began shipments on a new model, the Megastore M-316, compatible with the Honeywell H3-16. The Ampex Business Computer (ABC), introduced in 1979, plug-compatible with Data General minis, and designed for the oem and turnkey systems market, is doing only fair. In 1980, Ampex introduced its first terminal, the Dialog 80, a semismart crt sold independently. So far, Computer Automation has been the largest customer. In 1980, the Dialog 30, a dumb crt was announced and is priced at about $800.

Ampex also serves two additional, rapidly growing components of the memory market: the oem noncaptive digital tape drive market, expected to grow about 50% per year over the next three years, and the larger oem noncaptive disk market, expected to grow about 50% during the same period. The company reports record orders but has lost market share to Control Data.
THE MICOM 2002. TODAY’S SOUND INVESTMENT.
TOMORROW’S STROKE OF GENIUS.

A word processor that actually improves with age.
In this age of obsolescence, Philips Information Systems brings you the word processor that defies time. A system as expandable as the ever-growing needs of business.

The beauty of the Micom 2002 lies in a shared logic controller. It enables separate operators to work independently, through one central processing unit. So you can expand by simply adding a keyboard and screen, without incurring the cost of a whole new system. The Micom 2002 features keystroke memory, is user programmable and fully compatible with existing Micom systems. It combines expanded memory with virtually unlimited potential for software integration.

So consider potential as well as price. And provided you are a person of foresight, good judgment will tell you that the Micom 2002 is the only word processor to consider. And should you choose to follow your judgment, we offer you one last bit of persuasion. Unlike companies that keep you waiting up to 12 months, our policy is delivery within 30 days. You see, if you’re shrewd enough to want one, we’re quick to respond. After all, the Micom 2002 is a product of Philips, a twenty-billion-dollar, worldwide leader in the electronics industry. And we’re the company that responds.

To find out just how responsive we are, clip the coupon below and send it in. Within 48 hours of receiving your inquiry, one of our representatives will contact you.

See us at
Syntopicon IX
Atlanta Civic Center
June 30-July 2
for a full demonstration

---

Philips Information Systems
Talk to the company that responds.

Mail inquiries to: Philips Information Systems, Inc., 4040 McEwen, Dallas, Texas 75234.

NAME

COMPANY

ADDRESS

PHONE

CITY STATE ZIP
Another year of explosive growth for Apple raised revenues to $165.2 million, up 175% from '79 revenues of $60 million (a re-statement from $79 million in the 1979 DATAMATION survey). Apple's rise to become a Top 50 company is one of the more remarkable accomplishments in dp history, considering that three years ago, its first year of revenue, total revenues were under $2 million. Employment rose to 1,100 up over 80%, and R&D expenses increased to $9.5 million, up almost 100%. Management's expectations for continued near-term growth is best exemplified by its capital expenditures which grew eightfold to $10.4 million. Apple is extremely profitable (operating margins in excess of 20% and after-tax margins at 10% in 1980) and has generated enough working capital from operations to fund all its capital requirements since 1978. However, in order to ensure sufficient capital for future expansions, Apple went public.

The main product is the Apple II, a microcomputer which retails for as little as $1,200, although fully configured systems can cost $5,000. Shipments in fiscal 1980 (year ending September) rose to 78,000 units, up from 35,000 in fiscal 1979. Shipments accelerated further in the last three months of 1980. A more powerful Apple III was introduced in May 1980, and although shipments were to begin by September, manufacturing and product engineering problems have caused delays.

Distribution and marketing have undergone several changes. In early 1980, Apple terminated independent distributors and established company-owned regional support centers. This distribution restructuring was accomplished to provide better support to Apple's 850 domestic dealers.

International distribution has also experienced a change. Prior to August, foreign sales were made exclusively through Eurapile, a U.S.-based distributor that sold to independent foreign distributors. In August, Apple acquired Eurapile's distribution rights. In September, Apple established a distribution, marketing, and education center in the Netherlands.

Several key management changes and additions were accomplished in 1980. Carl Carlson became executive vp of operations. Andre Sousan, who had been president of Eurapile, has joined the corporate staff and is expected to develop opportunities in Japan and Canada. Thomas Lawrence, formerly with Intel, joined Apple as general manager of the European operation. Finally, Dr. John Scott, a leading Winchester disk design executive from Memorex, has joined Apple as a director of engineering for peripherals.

Weathering the recession with a 10% sales increase and greater employee productivity drove BT earnings up 16% to $27 million. Bunker's non-dp products: connectors, fiber optics, textiles, and sonar equipment, performed slightly better than its dp products.

For the last six years, the electronic information systems division has had an inconsistent growth record, fluctuating between 0% and 15%. Last year, dp revenues increased 8% to $146.6 million, less than 1979's 15% increase. Dp operating margins declined slightly from 10% to 9%. Although total corporate employment dropped 400 to 9,400, division employment remained constant at about 2,500.

Bunker's growth lies with the banking control systems which now account for more than 60% of revenues. It has continued to expand its standard transaction programming language.

Bunker Ramo has entered into a favorable agreement with Diebold, which produces automatic teller machines (ATMS). The companies fund joint software development, engage in joint marketing, and sell each other's products as part of their systems. Bunker has also expanded sales of the banking control systems into the insurance industry which now account for about 10% of its sales. In 1980, a major contract was signed with Aetna Life and Casualty to equip branch offices with the System 90 terminals.

Bunker Ramo is continuing overseas expansion. It has been operating abroad for just a few years, but banking systems sales have slumped 70% to $23.9 million in 1980 after a 35% climb in 1979. Over 6,000 installations are now in Europe in the U.K., Germany, Spain, the Netherlands, Switzerland, Yugoslavia, and Bulgaria; in the Far East in the Philippines and Hong Kong; and in South America in Chile, Ecuador and Costa Rica.

A European distribution arrangement has been made with Plessey in the U.K.

While Bunker Ramo does sell an occasional minicomputer or terminal in the oem market, it does not plan to expand in this direction.
Introducing DATA SOURCES

The first—and only—complete guide to companies, products, people and services in the computer industry.

Computer professionals like you are caught in a vicious circle: Your installation's overloaded with present and future requirements. You're understaffed and everyone's overworked.

To ease the load you've got to choose the most cost-effective new products, services and technologies. You've got to sort out DPD, PDP, CICS, SNA, OSI, OS, DOS, VS, VSAM, Series 3200, Series 4300, 3270, 3240, 3340/50/60, CS/140, 3270, 3280, etc. etc. etc. It's enough to keep the midnight oil burning.

It's time you had help. And now it's here. DATA SOURCES, the most useful information service you'll ever own.

DATA SOURCES will make it possible for you to identify, evaluate and contact vendors of hardware, software and services quickly and effectively.

You'll find carefully formatted listings on over 20,000 products and 5,000 companies. And they're all fully indexed by product type, applications and industry specialization to make it practical for you to do the conscientious and comprehensive vendor surveying you've never had time to do before.

Everything you need in one, quarterly updated volume.

Companies. You'll find the most comprehensive listings ever compiled on manufacturers and distributors of: Computer systems. Communications equipment. Terminals. Printers. Word processing systems. Software. Media and other supplies. OEMs, systems builders and distributors, too.

You'll get a complete profile on each company: year established; sales volume; locations, plus names and phone numbers of key people in both sales and service.

Products. For each, you'll find: General performance specs. List price. Compatibility with your system. Approximate number of customer installations. Date of first shipment. Leasing terms and support available.


DATA SOURCES speeds your information search. And gives you the comfortable feeling that you're making decisions based on all the information—accurate, timely, complete. Find out what DATA SOURCES can do for your system, your department—your career.

Start doing your job better and more easily. Now.

Get your first copy free.

Try before you buy. As a special introductory offer, we'll send you the first edition absolutely free—with no purchase obligation. Simply fill out the coupon below, or the attached business reply card. If they've already been removed, contact:

DATA SOURCES
20 Brace Road, Cherry Hill, NJ 08034
609-429-2100
An information service of Ziff-Davis Publishing Co.
SANDERS ASSOCIATES, INC.
Daniel Webster Highway South
Nashua, NH 03061
(603) 885-4321

Sanders jumped into the DATAMATION Top 50 by acquiring Cal­
comp and the related Talos Systems, and performed well as the
leading producer of refresh stroke graphic displays. Sanders ac­
quired a scaled-down version of Calcomp—without its PCM disk
drives, add-on memory, and oem peripherals. This approximately
$70 million business is the leading supplier of pen-and-ink vector
plotters and an important supplier of electrostatic plotters. Talos
manufactures digitizers, another important component for the fast
growing computer-aided design graphics industry.

Calcomp, by selling off its losing operations, has become
a profitable operation once again. Plotter sales increased for the
20th consecutive year, and are projected to continue their recent
25% growth rate. The Calcomp group introduced nine new pro­
ducts, including the Model 1065 drum plotter and the Model 970
belted plotter. In a move to combine the synergies between it­
self and Sanders, Calcomp began marketing the Graphic 7 inter­
active display systems. Previously, Sanders had been marketing
the Graphic 7 on a limited basis, primarily to government agen­
cies and a few oems. With Calcomp’s worldwide sales organiza­
tion, the product will be marketed directly to end users and is
expected to increase the product’s market share significantly.
Calcomp has also been developing a turnkey graphic system for
architectural and engineering design. Progress is expected to be
accelerated by its financially strong parent. Calcomp sells and
services its products in 42 countries, including the People’s Re­
public of China. Close to 50% of Calcomp’s sales were derived
from international markets.
Sander’s graphic display division increased by 60%, to
around $75 million in 1980. Its displays are used for CAD appli­
cations, air traffic control, and flight simulation. Sanders also in­
roduced the Graphic-8 refresh raster color display in 1980,
which has improved resolution and can use 256 colors simulta­
neously.

Much of Sanders’ growth in 1980 can be attributed to its
success in oem graphic display terminals. During the year, San­
ders received an additional $20 million order from IBM, its largest
oem customer, for production of the IBM 3250 graphic display
system. This system is marketed by IBM primarily for CAD appli­
cations. Sanders also signed a multi-year contract to produce
graphic terminals for Control Data.

Between Sanders and Calcomp, the corporation had $145
million in dp sales, 62% derived from the domestic market. Op­
erating margins of almost 14% are impressive considering the
consolidation expenses of the market and the margin problems
(deficit in ’79) that Calcomp has experienced in the past.

BRADFORD NATIONAL CORPORATION
1500 Palisades Avenue
Teaneck, NJ 07666
(201) 833-1020

Bradford, a $142.7 million New York company, provides a
broad array of services to financial institutions, securities firms,
industry, and government. Total revenue in 1980 increased nearly
19% over 1979, following a 1.2% increase in 1979 over 1978.
All market segments reflected increases, but 40%, or $8.6 mil­
on, of the increment came from health services, insurance, and
government loan processing.

Bradford recently received an unfortunate setback in its
health care services revenues when the Texas Board of Human
Resources awarded Bradford a $3.1 million settlement to termi­
nate a four-year contract that had a potential gross revenue value
of $2 billion. The business was not expected to contribute to
BNC’s earnings until 1982, but its significance lies in the higher
profile BNC would have assumed in the medicaid market.

Bradford is competing with Electronic Data Systems,
Computer Science Corp., and other firms to provide Medicare
processing services for the 20 states federal legislation may force
to automate. Processing services for the New York State Medi­
care program alone provided 18% of BNC’s 1980 revenues.

In July 1980, the company acquired the Health Services
Div. of Optimum Systems to maintain Medicare patient records
and to make payments to doctors. This is known as Part B
Medicare for which annual nationwide expenditures are currently
about $10 billion. Bradford is also developing a computerized
Medicare information processing system to maintain patient rec­
ords and to make appropriate payments to institutional health
service providers. This is known as Part A Medicare for which
annual nationwide expenditures are about $23 billion.

In 1980, service to financial institutions grossed $96 mil­
on, up 22%. Bradford Trust Operations, an on-line accounting
and reporting system, now serves 87 trust departments with over
98,000 accounts and assets. Bradford Broker Settlement, Inc.,
was established to offer computerized clearing and processing
services to stock brokerage firms. Revenues in 1980, however,
were nominal, and expenses high.

The company has functioned in the fixed income segment
of the securities industry for many years through its affiliate,
Bradford Securities Processing Services, Inc. (BSPS). In 1980,
BSPS cleared more than $75 billion in municipal bonds and pro­
vided services to over 250 brokerage firms. To reduce costs,
Bradford proposed an automated municipal bond comparison and
netting service and applied for SEC approval in 1977. When Na­
tional Securities Clearing Corporation (NSCC) also applied for SEC
approval, Bradford proposed development of an automated inter­
face. Various legal steps by both companies resulted in a Feb.,
1981, settlement under which NSCC dropped the court action and
Bradford agreed to participate in an NSCC system as a nonclearing
agency participant.
You don’t have to take our word about Maxell Floppy Disk quality.

Ask the people who made your system.

Maxell Floppy Disks are either expressly specified or recommended by many major disk drive manufacturers. We’re also relied upon by a growing number of 8” and 5¼” Floppy System owners. They find our Floppy Disks do everything possible to bring out the maximum performance of their systems. And they find our disks do this consistently.

Are we better than others? Will a box of ten Maxell Disks always contain ten disks that produce high performance results every time? We think so. We certify each one. We maintain extraordinary quality control. So they all meet or exceed the most critical industry standards.

But please ask the manufacturer of your system to double check our recommendation. See your computer products supplier. Or write to us for more information. We recommend dealers write to us about the opportunities Maxell Business Products offer.

CIRCLE 121 ON READER CARD
Centronics had a very difficult year in 1980. Production problems with its new miniprinter product line, investments in Quietwriter, and diminished market share in its older product lines caused a sharp decline in operating margins. Revenues did squeeze out a 2% gain to $128.9 million, but operating margins dropped precipitously to 3.7% (from 25% the year before). Operating results deteriorated as the year progressed, with the last three months of 1980 seeing a $9.3 million pretax loss, which included a $5.5 million inventory write-down of the inventories of components of older printer lines.

Although Centronics’ low-priced printer market experienced a sharp increase in shipments during 1980, the real culprit appears to have been severe price competition in other lines.

Many of Centronics’ problems can be traced to its line of miniprinters. Centronics had to shut down its production line for nearly six weeks when it discovered that the printer was randomly shorting and emitting static electricity. It shipped only 25,000 units in fiscal ’80. As the year progressed, the production schedule improved. By the end of 1981, Centronics hopes to produce 1,000 units per day and be profitable. However, the production problem opened the way for competitors. Tandy, a client which accounted for 12% of fiscal ’79 revenues, yielded less than 4% in 1980. In addition, it is believed that Tandy will only be offering Japanese-made printers in the future.

All is not bleak, although Centronics will have to fight hard to regain its lost market share. Directing the turnaround will be Michael D. Kaufman, a former Xerox executive, who has been named president, relieving Robert Howard, who remains chairman and chief executive officer. Immediately after taking his position, Mr. Kaufman reorganized Centronics into three product groups and named six new vice presidents.

In addition to miniprinters, Centronics expected to introduce a new line of dot-matrix printers that will replace its existing aged product line and compete with the more expensive daisywheel printer products.

Longer term, Centronics is betting heavily on its new typewriter technology-based printer, Quietwriter. The Quietwriter has an infinite front flexibility and multicopy capability that uses fully formed characters. It uses a stylus controlled by electromagnets, and among its most prized characteristics is its silence. The target is the computer terminal market, a market of several hundred million dollars. Scheduled to be introduced at the 1981 NCC, Quietwriter is also planned for production by year-end 1981, with volume shipments and profits expected by mid ’82. Centronics named two former Digital Equipment managers as product line managers for Quietwriter.

In order to bring Quietwriter to market along with its new lines of matrix printers, Centronics has been investing heavily in R&D. Expenditures increased by 73% to $6.5 million in 1980. If Quietwriter becomes a successful product, Centronics may again be very profitable, although not as profitable as it has been. However, Centronics is likely to experience another difficult year in 1981. We would not be surprised to see the dividend, already lowered to 10 cents from 25 cents per quarter, eliminated entirely.
1980. PRC's largest dp contract with NASA is for operation of STIF, (Scientific and Technical Information Facility). The project makes NASA's research accessible to other fields to accomplish this goal. PRC abstracts catalogs and microfilms NASA's research reports so that the information can be accessed through remote terminals by private industry. PRC also has contracts for running a number of automated NASA systems, including a system that allocates space shuttle costs. PRC also performs defense intelligence system support and a number of other high-security contracts for the Department of Defense, NATO countries, Korea, and other governments.

PRC's commercial information systems accounts performed well, with a 41.7% growth to $58 million in 1980. The star performer, with sales of about $35 million, was real estate systems. The service is made familiar to more than 115,000 real estate agents and home buyers by a weekly publication of approximately 70,000 computer-generated multiple listing service reports in over 135 locations. It is accompanied by an on-line version accessible from 9,700 leased Teletype and Texas Instruments terminals tied into minicomputers in 101 geographical locations. In 1980, PRC introduced BOSS, a microcomputer-based system for real estate offices to handle financial accounting, word processing, and property management. Clients using BOSS can also access the multiple listing service database if they lease a modem, but most clients retain existing terminals and add on the microcomputer. PRC hopes to expand automation in the real estate industry to include title searches and assessments. PRC, however, still faces competition in the specialized small business systems market. Nixdorf, for instance, claims to have gained a 35% market share for a specialized mortgage closing system in only one year.

The commercial business unit also handles sales of a user-oriented software package and sales of systems designed for police and fire departments. In 1980, PRC retrenched from a short venture in the European software market. It established a business in the U.K. in 1979 that provides software for Prime and DEC minis. The company phased out the operation in December 1980 because of unanticipated expenses and market softness.

55 GENERAL AUTOMATION INC. 1055 S. East Street Anaheim, CA 92805 (714) 778-4800
It was another disappointing year for GA, with revenues up only 7% to $127 million; 1979's modest earnings of $240K turned into a $16 million loss in 1980. The work force was cut by 15%, and R&D expenditures declined 6%.

A new management team was installed over the course of 1980; the most important appointment was that of Leonard Mackenzie as president and CEO. Mackenzie was previously president and CEO of Northern Telecom Systems. He replaced Frank Grisanti, a management consultant specializing in turn-arounds who had taken on the presidency in 1979. A new vice president of marketing, Stephen W. Nielson, was chosen in May, and Richard Cortese of Northern Telecom was named vice president of operations in September. In December, John Murray was promoted from corporate controller to vice president, finance, and treasurer.

General Automation is now trying to redirect its energies toward the general-purpose minicomputer business. During the past few years, it has ventured into complex specialized markets which have required unprofitably large hardware and software investments. The company's principal business (75% of revenues) is the sale of computer systems for factory automation and management, as well as systems for international telecommunications and electronic funds transfer. Some of these systems are delivered turnkey; General Automation owns the peripherals and supplies the micros and software itself. About 25% of revenues come from the sale of "products and components," including printed circuit boards, circuit board laminates, and intelligent terminals. Much of this production is used internally.

56 INFORMATICS 21031 Ventura Boulevard, Suite 800 Woodland Hills, CA 91364 (213) 887-9040
In 1980, Equitable Life Assurance sold its remaining 61% of outstanding shares of Informatics common stock. Although revenue growth slowed to 12% in 1980 from 21% in 1979, operating margins have improved dramatically to 6.6% from 5.5% in 1979 and 4.6% in 1978. Margins were helped by improved employee productivity as dp employment decreased by 7% to 2,500. Pretax income increased a whopping 47%, to $7.7 million, although a higher tax rate shaved earnings improvements to 33%, at $4.1 million.

Informatics organizes its business by three groups: software products, which grew 5% to $38 million last year; professional services, which grew 3% to $36 million, and processing and processing services, with 26% growth to $53 million.

The most widely recognized group is the company's modestly profitable software products group, whose Mark IV batch implementation-oriented system cumulatively exceeded 2,000 installations at 1980 year-end (an increase of 18%) and has contributed over $100 million in revenues since its introduction in 1967. Mark IV and related system products account for nearly half the revenues of the group. An advanced transaction-oriented on-line implementation will be introduced in 1981.

For the second consecutive year, the largest revenue gains were in information processing services. The most profitable line was litigation information services, which provide information resource management for attorneys in large-scale cases (such as antitrust and major contract disputes). Management is trying to draw on this technology and approach by establishing Info Dynamics, a joint venture with Management Analysis Corp. in San Diego, providing information resource management services to utilities for regulatory compliance. The firm is also developing its industry data services and last year delivered eight turnkey systems. Early in 1981, this service was expanded by acquisition of Transportation Computing Science and its major subsidiary, Commercial Online Systems (COL). These companies provide a range of financial on-line services to the apparel industry.

With an eye to the future, R&D expenditures for software development were increased 34%. A portable software system for screen generation and database management was purchased and will be developed.

57 THE BOEING COMPANY BOEING COMPUTER SERVICES COMPANY 177 Madison Avenue Morristown, NJ 07960 (201) 540-7700
Boeing Computer Services (BCS) was formed in 1970 to service internal computing needs of all Boeing divisions. Nearly two-thirds of its activities are still house. The company does not report division revenues and would not bless our estimate for BCS of $125 million in 1980 (less than 2% of total corporate revenue), a 30% increase from our 1979 estimate of $96 million. It now has 2,000 active accounts, and the number of commercial orders are up 28%. BCS employment has increased 10% to 7,300, and marketing has been completely reorganized. The federal region remains separate, while the Eastern and Western regions have been split into the Eastern, Central, Pacific-Northwest, and Pacific-Southwest divisions.

Boeing's financial industry services group is doing particularly well. In 1980, it had 123% more contracts than in 1979 for its thrift services, bank services, and electronic funds transfer. Financial clients use the EIS, an interactive financial planning systems originally developed for in-house use. It offers budget performance tracking, product line forecasting, consolidations, cash control and foreign currency conversions.

The firm is quite active in dp education. In 1980, it opened an education and training division and now services more than 10,000 students at its national training center in Seattle. Client firms include commercial airlines, banks, and a major automotive manufacturer. In 1980 the package was expanded to include microcomputer applications, word processing in office systems, and networks and distributed data processing.

The federal system group has added a new division to market facilities management. Although GSA's federal contract revenue is significant, its growth has not kept pace with other sectors.

In 1980, GSA awarded an $8.4 million army contract to BCS and a smaller Navy contract for systems to manage enlistee data and to allocate training opportunities and class-
YOUR PRODUCTION WORKLOAD. DO YOU CONTROL IT OR DOES IT CONTROL YOU?

You can take complete charge of your data center's entire production process with the UCC-7 Automated Production Control System. UCC-7 doesn't just schedule; it moves the workload to, through, and out of the data center...on time. It manages every production activity - from receipt of input through output delivery.

UCC-7 is the only software package that lets you centralize control for all work areas - Data Preparation, Scheduling, Operations and Distribution. Plus, it gives you one common source of information for all user requests.

The UCC-7 Automated Production Control System: it is probably the most significant single step you can take to improve your data center's productivity. Call us at 1-800-527-5012 (in Texas, call 214-353-7312) or circle 122.

And, why not ask us about:

- A Tape Management System that protects data from loss or destruction (UCC-1). Circle 123
- A DOS Under OS System that lets you execute DOS programs without conversion (UCC-2). Circle 124
- A Disk Management System that can save the cost of new disk drives (UCC-3). Circle 125
- A PDS Space Management System that eliminates PDS compression (UCC-5). Circle 126
- A Data Dictionary/Manager that really gets IMS under control (UCC-10).
- An Automated Re-run and Tracking System that solves your re-run problems (UCC-11). Circle 128
- A software package that reduces hardware failure because it improves vendor responsiveness (UCC Reliability Plus). Circle 129
- General Accounting software packages. Circle 130
- Application software for the Banking and Thrift industries. Circle 131

UNIVERSITY COMPUTING COMPANY
DALLAS • LONDON • TORONTO • ZURICH
business is dependent upon the prosperity of automotive dealers, it comes as no surprise that 1980 did not reach management's expectations. Although dp revenues did increase by 7.6% to $117.8 million, dp operating margins for 12 months ending September decreased to 8.5% from a more lofty 17.7% level in fiscal 1979. Margins continued to worsen throughout 1980, and by year-end, the computer business was probably contributing losses.

R&R's computer business consists of both off-line (batch) and on-line computer services. Products include in-house computer systems with application software programs for general ledger accounting, parts inventory control, parts invoicing, merchandising, lease accounting, payroll, vehicle inventory control, word processing, and others. Over the years, batch and timesharing services for automobile dealerships have been decreasing in importance for R&R, from 66% of 1978 dp revenues to 37% of 1980 revenues.

R&R's turnkey minicomputer system, VM III, first introduced in 1976, has had enhancements added every year. Sales, which have skyrocketed from $12.8 million in fiscal 1978 to $33.0 million in fiscal 1980, experienced their first quarterly decline during the last three months of 1980. R&R buys its hardware and maintenance services from BTI.

To R&R's credit, the company has not shortchanged its product development efforts in order to show improved near-term results. R&D expenses almost doubled in 1980 to $2.8 million.

R&R is expanding its computer operations in areas outside of its traditional auto dealer domain. During 1981, R&R is expected to introduce turnkey systems to the medical, legal, and contractor markets. These markets are already served by R&R's forms division, and if these customers prove receptive to the new product offering, R&R should be less vulnerable to a downturn in the auto industry.

United Information Systems' 1980 revenues of $115 million increased 20% from $96 million in 1979 (all figures restated to exclude Calma), but net income substantially decreased to $4.8 million from $5.8 million. Profits are expected to recover in 1981, following heavy 1980 expenditures on expansion and new market development.

The Information Systems Group consists of four companies: 1) United Computing Systems, the largest of UIS' three remote computing service companies, grew 25% in 1980 to $75 million. United Computing installed a CRAY-1S computer in 1980 to enhance services to the engineering and scientific timesharing markets. 2) United Computing International serves the overseas computer services market. 3) On-Line Systems offers business, financial, and database management products through DEC timesharing equipment. It offers an on-line project management system (OSCAR) for defense, manufacturing, and energy-related applications. On-Line, which was acquired in late 1979, had 1980 revenues of $25 million, up 15%. 4) Uninet Inc. was formed in March 1980. It is the world's third largest packet network, and was formerly used internally by United Telecom. In early 1981, UIS announced that Uninet will be offered to the public, in competition with GTE, Telenet, and Tymnet.
Meet A Smart Performer

15" Screen, 132 Characters per Line, 7 x 11 Dot Matrix, Over 100 Operator Selectable Functions in 8 Soft Keys, 4 Page Memory.

Now, you can have all the features of the best terminals on the market in a single unit. All on a large screen with crisp, clear characters. The TAB 132/15. You'll get the kind of screen action you've been looking for.

Bidirectional smooth or jump scroll. Horizontal scroll. Split screen. 19,200 Baud communications. ANSI and DEC compatible. Full range of character attributes and editing features. English prompted set up mode. 24 data lines plus status and prompt lines. And more.

Solve your most demanding applications problems. Boost your operator productivity.

Screen test the TAB 132/15 today. You'll see a smart performance.

Call or write:
Smart Performer
TAB Products Co.
1451 California Avenue
Palo Alto, California 94304
415-858-2500
Distributor/OEM Inquiries Invited

Think TAB for Terminals

CIRCLE 132 ON READER CARD
Nobody sizes up your network needs like Digital.

Digital's know-how is changing the way networks are planned to perform right from the start.

Not everyone takes sizing as seriously as Digital.

You'll see networks offered on the "one technology fits all" theory. Networks that fill a number of needs but may not get top potential from your investment or allow for future growth.

At your earliest planning stages—where it really pays off—you can put Digital's years of network experience to work for you.

Experience works out the ideal balance of speed, throughput, cost, data integrity, flexibility, control.

Experience asks the right questions to start with. Basics such as:

What business problem do you want your network to solve?
What systems must communicate?

To specifics: What size should each individual node be for the job it has to do locally? How much communication
redundancy should be planned to avoid downtime? What options are possible later for future growth?

And how do you meet your requirements most economically?

**Digital's range of options.**

No other vendor can match Digital's broad range of flexible, cost-effective communications and processor options which allow networks to be sized to your organization's particular needs.

A few examples.

Some manufacturers support only BISYNC or X.25. Digital supports Batch BISYNC, Interactive BISYNC, and other standard mainframe communications protocols.

An advanced SNA protocol emulator allows Digital systems to participate in IBM/SNA networks.

And Digital offers X.25 Packetnet™ System Interfaces so Digital systems can communicate to public packet-switched networks.

DECnet™ Digital's highly functional networking software, provides features not available with mainframe protocols. With DECnet, you have point-to-point, multipoint, and parallel communications.

You can automatically reroute information around problem areas so network operations can continue even when communication links or nodes fail.

Even add new nodes without shutting down operations. With DECnet, you can have complete control.

**Your Digital Network Profile.**

A Digital team of networking experts will work closely with you, from concept through installation through support.

First, a written Profile details your network requirements. The number and location of each proposed node, each terminal. Types of network applications. Volume of data to be transferred between individual nodes. Data urgency and importance. Line and system reliability, availability, and maintainability.


**Digital's Customer Support Plan.**

Based on your Network Profile, our experts, working with you, document how Digital will help satisfy your needs. Installation, start-up, training, network maintenance, troubleshooting. This plan clearly spells out what Digital will do, when it will be done, and how it will be accomplished. Following this thorough preplanning, Digital field service and software support experts will install and verify the hardware and software needed at each node, and demonstrate working network connections.

**Digital planning leads to Digital performance.**

A working network, ready to go. Ready to perform to the maximum now. Capable of expanding later as your business grows.

To date, Digital has implemented over 5,000 network nodes around the world. And we don't just install them. We support them, too, with an international team of over 14,000 service people. At Digital, we're changing the way technology works for your needs.


digital
We change the way the world thinks.
RECOGNITION EQUIPMENT, INC.
2701 East Granwyler Road
Irving, TX 75061
(214) 579-6000

REI manufactures OCR equipment for centralized processing, distributed processing, and postal/mail processing. These activities account for 70%, 20%, and 10% of 1980 revenues. Revenues increased 15% over 1979 to $113.1 million. More significant was the 41% increase in dp operating income to $10.6 million (compared to $7.5 million in 1979). R&D accounted for $8.4 million; $1.6 million was received from the U.S. Postal Service for R&D related to letter sorting products.

To strengthen its capability in application software development connected with its hardware products, REI acquired the Computer Div. of Waveotek in July 1980.

The Trace Image (TRIM) system is the principal product in the centralized processing segment. It allows for computerized processing of image data rather than the physical documents, and it is used by institutions such as banks and credit card companies. With the acquisition of the Data Systems Div. of Cummings-Allison Corp., which was engaged in the manufacture of systems complementary to its own, REI was able to broaden the TRACE product to TRACE I, II, and III. (TRACE ID) is the lower speed document transporter, and customers can upgrade it as processing volumes increase. Other products in this segment include the Currency Verification, Counting and Sorting System (CVCS), which processes currency and issued by the U.S. Federal Reserve system, and INPUT 80, which reads data from typed or printed pages.

In the distributed processing segment, the principle product is the OCR WAND reader, which, among other things, can be used in non-food retail stores for reading and entering information from price tags. In 1980, the capabilities of the OCR WAND were expanded to allow reading of magnetic characters on the bottom of checks.

REI is facing with some formidable competition in all of its businesses, primarily from IBM, Burroughs, and NCR. In addition, various international electronics firms compete in the foreign postal mail processing market and the U.S. postal market may also become more competitive.

LANIER BUSINESS PRODUCTS, INC.
1700 Chantilly Drive N.E.
Atlanta, GA 30324
(404) 329-8000

Lanier is on the move. Not satisfied with the excellent results of its entry into the wp arena in 1977, Lanier has revealed an active interest in dp operations with the 1980 release of its "Alert" shop floor control system, a data collection and factory management system.

Despite operating losses reported during the early part of 1980 by AES Data Ltd., the 36.7% Canadian-owned subsidiary that makes Lanier word processors, Lanier's dp revenue increased a healthy 64% over the previous year to $128 million. Net profit for 1980 amounted to $20.2 million, representing an increase of 36% over 1979. As it did with both its dictation equipment and wp ventures, Lanier is counting on its national sales force and a heavy advertising campaign to successfully market the new systems. Its nationwide sales and service organizations are its primary competitive strength.

Lanier's total corporate revenues reached $275 million, up 28% in 1980. Dictation equipment (manufactured by the Japanese) is estimated at $80 million; copiers and microfilm products (manufactured by 3M) is estimated at $40 million; and service represents the remaining revenues not generated by dp. Lanier's profitable relationship with 3M celebrated its 25th year during 1980.

In 1981, Lanier plans to introduce six smart disks and software packages to supplement the programs for its "No Problem" shared logic systems. During 1980, the company began selling a text editing system. Additional enhancements will be required for the company to remain competitive in the hotly contested standalone word processing market as IBM, Wang, and Digital Equipment all introduced new low-cost products during 1980. As volume shipments begin, Lanier may suffer margin pressures from its wp products because of likely price reductions.

SHARED MEDICAL SYSTEMS CORP.
650 Park Ave.
King of Prussia, PA 19406
(215) 265-7600

Capping a decade of steady growth, Shared Medical Systems' (SMS) 1980 revenues increased by 29% to $106.6 million. The company provides a broad variety of computer-based information services, mostly to acute-care hospitals, from which over 93% of its annual revenue was derived last year. SMS is the leading supplier of timesharing services to hospitals, with the balance of its services going to physicians' groups and other health-care organizations. Virtually all of its business comes from the sale of software products to the medical industry.

Although there has been some slippage in profit margins in each of the past few years, 1980 pretax margins were still a healthy 24.6%. Net profit increased 23.5% to $13.3 million. Dp research and development expenditures rose by 31% to $8.2 million. Total 1980 dp expenditures, however, were down 10% to $16.9 million from the previous year, primarily as a result of a $2.7 million decline in the company's spending for buildings, including construction in process. During the last five years, SMS has financed nearly all of its capital expenditures internally.

While most of SMS' revenues come from domestic sales, the company did initiate negotiations last year for establishing an international corporation, to be named SMS International. This company will market SMS technology outside North America. International business is not expected to make any significant contribution to earnings for the next few years.

AM INTERNATIONAL, INC.
1900 Avenue of the Stars
Los Angeles, CA 90067
(213) 556-8500

The big news at AM International last year was its poor performance and the resignation of chairman Roy Ash in early 1981. Total corporate revenues of $935.7 million were up 14%, but net income was a paltry $2.2 million. Dp revenues were up 49% to $98.8 million, but earnings, if any, were negligible.

Three divisions generate dp revenues—AM Jacquard Systems, AM ECMR, and AM Documentor. AM Jacquard, acquired in early 1979, provides small business computers and a line of wp equipment that ranges from intelligent typewriters to hybrid wp/dp systems. This division has been deeply troubled: it lost $22 million on sales of $44.1 million in fiscal 1980 (ending July 31). A new president, George Vosatkia, was appointed in August, following the resignation of president and founder Edgar A. Bolton. Shortly thereafter, 80 salespeople and 11 engineers were laid off. The ax fell again in December, when 80 more employees were laid off, reducing the division's work force to 620. Sales continued to expand during the last half of 1980, although the division has remained unprofitable. Management has stated that it plans to slow its growth to a "mere" 50% maybe during 1981 so that it can return to profitability.

AM ECMR manufactures text editing terminals, optical character recognition (OCR) devices, and laser scanner camera systems. This division was acquired in 1978 and had 1980 revenues of $12 million. ECMR is a key component of AM's office automation strategy: merging AM's capability in duplicators with its laser technology to create "intelligent document generators."

The AM Documentor Div. is the world's largest producer of point-of-sale electronic management control systems for the food service industry. Its 1980 revenues of approximately $40 million gave it a 35% share of the food service industry's control systems market. In March 1981, AM disclosed that Documentor was among the several businesses and properties that the company plans to sell off.

COMMODORE INTERNATIONAL LTD.
950 Rittenhouse Road
Norristown, PA 19401
(215) 666-7950

Following two consecutive years of over 100% growth, Commodore's dp revenue growth rate slowed to a "mere" 54%, to $98.7 million. (Dp revenues for 1979 have been restated to $64.1 million from $55 million as reported in last year's survey). Commodore remains the dominant European supplier of microcomputers, with 1980 sales of $74.7 million, up 105% from $35.4 million in
Call a manufacturer and you'll hear one story: Me, me, me.
Call Selecterm and you'll hear the whole story: Which manufacturer is best for what kind of business; where the new technology is coming from; which terminal and how many.
Selecterm leases the finest data terminal equipment from all the major manufacturers of terminals. We don't just push one (unless we think he happens to be the best one for you).
We won't recommend more terminals than we think you need.

We won't hold anything back: If there's better equipment coming out in a month or two, we'll tell you to wait.
You see, we're in business to offer you management help on the selection and service of the best terminal equipment.
The best doesn't mean the one that's most easily available, or the one that brings in the highest commission.
The best means the one that's best for you.
Because what's best for you is best for us.
To our way of thinking, an open mind is a lot better than blind loyalty.

We won't let you go wrong. 2 Audubon Road, Wakefield, Massachusetts 01880. Offices in Boston, (617) 246-1300; New York, (212) 868-1300; Washington, D.C., (703) 522-2520; San Francisco, (415) 461-6730 and Chicago, (312) 595-3994.

CIRCLE 134 ON READER CARD
1979. Its U.S. revenues, however, declined 13% to $24 million.

Commodore has set ambitious objectives to increase penetration of this market. These efforts were initiated in 1980 by eliminating independent distributors and establishing seven regional distribution centers that will also be dealer support centers. Commodore focused initially on the northeast corridor, running trade shows in Philadelphia and Boston. These trade shows were modeled on the company’s successful shows in the United Kingdom. In addition, Commodore, for the first time, is running a national advertising campaign. Gains in the education market were also noteworthy.

Dp capital expenditures increased over 13-fold to $4.2 million in 1980, primarily because of construction of a German plant that opened in October. In addition, Commodore began manufacturing its new low-cost VIC-20 (retailing for $300) in Japan.

Commodore was very active in introducing new products. In addition to the VIC-20, it introduced several peripheral products, including disk drives and printers. Commodore also introduced a point-of-sale (POS) system designed around its self-manufactured 6502 microprocessor. Priced under $3,000, the product will be sold through dealers to grocery stores and later to general merchandisers. Manufacturing is expected to begin in 1981.

Commodore had several management changes in 1980, including the resignations of Bud Frye, president of the semiconductor group; Chuck Peddle, of engineering; and Dennis Burnhart, of international marketing. James Finke was named president, replacing Jack Tramiel, who became vice chairman. Most recently Mr. Finke was in senior management with Data General, and he is an alumnus of Motorola and General Electric.

67 DUN & BRADSTREET CORPORATION

National CSS
187 Danbury Road
Wilton, CT 06897
(203) 762-2511

In its first year as a wholly owned subsidiary of the Dun & Bradstreet Corp., National CSS generated revenues of $124 million, an increase of 12.7% over the $110 million revenue mark posted in 1979. However, excluding computer output microfilm (COM) revenues, the receipts increased by only 6%, to $96.7 million. With 1,875 employees in the U.S., France, and the United Kingdom, National CSS provides software and on-line computer services, image storage and retrieval technology, and computer systems for business information applications. Since becoming a subsidiary of Dun & Bradstreet, the computer network and systems have increasingly been integrated into the delivery of the products and services of other D&B subsidiaries.

National CSS’s remote computing service business was strong in the first half of 1980, but slowed in the second half of the year. The database management system, NOMAD, and its recent major enhancement, NOMAD 2, continued as the company’s largest revenue producers. National CSS is concentrating its efforts on services geared to functionally specific applications by introducing such products as TEXT, SYSTEM, an information storage and retrieval system, and RESPOND, a human resources management system. Other products soon to be announced include a financial planning/modeling product and an on-line accounting package.

NCSS also markets the 3200 IBM-compatible minicomputer manufactured by Two PI Corp. (since acquired by Four Phase). This operation got off to a slow start after its inception in 1978 and has continually disappointed management in both sales and profitability. The computer operation was integrated into the Remote Computer Services Div. at mid-year 1980, and 85 marketing and technical support people were laid off as part of the consolidation. NCSS remains committed to selling the 3200, however, stressing the long-term strategic benefits of a computer hardware offering. A sales acceleration in 1980 was encouraging.

Also posting revenue gains were the Software Products Group, consisting of Turnkey International and the newly acquired Program Products, Inc., of Montvale, N.J. PPI’s operations were integrated with those of Turnkey International to form the Systems Products Group, an information storage and retrieval software group. PPI specializes in the development and sale of software products that facilitate information retrieval and reporting. PPI products enable individuals without a large amount of data processing experience to use computers.

Zytron Corp., a 1978 NCSS acquisition with a computer output microfilm (COM) business, continued its revenue growth in 1980 with an estimated 22% increase over 1979. Aiding this upward trend were the acquisitions of five COM services companies, including Micro-Datamation Corp. of California; Texas Microfilm, Inc., COM, Inc., and Data Media, Inc., all of Texas; and COM Serviceware Bureaus, Inc., of Massachusetts. These acquisitions expanded Zytron’s geographic coverage and enhanced its position as one of the industry’s leading suppliers of COM services.

68 COMSHARE, INC.

3001 S. State Street
Ann Arbor, MI 48104
(313) 994-4800

Although Comshare failed to duplicate ‘79’s 100% growth rate in revenues, it did have a 31% increase in revenues, to $88.2 million. Net income was down 14%, however, and operating income was down 10%. The company attributed the disappointing year to increased expenditures on new products and computer equipment. Comshare upgraded its computer plant by replacing old memories on its Sigma 9 equipment with 16MB Honeywell monolithic memories, and by replacing IBM gear with two Amdahl 68s.

Comshare is an international computer services company that specializes in “professional” areas, as opposed to industrial or scientic applications. The company has followed two principle strategies during the past decade: market specialization and international expansion.

The specific markets served include financial planning and control, with Comshare’s “Parsec” service; human resources management, with “Profiles”; public accounting, with “Compass”; government agencies, with the “Public Services” program; telephone companies, with the “4.1.1” directory assistance administrative service; and bank trust department services, with the “Trust Services” package. In early 1981, Comshare introduced a new color graphics product, “Execucart.”

In June 1980, the French government authorized Comshare to establish a wholly owned computer services subsidiary in France, the largest European market for remote computing services. No other U.S. timesharing firm has received such an approval. Comshare’s European group also adheres to the specialization strategy; it offers some U.S. products—the “public services” package is very popular in the U.K., for example—and it creates some of its own based on local market needs.

International and domestic clients connect to Comshare’s Commander II computer centers in Ann Arbor, London, and Toronto over Telegrid. The Telegrid Communications Network reaches more than 90 cities in the U.S. and Europe over 25,000 miles of leased telephone circuits. Clients who are not located near a Telegrid city can access the network over GTE/Telenet, a feature which was added in 1980 and expands Comshare accessibility to more than 150 cities in 22 countries.

69 THE SUN COMPANY, INC.

SUN INFORMATION SERVICES CO.
280 King of Prussia Road
Radnor, PA 19087
(215) 293-8000

Sun Information Services Co., a five-year-old subsidiary of the Sun Oil Co., provides dp and telecommunications services, including remote computing services, software packages, and disaster recovery. Its major customers are large manufacturing companies and financial institutions, which account for 70% and 23% of revenues, respectively. It also serves other Sun-affiliated companies—SIS was actually formed to serve Sun’s information services needs, with a secondary goal of developing outside business.

Total $US revenues were $97.6 million in 1980, with $86.9 million coming from dp. Dp operating income was $9.6 million, but SIS’s overall operating income was only $2.7 million. Management, which accurately projected revenue growth last year, forecasts an annual growth of 25% for the next few years, with revenue reaching $150 million in 1982. Profitability should improve as the company matures and has fewer startup expenses.

Sun Information Services derives 95% of its revenues from the services sector and 5% from software. Its major competitors are...
THE WORLD MEETS AT THE SICOB-PARIS.

SICOB:
2,433 MAKES FROM 31 COUNTRIES
356,316 VISITORS FROM 97 COUNTRIES

SICOB:
EVERYTHING IN TELEMATICS
EVERYTHING IN OFFICE AUTOMATION
EVERYTHING IN DATA PROCESSING
EVERYTHING IN OFFICE ORGANIZATION

THE PARIS SICOB.
THE GREAT INTERNATIONAL TRADE FAIR.
SEPTEMBER 23RD TO OCTOBER 2ND 1981.

AND CONVENTION INFORMATIQUE
THE INTERNATIONAL SOFTWARE CONGRESS
SEPTEMBER 21ST TO 25TH 1981

CIRCLE 135 ON READER CARD
Boeing Computer Services, Martin Marietta Data Systems, the Service Bureau Co., ADP, Informatics, McAuto, and GEISCO.

sis consists of three divisions: banking services, computer services, and electronics and telecommunications systems (ETSD). SIS has built the banking services division through a series of acquisitions: Weilard Computer Group in May 1978, a computing division of Metridata in February 1979, Applied Financial Systems in May 1979, and Cattlactics Corp. in November 1979. In June 1980, SIS bought NMF, Inc., a privately held data services trust company based in Charlotte, N.C.

The computer services division provides time and programs in distribution management and control, database management, financial planning, and other applications. It operates three data centers. Computer services also offers the SunGuard disaster backup and recovery service, which became operational in 1979. SunGuard's two data centers in Philadelphia protect computer-dependent clients against loss of data and computing power. The centers are resistant to natural disasters, and have elaborate security systems, their own power sources, and 1,600 telecommunications lines ready. They hold duplicate data tapes for clients and take over all of the client's dp functions if necessary. A third SunGuard center will be opened in Chicago this year.

The electronics and telecommunications systems division, which had 1980 revenues of $17 million, develops software products and services for electronic and telecommunications users, and mini- or micro-based systems for supervisory control and data acquisition. SCADA, the supervisory control and data acquisition system, provides security, monitoring, and process control for remote operations, such as offshore oil rigs or factories. ETSD also performs data and voice network planning and design, and runs an RF radio equipment engineering and service operation.

70 GOULD, INC.
SYSTEMS ENGINEERING LABORATORIES
6901 W. Sunrise Boulevard
Ft. Lauderdale, FL 33313
(305) 587-2900

Systems Engineering Labs had an estimated 22% growth in annual revenues to about $86.9 million; international sales accounted for about 27%. In September, the company was acquired by Gould, Inc., a diversified electronics manufacturer and a Systems customer prior to the acquisition.

Riding on the popular crest, Systems expanded its energy business with a number of new contracts for equipment for seismic exploration. Systems' simulator market also expanded with rising requirements for maintenance trainers.

Systems, targeted to the industrial automation market, has access to the resources of a major participant in that market in Gould's Modicon division. Modicon builds programmable controllers for factory equipment. Technical and marketing synergy between Systems and Modicon, as well as between Systems and other Gould subsidiaries, is likely to be encouraged.

During 1980, Systems announced its Concept 32, a one-board, 32-bit computer for oems. At the high end, the VPS 6400 CM combines the Systems 32/77 computer with a unique 64-bit array processor to produce an extremely powerful computing engine. This product is used for the solution of problems involving arithmetic processing of large amounts of ordered data, such as that found in image processing or waveform analysis. Software announcements for the year 1980 included Pascal.

Systems has held to its basic SEL-32 hardware architecture developed during the mid-1970s, producing variations (32/77) and reimplementations (Concept 32) but maintaining basic software and 10 compatibility through its growing family of models. Because of its heavy oem orientation, Systems is expected to continue this product strategy, adding compatible hardware at both ends of the performance spectrum and concentrating software development on tools for application implementation rather than on applications themselves.

71 EXXON CORPORATION
EXXON INFORMATION SYSTEMS
1251 Avenue of the Americas
New York, NY 10020
(212) 398-3000

Exxon, with 1980 earnings of $5.7 billion, does not release any financial information on tiny Exxon Information Systems, which accounts for less than 0.5% of revenues. We estimate Exxon Information Systems' 1980 revenues at $350 million, up from 1979. Earnings were negative. DP revenues from Vydec, Periphonics, and Zilog were an estimated $86 million, up 39% over estimated 1979 revenues of $62 million. Vydec, which has been plagued with problems, accounted for $70 million. Vydec's word processing products are generally considered to be technologically laggers, and the affiliate's demise is widely predicted. As part of the Vydec/Qwip/Qyx joint sales and service operation, Vydec's standalone and clustered word processing systems could be phased out as Qyx's line of intelligent typewriters expands upward. Nevertheless, Vydec did announce two new products in 1980—the S-100 and S-200 controllers, which turn Vydec's standalone products into shared logic systems which can support up to 16 terminals.

Zilog, with estimated dp revenues of $12 million in 1980, makes the Z-80 microprocessor and a variety of small Z-80 based systems. In 1979, Zilog introduced the MCZ-1, a $7,000 to $18,000 microcomputer. In 1980, the MCZ-2 was announced. Also Z-80 based, it comes in three models. The model 50, which is the top of the line at $12,000, consists of one Z-80A microprocessing unit, a 2.4MB floppy disk system, and a crt. In 1980, Zilog also announced Z-Net, a baseband local network which links its own processors and will be Ethernet-compatible.

We estimate Periphonics at $4 million; the company makes Peripacs, a 64K add-on memory, as well as the Voicepac 2000, an audio response system for bank-at-home applications.

72 COMPUTER AUTOMATION, INC.
2181 Dupont Drive
Irvine, CA 92713
(714) 833-8830

Computer Automation's much-heralded turnaround had halted, at least temporarily, by the end of 1980. While revenues of $81.4 million were up 26% over 1979 revenues of $64.4 million, and earnings were $3.9 million as opposed to 1979's $1.7 million loss, financial results for the second half of the year were disappointing, with revenues up less than 1% and earnings down 46% over the same period in 1979.

Management attributed the poor second half showing to a combination of high operating costs and the impact of the recession on order rates for products from the firm's minicomputer division. Some customers had delayed receipt of previously ordered shipments, while others had postponed making new orders. An 8% cutback in employees of the Naked Mini Div. was made in October, and the attendant savings are expected to aid 1981 performance, although continued higher costs in other areas may force Computer Automation to raise prices for some products.

CA derives half its revenues from sales to oems, making it particularly vulnerable to the general economic climate. Best known for its Naked Mini, CA offers a full line of minicomputers, ranging from the 32K SCOUT 4/04, which costs as little as a few hundred dollars, to fully integrated computer systems capable of developing systems software in the $27K range. The Naked Mini Div. has delivered more than 35,000 computers.

CA's Commercial Systems Div. offers the SYFA distributed data processing system, and the company also sells minicomputer-based automatic test equipment through its Industrial Products Div.

73 MODULAR COMPUTER SYSTEMS, INC.
1650 West McNab Road
Fort Lauderdale, FL 33309
(305) 974-1380

Modular Computer Systems (Modcomp) had another tough year. Although revenues increased 13% to $81.1 million, operating income was down 51% to $5.5 million and net income decreased 18% to $3.8 million. The predicted turnaround has been postponed to 1981.

In the first half of 1980, Modcomp had a price hike; it gained a $20.3 million line of unsecured bank credit in March; installed a new management team; and initiated a venture with AEG-Telefunken. Management changes included promoting Alexander...
An IBM 3270 compatible proven CRT/printer workstation from Beehive

Single Station 3276-2 Controller Display and 3287 Printer

WORKSTATION FEATURES
- Concurrent CRT and Printer Operation. ■ Dedicated or Dial Up Service.
- Full Complement of IBM 3276 ATTRIBUTES PLUS Reverse Video, Field Blink, and Underline as supported by the IBM 3279. ■ Monitor Mode, Line Monitoring Test Facility allows display and printing of Alphameric and Control Codes. ■ Printing Capability from the Host or Locally with EXTENDED Features; Compressed Print (Paper Saver), Double Width Characters (Headlining), and a Short Form Tear Bar Option.

$4790*
Available Now
CALL TOLL FREE
(800) 453-9454

*Includes a Beehive DM3270 controller display and P1600 printer

BEEHIVE INTERNATIONAL
“A proven competitive manufacturer of smart terminals”

CALIFORNIA Costa Mesa (714) 540-8404 • Sunnyvale (408) 738-1560 FLORIDA Altamonte Springs (305) 830-4666
ILLINOIS Arlington Heights (312) 593-1565 MASSACHUSETTS Woburn (617) 933-0202 NEW YORK New York (212) 682-1600 TEXAS Dallas (214) 239-3330 UTAH Salt Lake City (801) 355-6000 WASHINGTON, D.C. (VA) Falls Church (703) 356-5133 EUROPE The Netherlands Phone 020-451522

CIRCLE 136 ON READER CARD
Datamation offers not just what is here today but what is coming tomorrow. So does Olivetti.

Datamation

&

Olivetti

When the readership of Datamation goes up, Olivetti is delighted. Because this means that more and more people are interested in finding out not just what the market offers today but are looking ahead. And therefore this means that the number of people interested in Olivetti and in its data processing equipment has also grown. Because Olivetti is Europe's leading manufacturer and one of the world's major operators in this field.

To understand why, just take a closer look at some of the facts.

2,400 research workers in the Ivrea laboratories – some of the largest in Europe – are designing the future. 53,500 people are working in 28 plants distributed in 10 nations. 32 foreign subsidiaries and more than 100 general agents are engaged in direct sales throughout 140 countries.

9,300 servicing technicians, 3,000 software specialists. By virtue of this Olivetti today offers the widest range existing of distributed data processing systems and equipment for office automation. In fact with its network of terminals and concentrators spreading from the North Pole to Australia, Olivetti does away with continental distances ensuring the organization and flow of information. And with the world's most complete line of electronic typewriters Olivetti has recently brought a new dimension into everyday office jobs – the possibility of increasing productivity while helping to make work more creative.

So, in 1980 the turnover amounted to approximately 2,540 million dollars. 65% of this is accounted for outside the Italian market.

A turnover coming from sales but also from technologies, covered by international patents, that Olivetti exports worldwide, U.S.A. and Japan included. And it is this turnover, this presence extending everywhere, the advanced solutions of its technology that make it possible to affirm that Olivetti is wherever there are people interested in finding out not just what is here today but also what is coming tomorrow. That Olivetti is wherever there's Datamation.

olivetti* is a registered trade mark of Dun Donnelley Corp.
Giles, Jr., from president to chairman and ced; moving John Lobb from chairman to vice chairman (a new post); and bringing in Gabri-el Rosica from Foxboro as president and ced.

Under the agreement with AEG-Telefunken, Modcomp sold approximately 1 million shares (25% ownership), for $30 million cash. In addition, the two companies set up a joint venture in Germany called A-T-M Computer GmbH. Based in Munich, A-T-M is 25% owned by Modcomp and 75% owned by AEG. It will sell both Modcomp and AEG equipment, and will serve as a vehicle for technology exchange and licensing agreements.

Modcomp introduced the Classic family of computer systems in 1980. The company amortized $10 million cash for the low-to-mid-range systems, Pascal and X.25 programs, and other small products.

An issue that will likely be resolved in 1981 is the four-year-old SEC investigation into the circumstances surrounding the preparation and reporting of Modcomp’s 1975 and 1976 financial statements. Modcomp indicated that certain employees may have behaved questionably, and that restated figures for 1973-1977. The accounting policy under scrutiny was one in which sales of equipment that had not yet been shipped were reported as completed sales of April 1981, the investigation was expected to result in a negotiated settlement to an administrative proceeding.

74 MARTIN MARIETTA CORPORATION
MARTIN MARIETTA DATA SYSTEMS
630 Ivy Lane, Suite 300
Greenbelt, MD 20770
(301) 345-0100

Martin Marietta Data Systems is a relatively small subsidiary of the $2.6 billion Martin Marietta Corp. MM Data Systems, a leading services and applications software firm, grew 3% in 1980, to $78 million. In keeping with its parent’s businesses, MMDS draws 73% of its revenues from the manufacturing industry, and 22% from the government sector.

Remote computing services account for half of sales. MMDS operates data centers in Orlando and Denerver, which provide IBM and CDC-based services. The Denver center was upgraded and expanded in 1980, and a CDC system was installed. The MMDS network transmits 1.5 billion characters per day, a 50% increase since 1979. Some subscribers use their own software, while others use MMDS-supplied applications.

Martin Marietta supplies a series of manufacturing software packages. The Modular Applications Systems (MAS) offers engineering control, master production scheduling, purchasing, order processing, and other applications in separate modules, and a variety of versions for use in IBM, Honeywell, and Univac computers. MAS-E is an on-line, interactive management system. MAS-II is an integrated manufacturing system for 3000 minicomputers.

MMDS’s federal systems group has expanded rapidly since its formation in 1979. The company has also formed a professional services group.

MMDS International, England, provides services, consulting, and software to several industries, including retailers, hotels, management systems for automobile leasing, and education and training programs.

In 1980, Martin Marietta Data Systems divested itself of FIS (Financial Industry Systems), a partnership with Hartford National Bank. FIS’s three groups—bank facilities management, a transit software package, and a turnkey credit union accounting system—were sold separately; MMDS bought the credit union group for itself.

75 GERBER SCIENTIFIC, INC.
83 Gerber Road West
South Windsor, CT 06074
(203) 644-1551

Gerber Scientific had a very strong year in 1980, particularly in light of the recession-level orders in Gerber Garment Technology (GGT). DP revenues increased by 42% to $78 million. GGT manufactures a true computer-aided design/computer-aided manufacturing (CAD/CAM) system for the apparel, automotive, and aerospace industries. Prior to 1980, Gerber only participated in the CAD sector with its patented GERBERcut, a computer-controlled system used to cut limp material. In October 1980, however, GGT purchased the AM-1 Pattern Grading and Marker Making System from Hughes Aircraft.

The AM-1 is a minicomputer-based CAD system used to size pattern pieces and to arrange them to minimize material usage. The AM-1, together with the GERBER-cutter, is one of the few totally integrated CAD/CAM systems. (Excluded from DP revenues, is 35% of this division’s revenue, an estimate of that portion of revenues derived from the mechanical cutters.)

Gerber Scientific Instruments (GSI), Gerber’s largest division with 40% of 1980 DP revenues, manufactures computer-controlled drafting and photoplotters systems used for CAD/CAM and other applications. Its photoplotters are used for producing master artwork for manufacturing printed circuits, microchips, large-scale integrated circuits, and other applications using high quality graphic masters. GSI also manufactures the PC-800, a low-cost turnkey graphic production system used in the production of printed circuit board master artwork. Introduced in 1980, the PC-800 earned nearly $10 million. GSI also introduced the PC-800 Model 2, an enhanced version of the original model.

Gerber Systems Technology (GST), Gerber’s large-end turnkey computer graphics division, had sales of about $15 million in 1980. GST uses an Hewlett-Packard computer, and its application focus is toward mechanical designs, particularly for the aerospace, automotive, tool and die, and heavy equipment industries. This spring, GST filed with the SEC for an initial public offering of 600,000 shares (20% of its common stock). The net proceeds will be used to expand R&D and marketing.

76 CPT CORPORATION
8100 Mitchell Road
Eden Prairie, MN 55344
(612) 937-8000

CPT’s revenues increased 68% to $76.4 million in 1980, 68% of which were from U.S. operations. Sales of word processing equipment account for 86% of revenues; software, maintenance, parts, etc. account for the 14% balance.

CPT’s thrust is directed at the high end of the standalone word processing marketplace, offering users sophisticated word processing capabilities with both the lower end CPT 6000 and the more sophisticated CPT 8000, which can be enhanced to combine word and data processing with the company’s CompuPak software. An interesting feature of the 8000 is a multilingual feature which includes Arabic. Although primarily a standalone word processing company, a new software package, WordPak, brings CPT into the shared-resource marketplace.

During 1980 the company made several changes in top management and moved its corporate headquarters to a new 110,000 sq. ft. facility. Now in the final stages of negotiations is its first overseas production facility (in England). For the six months ending Dec. 31, 1980, R&D was 3.9% of revenues, compared to 2.7% for the same period in the prior year. A large investment is also being made in electronic testing equipment aimed at improving product quality and reducing service calls.

CPT sells and services its U.S. products primarily through independent dealers, thus reducing the demand for capital expenditures. Internationally, the company markets through distributor networks and is currently represented in 50 countries.

CPT does not manufacture its wp systems and is dependent on other manufacturers for its supply of components. In its quest for market share, the company relies heavily on its ability to offer a wide range of software. Principal competitors are IBM, Xerox, EXXON, Wang, and Lanier, all of which have substantially greater resources.

77 PARADYNE CORPORATION
8500 Ulmerton Road
Largo, FL 33764
(813) 536-4771

Paradyne is a leading manufacturer of high speed data communications products, and has also established itself in the broader market of distributed data processing (DDP) with the 1980 release of the 3270-compatible PDS 270 display system.

Paradyne’s revenues increased 83% to $75.9 million and operating income increased 98% to $10.9 million. Management is anticipating continued gains—capital expenditures grew over fivefold from 1979 to $1.5 million. R&D expenses reached $6.3 million, up 98%, and employment nearly doubled.

Paradyne derived 74% of its revenues
from its traditional modern business in 1980, and 26% from sales of its IXl dp networking systems. Also in the IXl family, Paradyne began delivering its RESPONSE minicomputer in the fourth quarter. RESPONSE is a remote processing system which gives dp users remote applications processing capability.

Paradyne introduced six new products in September 1980, attesting to its heavy R&D. Four modems were announced, one of which offers 50% more throughput than the standard 9600 bps modem over voice-grade lines. Two network management products were announced, including the $110,000 DATALYZER system, which measures a network's performance on-line.

By year-end, backlog was up over 88% over 1979's level to $76.7 million. Paradyne completed another successful year in which operating results were up substantially, order rates continued at record levels, and new product introductions broadened its market. Prospects appear highly positive for 1981 and beyond. The company's major challenges in moving into the distributed data processing industry will be financing that expansion against the larger companies entrenched in that territory. Paradyne's management, however, has faced harder tasks in the past, as when they rescued the company from a $3.4 million loss in 1974.

78 BASF SYSTEMS CORPORATION
Crosby Drive
Bedford, MA 01730
(617) 271-4000

BASF Systems manufactures and markets a complete line of magnetic media products, including computer tape, disk packs and cartridges, cassettes and floppy disks. The media group grew 13% in 1980.

BASF Systems, formerly a division of BASF Wyandotte Corp., became a separate entity on Jan. 1, 1981. Concurrently, the company's equity was increased by $10 million in order to support continued growth opportunities in the U.S. market. Even without this additional financing, dp revenues increased by 30% to $75 million in 1980. Management fully expects the company to grow in excess of 25% in 1981.

The most significant growth came from the Peripheral Equipment Group, which soared from $30 million in 1979 to $115 million in 1980. To support this growth, BASF Systems created a separate marketing group for hardware. BASF introduced a 40 MB drive in 1980 to complement its existing 6170 family of 8-inch fixed drives. In July, after six months of production experience, quantity discounts were offered in an attempt to capture the growing opportunities in the oem market. BASF has set up its Peripheral Products Div. in Billerica, Mass., to produce 5½-inch floppy drives. Their 8-inch fixed disk drives are manufactured in Los Gatos, Calif.

The media business will remain a steady base for BASF Systems, although its growth is not expected to keep pace with the hardware market. BASF Systems is investing $26 million over a three-year period to expand its magnetic media production facilities.

Several management changes have been implemented to help nurture the expected growth of BASF Systems. Dieter O. Heuer became president on Nov. 1, 1980, replacing Guenter J. Grochla, who was appointed chief operations officer for BASF Group in Japan. In addition, many middle management positions have been created to help insure controlled growth. With a new management team firmly in place, BASF Systems seems well positioned to enjoy the explosive growth expected in the oem rigid and flexible drive markets.

79 LEAR SIEGLER, INC.
Data Products Division
714 N. Brookhurst Street
Anaheim, CA 92803
(714) 774-1010

Despite softness in the terminal market during 1980, Lear Siegler managed to show a 15% gain (to $75 million) through its Data Products Division. One of the division's most striking accomplishments in 1980 was its improved productivity. Capital investments were channeled toward automated equipment and manufacturing efficiencies had improved by 50% by year-end. While sales increased by 15%, employment decreased by 17%.

The base product continues to be the ADM-3A Dumb Terminal, sold mainly to the dealer/distributor market with an installed base close to 150,000 units. The ADM-3A+, which was introduced in 1980, is an enhanced version with more bells and whistles. At COMDEX '80 in November, the ADM-5 Dumb Terminal with enhanced editing features was introduced for under $1,000. January 1981 saw the start of shipping for this conversational video display terminal (VDT). 1980.

Oem penetration continues to lag the dealer/distributor market, in part because Lear Siegler products have not been suited to oems. In 1980, the Data Products Division announced the ADM-32, a VDT with a detachable keyboard. The ADM-32 affords the oem an upgrade potential from the ADM-31.

Lear Siegler markets its terminals and printers through 25 major peripheral distributors. Many of these distributors have several outlets. In early 1981, Hamilton Avnet, with its 42 U.S. and Canadian outlets, signed on as an industrial distributor. European markets are handled through a wholly owned subsidiary near London, which, like its domestic counterpart, operates through various distributors.

Lear Siegler has a field service group of approximately 100 that provides on-site maintenance. During 1980, service was expanded by providing walk-in depot service for VDTs. Designated EXPRESS DEPOT, this new service enables users to bring in damaged terminals in 28 domestic cities. Service is either immediate or guaranteed within 48 hours, and is priced at $85 per year. This service is the result of an agreement between Lear Siegler and Dow Jones & Co. Initially, the depot centers will only service the ADM-3A and ADM-3A+ Dumb Terminals, although it is expected that the same service will soon be available for the company's other terminals and printers.

80 CONRAC CORPORATION
Three Landmark Square
Stamford, CT 06901
(203) 348-2100

Conrac is a $147 million diversified manufacturer that makes aerospace electronics, telecommunications equipment, dp devices, production machinery, and architectural products. The dp sector contributed 44% of sales and 34% of operating income in 1980. The telecommunications sector, which includes some dp equipment, accounted for 16% of revenues and 33% of operating income. Some dp revenues also come from the aerospace segment (23% of revenues and 5% of operating income). Dp revenues overall were $70 million, up 13% over 1979.

The main dp sector, information handling and control, did $65 million. Its line of ctt terminals, sold to the CAD/CAM, medical electronics, and process design oem markets, reached a record level in 1980. Conrac has captured a 70% share of the medical electronics display market and a 63% to 70% market share in ots for process control. It has a 35% share of the cad terminal market. The information handling and control group also makes intelligent terminals and computer management information systems displays for airplanes and airports. In May 1981, Conrac introduced a line of color and monochrome ctt monitors for computer graphics.

In the telecommunications sector, Conrac sells dp products through its Alston division, which supplies computer-based traffic engineering and maintenance systems to the Bell System and to many independent telephone companies (and has a 20% market share). Alston also manufactures standalone and portable traffic data terminals.

Dp revenues contributed by the aerospace segment come from its digital data acquisition systems installed on up to 20% of every aircraft type flown by the U.S. Air Force Structural Integrity Program.

81 INTERACTIVE DATA CORP.
486 Totten Pond Road
Waltham, MA 02154
(617) 890-1234

Interactive Data Corp. (IDC), a wholly owned subsidiary of Chase Manhattan Bank, is a dp services company specializing in on-line financial and economic databases. These services include econometric forecasting, financial modeling and simulation, portfolio management and informational inquiries. The Compustat and Value Line databases are among the major securities databases that can be accessed through IDC's timesharing network. IDC underwent significant organizational changes in 1980 as the consolidation of management and organizations of Chase Econometrics and IDC was completed. The new
The SLC-II is a microprocessor—that can speak. That's right. Its vocabulary runs well over 300 words. And what it can't say, it will spell for you. In English.

The SLC-II intercepts messages from your computer, and takes specific actions. Just hook up the SLC-II between your CPU and your terminal, with its standard RS-232 or 20mA serial loop interface, and you're set. With no software changes needed.

It automatically dials a pre-set telephone number and delivers any given message in an electronically synthesized voice. So if trouble comes up, the SLC-II can make the necessary phone calls to have it fixed. That's why it's so much better than just a simple monitor, which can only helplessly record events. The SLC-II can act on them.

It can call and tell you when credit is overdrawn, when security needs tightening, when danger crops up—even when to get up in the morning.

Find out today how little it costs to add a voice to your computer. Call or write for more information about the SLC-II from Digital Pathways today, at 1260 L'Avenda, Mountain View, CA 94043 Telephone (415) 969-7600 TWX: 910-379-5034. DIGITAL PATHWAYS

MEET THE SLC-II. IT TALKS TO SIMPLY EVERYBODY.

Sorry, credit for account #3217332 is overdrawn.

Help. Alert!
Fire in building 3!
Send assistance.

Wake up, sleepyhead,
it's now 7 a.m.!

Your computer is down . . .

CIRCLE 139 ON READER CARD
combined organization now consists of two primary business groups—the Business Analysis Group and the Network Services Group—comprising a total of 14 product and support divisions.

Dp revenues grew to approximately $69 million, with IDC's revenues up 30%. Chase Econometrics contributed approximately $13 million to the total and grew about 20% in 1980. Although six of IDC's 25 sales offices in 1980 were located overseas, international business represented less than 5% of revenues. However, IDC's first international sales office was established in London only four years ago. The Tokyo office was the only new international office opened in 1980.

About three-quarters of IDC's annual revenue is from timesharing charges; the balance is from subscriptions, consulting, and product sales.

Four major new products or services were introduced in 1980. They were: 1) the bank planning service, an integrated financial and economic planning service designed to address the diverse planning needs of commercial bankers; 2) modern portfolio service, an advanced analytical system enabling investors to estimate and control their investment risk and to evaluate the impact of past decisions on portfolio return; 3) the bond portfolio mangement service, which quantifies and analyzes the impact of economic and financial conditions on the return and risk in fixed-income securities; and 4) SHORTTERM, an on-line investment management system developed to assist portfolio managers with maintenance and accounting functions.

In order to handle the demands caused by higher volumes and system utilization, IDC continued to upgrade its computing capacity. Two Amdahl 470/V8 computers were installed during the year, replacing the Amdahl 470/V7 and IBM 370/168 computers that were on-line in 1979.

82 APPLICON INC.
32 Second Avenue
Burlington, MA 01803
(617) 272-7070

Inadvertently overlooked as a DATAMATION 100 last year, Applicon's 51% revenue increase to $68.5 million in 1980 clearly makes it one of the faster growing companies. Its operating margins improved slightly to 13.2%, which is quite an accomplishment considering that Applicon increased its R&D expenses 78%, to $8 million.

Applicon is among the leading suppliers of turnkey graphic systems. Its fully configured systems, priced on the average at over $3,000,000, use a dual processor architecture which encompasses DEC's PDP-11 operating its own 32-bit mini. Its peripherals include both raster scan and storage display graphic terminals, a variety of plotters and computer-based display equipment which links Applicon systems to each other as well as to mainframe computers. Applicon uses DEC's RXS-11M operating system in addition to its own two- and three-dimensional applications packages. Besides turnkey systems, Applicon manufactures an ink-jet color plotter (marketed through distributors) accounting for 5% of 1980 revenues.

In the United States and Western Europe, Applicon markets most systems through a direct sales force; in other countries it markets through distributors. Foreign sales increased dramatically to $17.1 million, up 137% from 1979, and this was accomplished with only a 45% increase in foreign employment. Service is handled by over 55 field locations.

Applicon's markets have traditionally been the electronics industry—over 60% of its revenues were generated from designing printed circuit boards and integrated circuits. New growth impetus may be derived from mechanical designs, which accounted for 30% of 1980 revenues.

At the end of 1980, Applicon moved its manufacturing organization into a new 120,000 sq. ft. leased facility in Billerica, MA. Its financial position going into 1981 is strong. Applicon's initial public offering last July raised more than $22 million, to which should be added a recently negotiated $20 million line of credit.

83 COMMERCE CLEARING HOUSE, INC.
4025 W. Peterson Avenue
Chicago, IL 60646
(312) 583-8500

Through its CCH Computax subsidiary, Commerce Clearing House (CCH) marked a 36% increase in dp revenues to $67.4 million. Computax provides computer processing services for professional income tax preparers, principally accountants and lawyers. This growth can be attributed to a record number of income tax returns, as well as to several acquisitions made during the year. Operating margins increased to 7.1% from 6.8% in 1979, despite digestion pains regarding the acquisitions.


To capitalize on turnkey minicomputer opportunities, CCH has formed a new subsidiary, CCH Computax Systems. This subsidiary combines the recently acquired R. J. Software Systems with PSCI, and transfers CT Technology from CT System Corporation. This new division represents an important opportunity for growth.

CCH is investing heavily in its computer processing services, as evidenced by its 76% increase in dp capital expenditure to $2 million. Management remains confident because the market for dp services in the accounting industry has barely been penetrated. Both legal and accounting customers continually seek to automate more tax preparation and planning applications.

84 QUOTRON SYSTEMS, INC.
5454 Beethoven Street
Los Angeles, CA 90066
(213) 827-4600

Continuing its lead in the booming financial information services market, Quotron Systems expanded revenue by 36% to $63.8 million, greatly exceeding its 20% projected growth. Corporate income, however, increased by only 27% because of higher tax rates since investment tax credits have been exhausted.

Quotron has now captured 50% to 60% of the financial information services market, accounting for 94% of its revenues. In 1980, Drexel, Burnham and Lambert became a customer and the lease base grew from 24,000 to 31,932 terminals. Applications were expanded to include a Dow Jones news retrieval service and a brokerage house distributed network system. These and other customer options generated $21 million in revenues. Customer access, through Quotron Systems, to standardized statistics on the stock, bond, commodity, and option markets generated $39 million in revenues. Factory production of a faster minicomputer, the Quotron 901, is scheduled to begin in December 1981. Additional sales of the Quotron 801 (developed for use in its own systems) to Dun and Bradstreet, the Chicago Board Option Exchange, and the Commodity Exchange Center in New York, generated $2 million (2.4 times 1979 revenue), while maintenance revenues remained fairly constant at about $1.7 million. Anticipating continued high demand, Quotron has increased capital expenditures by 70% to $19.4 million, R&D by 26% to $4.4 million, and employment by 23% to 785.

Quotron undertook a joint venture last year to establish Insurnet, Inc. with American Information Development, Inc., and the Continental Corporation. Insurnet will provide data processing, sales support, communication and information services to independent insurance agents. Quotron has invested $600,000, and will provide executive management services to Insurnet in return for 6,000 shares of convertible preferred stock which, when converted, will provide 50% ownership.

85 DYSAN CORPORATION
5440 Patrick Henry Drive
Santa Clara, CA 95050
(408) 988-3472

Dysan Corporation's 1980 sales were up 86% to $62.8 million. In 1978, revenues were $16.7 million.

Dysan manufactures magnetic media for both rigid and floppy disks. Although rigid disk media account for two-thirds of its revenues, both product lines grew at rapid rates
Nanodata's soft machine. It gets more out of your IBM/370 software than IBM hardware can.

Designers call it a "soft machine" - this open-ended array of microprogrammed components and specialized buses. Many call it the computer of the future.

Nanodata Computer Corporation is the leader in the design of emulating computers - the standard by which other companies in the industry are measured. With the QMX Mainframe, you can now take advantage of our decade of experience. The unique QMX frees you from the limitations of conventional mainframes.
in 1980. Dysan manufactures 14-inch, 8-inch and 5½-inch single plates and sells them primarily to oems who incorporate the media into other Winchester-type disk drives. The company manufactures single and double-sided, and single and double density, flexible media for both 5¼-inch and 8-inch floppy drives.

Dysan, a major supplier of disk media, sells to approximately 6,000 customers. Storage Technology (at 13% of revenues) and Memorex (at 10% of revenues) were its largest clients by far. Approximately 65% of revenues were generated by oems, the predominant buyer of rigid disk media, while 10% and 25% of revenues are generated by distributors and end users.

The company has been investing heavily in its own operations as well as in several joint ventures. In February 1979, Dysan funded the startup of Dastek Corporation, and currently has a 76% interest in this thin-film head manufacturer. R&D expenses grew 158% to $10.9 million in 1980 in part because of a $5.3 million expenditure in R&D for Dastek. However, the investment may pay off already in that Dastek started shipping initial production quantities of thin-film heads in September. Volume shipments are expected in 1981. With thin-film heads representing a new disk technology, Dastek could become a large company in its own right should its product prove superior to the competitors.

In April 1980, Dysan entered into a R&D agreement with Seagate Technology. Dysan funded a portion of the development costs of Seagate’s 5¼-inch Winchester-type rigid disk drive in exchange for manufacturing rights.

Dysan is obviously bullish about its prospects for the media business. It invested $25.3 million in capital expenditures in 1980, over double its 1979 levels. With the media business looking strong, and with good positions in two high growth areas within the disk business, it came as no surprise to see Dysan successfully raise approximately $15 million in early 1981 by going public.

86 CRAY RESEARCH, INC.
1440 Northland Drive
Mendota Heights, MN 55120
(612) 452-6650

Cray Research’s revenues and earnings have grown dramatically since the delivery of the first Cray-1 computer system in 1976. In 1980, revenues were up 42%, from $42.7 million to $60.7 million, and profits were up 39%, from $7.8 million to $10.9 million.

Cray has an extraordinarily high R&D rate directed toward Cray-2 and hardware and software development for the commercial exploitation of the Cray-1 and Cray-1S. Cray Labs was established in 1979 as a wholly owned subsidiary. A new engineering building has space for integrated circuit development, graphic design, system checkout, and other engineering activities.

Cray Research took several significant financial steps late in 1980. Most important was an issue of common stock during October, providing the company with over $36 million of new capital. In addition, in November 1980, the company declared a three-one stock split and began trading on the New York Stock Exchange.

Finally, the board of directors designated president John A. Rollwagen as chief executive officer of the company. Seymour R. Cray, who had been chief executive officer since the company was founded, will continue as chairman of the board and chairman of the security committee.

Cray’s marketing organization had significant 1980 growth both domestically and internationally. Three new U.S. sales offices were opened—in Chicago, Albuquerque, and Pittsburgh—enabling Cray to continue expansion of its customer base for present and future products. Additionally, a wholly owned subsidiary was established in France; Cray already has foreign subsidiaries in the United Kingdom, West Germany, and Japan.

87 TRIAD SYSTEMS CORPORATION
1252 Orleans Drive
Sunnynvale, CA 94088
(408) 734-9720

Triad System’s 1980 revenues reached $60.2 million, up 61% over 1979’s. Triad is a manufacturer of small business computer systems that are sold to specialty vertical markets. Its market strategy is to identify $50 to $150 million vertical markets, because these markets tend to be less competitive and offer more aggressive revenue and profit opportunities. Triad’s initial market, the automotive aftermarket, was affected by a mild winter, high interest rates and deferred automotive maintenance.

These factors contributed to Triad’s decline in dp operating margins to 15% from 18%. Yet despite these factors, it still experienced a record year in sales, opened up nearly 25 new sales offices, and increased its sales and service staff by more than 50% (to over 600). Triad also introduced new solutions to the auto-parts industry with the introduction of its Model 30 system. New applications included accounts payable and general ledger packages.

Triad continued to seek opportunities in other areas of the automotive aftermarket, particularly for warehouse distribution and for independent tire dealers. During 1980, Triad introduced the Model 80, a telecommunications-based turnkey system for medium-to-large warehouse distributors with multiple retail outlets. Triad plans to initiate a nationwide marketing effort in 1981, first focusing on automotive warehouse distribution. The company is also introducing turnkey systems to the retail hardware market.

Triad continues to spend a high percentage of its sales revenues (almost 7%) on product development. Last year R&D expenses increased 67% to $4.1 million. Capital expenditures are growing even faster (almost four-fold in 1980), largely for Triad’s new 50,000 sq. ft. facility adjacent to its current headquarters.

88 GENERAL DATACOMM INDUSTRIES
One Kennedy Avenue
Danbury, CT 06810
(203) 797-0711

General DataComm completed its 10th consecutive year of increased revenue with a 30% increase, to $57.3 million. General DataComm sells a very broad line of datacomm equipment (nearly 90 different modems and multiplexers) and two lines of diagnostic equipment. Markets range from large companies requiring communications networks to smaller companies requiring only a low-speed modem to transmit data to a central computer.

Development work is directed at both the low and high ends. At the low end, General DataComm recognizes an opportunity with low-cost modems and personal computers. At the high end, it is developing equipment to use data communications technology with fiber optic telephone lines.

The company sells modems ranging in speed from 300 bits per second (bps) to 9600 bps. Multiplexers, which accept multiple digital data signals for consolidation at one end and then separate them back into multiple signals at the other end, are sold in over 15 varieties. Network and diagnostic equipment is used to monitor data transmission sites from a central computer.

General DataComm has three distinct markets, each accounting for approximately one-third of revenues—domestic and user sales (which include end users, oems, specialized common carriers, international record carriers, and government agencies); domestic telephone and telegraph common carriers and railroads; and international businesses. Two customers, GTE and Bell Canada, accounted for almost 30% of 1980 revenues.

The company markets its equipment primarily through its own sales and service organizations, particularly in the U.S. Internationally, the company maintains eight overseas offices.

General DataComm set up a subsidiary in the United Kingdom in February 1980 and has successfully penetrated the British end-user data communications marketplace. In addition, the company has started manufacturing in its 20,000 sq. ft. facility.

General DataComm is significantly increasing its engineering and manufacturing facilities. During 1980, the new Florida Technology Center opened and the company also purchased a 200,000 sq. ft. manufacturing facility in Waterbury, Conn. The plant is expected to be on-stream sometime during 1981.
QMS Leads the way!

For In House Industrial Labeling and Barcoding Applications

The QMS Magnum 780F Labeling & Barcoding System
Stand-Alone Remote System or tie to the Host Computer

System Description
The Magnum 780F Microcomputer System provides an excellent means for printing low-cost, inhouse industrial labels, various type forms, barcodes and many other printing needs. The system utilizes the rugged, reliable Printronix Printer/Plotter and incorporates all of the powerful features of the QMS Magnum 3000 Controller. The Magnum 780F label development programs are designed to allow the user to create and print labels or forms for various applications.

System Configuration
The Magnum 780F can be used as a stand alone system or can be connected via communication lines to a larger central processor either local or remote.

As a stand alone system, the Magnum 780F can be used to create labels via the keyboard. The user can store the labels on disk for future access or can send them directly to the printer for immediate printing. A label format (stored on disk) and variable data, entered either via the keyboard or from data files, can be merged together to create continuous labels each containing variable information.

As a remote label processor, the system can receive data from a host computer via communication lines and merge that data with label formats previously stored on disk to create labels where they are needed. The host computer may be utilized for other functions while communications is in process.

The Magnum 780F provides the user with several programming languages including Databus*, Fortran and Basic. These enable the user to create custom programs not only to meet printing needs but also for data processing and accounting functions.

Consult your local member of the Printronix Distributor Group

QMS QUALITY MICRO SYSTEMS
P.O.Box 81250 / Mobile, Alabama 36689 / (205)343-2767

CIRCLE 141 ON READER CARD
Tailor Made
For V/3000 Interface

Tailored for use with the Hewlett Packard System 3000, the DIRECT VP 828 combines the capability of the HP 2645/A with the personality and features of the DIRECT VP 800/B.

<table>
<thead>
<tr>
<th>Feature</th>
<th>HP 2645/A</th>
<th>DIRECT VP 828</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Memory</td>
<td>2K</td>
<td>2K</td>
</tr>
<tr>
<td>Maximum Memory</td>
<td>8K</td>
<td>8K</td>
</tr>
<tr>
<td>Local Tape Storage</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Printer Port</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Fold-up Keyboard</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Self Test</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>Full Editing Capability</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>Protected Fields</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Transmit Only Fields</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data Entry Checking</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ANSI Compliant Mode</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>VT100 Compatibility</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ANSI Buffered Editing</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>PF Key Combinations</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Screen phosphor</td>
<td>Grey (P-4) or Green (P-31)</td>
<td>Grey (P-4)</td>
</tr>
<tr>
<td>Block Mode Transmission</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>132 Columns</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Screen Resolution</td>
<td>560x216</td>
<td>640x216</td>
</tr>
<tr>
<td>Character Size</td>
<td>7 x 9</td>
<td>7 x 9</td>
</tr>
<tr>
<td>Reverse Video</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>Blink</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Half-Intensity</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Underline</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Line Drawing Set</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Large Character Set</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Math Set</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Host Loadable Char Sets</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Max. Baud Rate</td>
<td>9,600</td>
<td>19,200</td>
</tr>
<tr>
<td>Split Input/Output</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Current Loop</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Multipoint Comm.</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
<tr>
<td>Synchronous Comm.</td>
<td>Opt†</td>
<td>Opt†</td>
</tr>
</tbody>
</table>

*Available at extra cost.

At Direct, we tailor make our terminals to fit the needs of the user.
1980 DATAPRO RESEARCH CORP. USER RATINGS OF PROPRIETARY SOFTWARE

Mean Average User Ratings

<table>
<thead>
<tr>
<th>Vendor and Package Name</th>
<th>Overall Satisfaction</th>
<th>Reliability</th>
<th>Efficiency</th>
<th>Ease of Installation</th>
<th>Ease of Use</th>
<th>Trouble Shooting</th>
<th>Documentation</th>
<th>User Education</th>
<th>Vendor's Technical Support</th>
<th>Vendor's Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLIED DATA RESEARCH</td>
<td>3.7 3.7 3.9 2.9 3.6 3.5 2.9 3.4 3</td>
<td>3.7 3.7 3.9 2.9 3.6 3.5 2.9 3.4 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATACOM/DB</td>
<td>3.0 3.3 2.0 2.5 2.8 2.8 2.8 3.3 3.0</td>
<td>2.9 3.4 2.4 2.3 2.5 3.0 2.8 2.7 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IBM Corp.</td>
<td>2.8 3.2 2.4 2.6 2.9 2.3 2.4 2.6 2.8</td>
<td>2.8 3.2 2.4 2.6 2.9 2.3 2.4 2.6 2.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Dictionary DOS/VS DL/1 IMS</td>
<td>3.4 3.1</td>
<td>3.1 2.9 3.1 3.0 2.8 3.2 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cullinane Corp.</td>
<td>2.7 3.0 2.7 2.3 2.3 2.0 2.7 2.7 3.0</td>
<td>2.7 3.0 2.7 2.3 2.3 2.0 2.7 2.7 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDQ IDMS</td>
<td>3.2 3.3 3.1 2.9 3.1 3.0 2.8 3.2 3.0</td>
<td>3.2 3.3 3.1 2.9 3.1 3.0 2.8 3.2 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software AG of N.A.</td>
<td>3.3 3.8 3.1 3.4 3.5 2.9 2.7 3.1 3.2</td>
<td>3.3 3.8 3.1 3.4 3.5 2.9 2.7 3.1 3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADABAS</td>
<td>3.1 3.5 3.1 3.2 3.2 2.9 2.8 3.0 3.0</td>
<td>3.1 3.5 3.1 3.2 3.2 2.9 2.8 3.0 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cincom Systems</td>
<td>3.1 3.5 3.1 3.2 3.2 2.9 2.8 3.0 3.0</td>
<td>3.1 3.5 3.1 3.2 3.2 2.9 2.8 3.0 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>3.1 3.5 2.8 2.8 3.1 2.7 2.9 2.6 3.2</td>
<td>3.1 3.5 2.8 2.8 3.1 2.7 2.9 2.6 3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intel Corp.</td>
<td>3.1 3.5 2.8 2.8 3.1 2.7 2.9 2.6 3.2</td>
<td>3.1 3.5 2.8 2.8 3.1 2.7 2.9 2.6 3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYSTEM 2000</td>
<td>3.1 3.5 2.8 2.8 3.1 2.7 2.9 2.6 3.2</td>
<td>3.1 3.5 2.8 2.8 3.1 2.7 2.9 2.6 3.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These ratings are an average of all responses for the product:
4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor.


ADR'S DATACOM/DB™ took on all comers and beat them in virtually every Datapro category

In addition to DATACOM/DB’s winning ways, ADR’s VOLLIE® achieved 3.8 in the important Overall Satisfaction category. LOOK® scored 3.5. The LIBRARIAN® 3.4, and ROSCOE® 3.4. ADR has led the field in Datapro awards for IBM 370/30xxx/4300 products for four consecutive years.

DATACOM/DB, a people efficient DBMS, simultaneously provides fast direct retrieval and update as well as efficient sequential processing against the same data base. Under DATACOM/DB, responsive online systems need not compromise the performance of high-volume batch applications. This unique package also provides the practical benefits of the relational model, a concept other software companies are only beginning to investigate.

DATACOM/DB is one of a family of products that includes DATADICIONARY, an expandable data dictionary and directory, DATACOM/DC™, an efficient, flexible TP monitor, DATAQUERY™ for data base retrieval, DATAENTRY for online data entry, DATASECURE™ for safeguarding data, and DATAREPORTER™, a natural language report writer.

DATACOM/DB is part of ADR’s integrated network of systems software products that solves today’s problems and builds a solid foundation for tomorrow. Contact your local ADR office or send in the coupon to learn more about ADR’s DATACOM Relational DBMS.

APPLIED DATA RESEARCH

Route 206 E. Orchard Rd., CRN-8
Princeton, NJ 08540 (201) 874-9100
I am interested in:
□ Management presentation on ADR’s Relational DBMS.
□ Call from salesperson.
□ DATACOM product literature.
Name/Title
Company
Address
City/State/Zip
Telephone
Computer

CIRCLE 143 ON READER CARD
ANACOMP, INC.
11550 North Meridian Street
Suite 600
Carmel, IN 46032
(317) 844-9666

Anacomp, a computer service company specializing in software development, on-line services, facility management, micrographics, and minicomputer and microcomputer systems, continued growing as its revenues rose 70% to $86.9 million and employment doubled.

Computer services revenues represent nearly two-thirds of the company’s business as dp-related revenues increased by approximately 60% to $57 million. Most of the company’s dp services are in the financial industry, and services for banks and credit unions represented 62% of total dp revenues in 1980, up from 48% in 1979. About one-quarter of Anacomp’s dp revenues came from services to government agencies. Less than 10% of its annual dp revenues came from non-U.S. clients.

Anacomp’s proprietary customers integrated reference file (CIRF) software system continues to be its major dp service. In 1980, development began on a software system for financial institutions called continuous integrated system (CIS). CIS is being designed to enable banks to process information on-line on a 24-hour basis.

In facilities management, Anacomp was awarded a three-year contract with a two-year renewal option by the Indiana Department of Revenue. The potential value of this award over five years is $14.6 million.

Anacomp’s growth in recent years has mainly been accomplished through acquisitions. In 1980, five acquisitions were completed: one in computer services, and the other four in the micrographics business. Not surprisingly, there has been a considerable financial affect on the company resulting from its acquisition policies. Acquired companies have been financed mostly with debt and stock. A convertible subordinated debenture offering in September 1980 raised $30 million and greatly increased the company’s financial leverage. Operating income margins from Anacomp’s dp activities declined in 1980 to about 9%, from 10% in 1979. Dp operating income in 1980 fell to approximately 54% of total operating income vs. 73% the previous year.

INTERGRAPH CORPORATION
One Madison Industrial Park
Huntsville, AL 35807
(205) 772-3411

Intergraph Corporation, formerly known as Micrographics, is another rapidly growing turnkey graphics vendor. Its business is split between AEC applications (architectural, engineering, and construction—51%), and MES (mapping and earth science—49%). AEC applications include architectural layout and design, plant design, and finite element modeling. MES applications include cartographics, inventory and thematic mapping, and, for the petroleum industry, civil engineering and processing.

Intergraph’s growth exceeded the estimated 70% industry average by scoring a 91% gain to $56.4 million. Operating margins remained flat at 15.4%, which is remarkable considering its 10% increase in R&D to $6.2 million. Investments in product development are expected to increase with concentration in systems software (both graphics manipulation and database management), specialized application software, design and manufacturing of graphic display terminals, and other specialized hardware devices that improve system performance. We would expect Intergraph to continue buying processors, plotters, and disk and tape drives.

Intergraph markets its products through a direct sales force in the United States and through wholly-owned subsidiaries in Europe and Brazil. During 1980, it opened up subsidiaries in Holland, the United Kingdom, and in early 1981, in France. Customer support, which includes pre-installation guidance, training, preventive maintenance, and repair services, is handled by 170 specialists located in over 50 field offices.

Capital expenditures increased over fourfold to $8.3 million. To help finance expansions, Intergraph filed to go public in early 1981, which could net the corporation close to $25 million. With a backlog of $35.5 million at yearend 1980 compared to $19 million in 1979, prospects for a record 1981 appear strong.

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

Best known for its family of digital PBXs and telephone sets and its recent forays into office automation, Rolm is also a major participant in the military computer market. In 1980, military computers, made by the mil-spec computer systems division, contributed $6.2 million, investments in product development and the manufacture of graphic display terminals, and other specialized hardware devices that improve system performance. We would expect Intergraph to continue buying processes, plotters, and disk and tape drives.

Intergraph markets its products through a direct sales force in the United States and through wholly-owned subsidiaries in Europe and Brazil. During 1980, it opened up subsidiaries in Holland, the United Kingdom, and in early 1981, in France. Customer support, which includes pre-installation guidance, training, preventive maintenance, and repair services, is handled by 170 specialists located in over 50 field offices.

Capital expenditures increased over fourfold to $8.3 million. To help finance expansions, Intergraph filed to go public in early 1981, which could net the corporation close to $25 million. With a backlog of $35.5 million at yearend 1980 compared to $19 million in 1979, prospects for a record 1981 appear strong.

90 MSI DATA CORPORATION
340 Fischer Avenue
Costa Mesa, CA 92626
(714) 549-6000

MSI Data has continued to expand the market for portable data entry terminals by introducing programmable portable terminals called the Omega Generation. Although the first programmable terminal was introduced in 1979, many new models were introduced during 1980. MSI’s traditional markets have been in the food, drug, and hardware retail/distribution sectors. Unfortunately, these markets have limited growth opportunities and are subject to sharp downturns during recessions. With programmable portable terminals that offer communications capabilities, MSI has been able to develop several software applications that expand its markets to manufacturing and field service. The retail and wholesale industries still accounted for 96% of MSI’s revenues in 1980 (down from 99% in 1979), but with MSI’s 1980 product introduction, we suspect that its dependence upon these industries will decrease. Typical new manufacturing applications include inventory control, quality assurance, material control, and industrial engineering.

MSI distributes its product to end users through its own direct sales force both domestically and in Europe. Distributors are used in other countries. An important and very profitable part of MSI’s business is field service, which accounted for 24% of 1980 revenues. MSI has 250 service personnel operating out of 19 domestic MSI field service centers in the U.S. and Canada, and nine service centers in Europe. Marketing and service employment was the fastest area of growth, up 20%.

91 MSI’S revenues reached $53.2 million in 1980, up 17%; after-tax margins remained at about 6.3%; R&D expenditure remained flat, but still represented a fairly healthy 4.4% of sales. European market penetration is evidenced by a 79% revenue increase to $15 million.

MSI discontinued operations of Chase Computer (its P.O.S. subsidiary) after one year of operation because it had extensive capital
If you're in the dark about how to make your data entry system more efficient, TSI International has some eye-opening news for you.

About an on-line system called Key/Master.

Key/Master allows you to enter very clean data. Very fast. Because it reduces data entry to its simplest equation: entry at the source, directly into your system.

And because Key/Master is easy to use, non-technical people can design their own input formats interactively—in minutes. And enter data immediately, correcting errors on the spot.

Key/Master also offers powerful editing functions, like range testing, table lookups, running totals, field balancing and more.

And Key/Master runs under CICS, using your existing on-line terminals.

You can start using it the day you install it. And save money right from the start.

For more enlightening information about Key/Master, call (203) 853-2884 for the location of our office nearest you. Or clip your business card to this ad and send it to TSI International at the address below.

Hardworking software that's easy to use.
Nashua Corporation

Nashua Corp. followed 1979's 59% dp revenue increase with a 1980 increase of 24%, to $53 million. Growth in existing applications, gaining market momentum, was not an exception, with a revenue increase of only 6% to $53 million. Its new market and product expansions, however, make FDR a company to watch.

Management Science America (MSA) has licensed approximately 6500 software packages for use by a broad range of customers. Included are manufacturers, distributors, banks, insurance companies, health care institutions, educational institutions, government agencies, and others. The company's products are offered for use and supported on medium and large scale IBM computer systems as well as a number of other mainframes. MSA's product line consists of nine applications software packages directed to two functional areas of business—financial management and human resources.

In 1980, the company paid $1.7 million for the Q-Pac software package, an automated payroll calculation, disbursement, and reporting package designed for paying employees outside North America. MSA's international market is developing quickly—prior to 1979, international revenues were insignificant; but they grew to $5.4 million in 1979, and to $10.9 million in 1980. MSA's potential competition is keen both nationally and internationally. Many prospective customers choose to develop their own custom software. At the present time, MSA's primary competitors are independent software firms and major accounting firms. The accounting firms have the resources, capabilities, and customer relationships to be strong competitors. IBM has not yet chosen to be dominant in this market, but it probably could be.

Financial results in 1980 are indicative of the high growth rates which MSA has steadily achieved in the booming software industry. Revenues have almost quadrupled in the last four years, reaching $51.7 million in 1980, both through price increases and by licensing more software. Operating margins declined from 14% to 11.5% because fewer multiyear support agreements were executed, and these revenues declined to $1.6 million from 1979's $2.7 million. Software development expenses increased 50% to $12 million, and international marketing expenses were dramatically higher. Capital expenditures grew over sixfold to $5.7 million, in part for a new office in Maidenhead, U.K.
Xerox Computer Services announces more Xerox computer services.

Business is changing. And so are we. This year, we have more ways than ever to help solve your business problems.

Our software. Your hardware.

For the past ten years, Xerox Computer Services has provided on-line integrated computer services to hundreds of companies and public agencies. Our software has been one reason for our success.

Now for the first time, we're licensing this proven software with over 25 applications to run on in-house equipment. And we're also offering mini-computer turnkey systems and other software products.

Run your own network.

If your business operates in more places than one, even in Europe, we can help you be everyplace at the same time. Our network services give you the information you need from any of your locations in a moment's notice.

A common production problem.

We'll help make sure the right jobs are done in the right order. Instead of putting the cart before the horse. For years we've been helping manufacturers improve their material requirements planning, priority scheduling, production control, and inventory control.

No bikinis in Alaska.

When it comes to distribution, it's all in your delivery. Our systems can help you manage inventory and oversee multiple warehouses making various shipments from each. Without leaving anyone out in the cold.

For more information call or write

Ron Rich
c/o Xerox Computer Services,
5310 Beethoven St., Los Angeles 90066, (213) 306-4000. And you'll see how we can help you keep from manufacturing problems and distributing mistakes.

Xerox Computer Services

XEROX
Auto-trol is a manufacturer of computer graphic systems used primarily by architects and engineers, in architectural and engineering firms (20%) and in energy-related companies (another 20%). The business has grown rapidly, with 1980 revenues at $50.8 million; revenues grew 51%. Operating margins have declined to 13% from 17.8% in 1979, primarily because of a larger commitment to R&D (up 50% to $6.1 million) and increased marketing expenditures in international operations. International revenues grew 27% to $9.8 million in 1980, but it is hoped that the large marketing expenditures made in 1980 will be fruitful in 1981 and beyond. To guide this expansion, Auto-trol has established a new management team.

During 1980, Auto-trol made several key product announcements. In August, it announced that it was adding Digital Equipment's VAX 11/780 as the graphics processor for its AD380 automated design and drafting system.

To augment the system's capabilities, Auto-trol announced the GS-2000 software package that was developed by Manufacturing and Consulting Services. This product will emphasize both two- and three-dimensional mechanical design applications and should open up marketing opportunities in aerospace, automotive, and other manufacturing industries. Auto-trol hired 50 software and engineering professionals during the last six months of 1980 to expedite the implementation of this new system. It has also expanded its software capabilities in mapping and processing design.

During this transitional year for Auto-trol, several management changes were made. Most prominent was the appointment last August of Graham King as president, succeeding Don Smith who now serves as chairman. E. J. Zenke joined Auto-trol in November as executive of field operations.

98 PHILIPS INFORMATION SYSTEMS, INC.

MICOM CO.
4040 McEwen Avenue
Dallas, TX 75234
(214) 586-5580

In early 1981, Micom Data Systems, Inc., changed its corporate name to Philips Information Systems to associate itself more closely with its partner, Philips NV of The Netherlands. Steve Dorsey, president of Canada-based Micom Co., started the company on a shoestring in 1976 with a good product idea—a user friendly programmable word processor. Micom added a second model using dual floppy disks in 1978. Total sales were $1.7 million in 1977, about $14 million in 1978, about $50 million in 1979, and about $100 million in 1980. In early 1979, Dorsey agreed to a partnership with Philips to take advantage of their name, R&D emphasis, capital resources, and large distribution network. Dallas-based Philips Information Systems is the U.S. distributor for products designed and manufactured in Montreal. U.S. sales grew 100% to $50 million in 1980.

Micom may not remain on all existing equipment and will be used as a brand name in the U.S. for one year. Micom now uses a Philips CRT screen in their word processors. Employment in the U.S. has increased 40%, to about 500. Most senior management in the U.S. was changed at the direction of Micom Co. John Clark, formerly of Itel, has replaced Dick Grieve as president, and Darrel Baldwin is the new vice president of finance.

Although there have been no additions to the 14 American direct sales offices, 18 new distributors were added in 1980, bringing the total to 70.

In September of 1980, management lowered the Micom 2001-04 price 19% to $13,500. This followed the June 1980 announcement of IBM's standalone "Displaywriter" text processing system, which sells for under $1,000 per workstation. Introduction in December of the less expensive standalone Wangwriter may spur further price cuts, although Micom addresses a more sophisticated market. Micom offers discounts of up to 23% for machines in quantities of 16 to 25. At that level, the $200 electronic mail feature. The plug-compatible asynchronous option, which allows 2-way CPU communication at $1,300, is the most expensive communication option; the synchronous option allows only one-way communication and costs $700. Larger systems have also sold well. But a dozen systems with more than 100 workstations have been installed, and a New York bank recently ordered a system with about 200.

In summer 1980, Micom introduced Execupak, an executive workstation, with a "activities tickler" feature that provides an up-to-the-minute list of telephone calls and letters received, appointments and meetings scheduled, and prioritized tasks. Execupak prices were not reduced along with those of comparable word processors. About a hundred have been sold as add-ons for $19,095.

99 PRINTRONIX, INC.

17421 Derian Avenue
Irvine, CA 92714
(714) 549-8272

Printronix continues to grow: 1980 revenues of $48.9 million were 49% higher than '79, and earnings of $4.2 million were up 39%. Dp operating margins decreased slightly to 16.6%. International sales were particularly strong, increasing 93% to $12.8 million. To support this growth, a wholly-owned subsidiary is being established in the Netherlands for support of the European market.

Printronix participates in the medium-speed line printer market, which, according to industry estimates, is growing at 20% to 25% annually. Printronix's three matrix printers compete with similar speed band printers, but offer graphics capabilities.

Oem sales account for 53% of revenues, with Management Assistance, Prime Computer, Microdata, and Digital Equipment as the four largest customers. The other marketing channel is distributors, who sell to small oems and end users. Because of economic uncertainties, particularly as to small end users, orders from distributors are concentrated near term, reducing backlog to $14 million from over $17 million in June 1980.

Capital expenditures increased by 10% to $28 million. Spending has primarily been directed toward manufacturing process and tooling equipment, but money has also been spent on a 40,000 sq. ft. hammerbank production facility, which came on-stream in April. R&D expenses, up 19% to $1 million, should increase again in 1981.

100 VERBATIM CORPORATION

323 Soquel Way
Sunnyvale, CA 94086
(408) 245-4400

The year 1980 was a period of retrenchment for Verbatim. Although revenues improved by 7.6% to $48.4 million, order weakness in both the U.S. and Europe, lingering effects of defective raw materials, and the discontinuance of their rigid disk program resulted in a loss in excess of $700,000.

Verbatim discontinued its rigid disk program because its original supply-constrained market forecast became questionable after the Xerox Magnetics subsidiary announced plans to be a net seller, and existing companies invested heavily in expanding plant. The aborted project cost Verbatim $2.2 million.

Operations in 1980 were also affected by a depressed sales level in floppy disks, not only because of the recession, but also because current customers are taking long lead times in evaluating products. Verbatim has experienced a higher than expected level of product returns, resulting in an additional $1.5 million write-off in 1980. Part of the write-off, however, will finally clean up Verbatim's balance sheet. Verbatim is trying to regain lost market share with the introduction of a higher quality floppy disk line, Datライフ. The floppy media market continues to grow in excess of 30% per year.

In other news, Verbatim has named Malcolm Northrup president and ceo, replacing Peter McCuen. Northrup had been an executive in the electronic devices division of Rockwell, and brings with him his operations experience and senior background in peripherals and microelectronics. With 1980 behind them, and new management in place, Verbatim is looking forward to a sharp rebound.

This report was prepared for DATAMATION by the staff of the Gartner Group, Greenwich, Conn., under the supervision of Peter Wright and Kay Anderson.
After all, isn’t this one available right off the shelf like all the others?
And like the others, isn’t this one of the Funnel Series?
And after 6 years, it is the one that’s the industry standard for Winchester save and restore isn’t it?
And just like the others, it loads 17.5 MBytes in less than 4 minutes doesn’t it?
Doesn’t it also have a 4-track serial recording format which conforms to the proposed ANSI Standard?
And to Onyx Systems, Incorporated, who has already purchased over 3,500 of them, it’s just another one too.
So why make a ceremony about presenting this one to Doug Broyles?
Because this is the 35,000th one and no one else has ever done that before.

After you’ve made 34,999 high density cartridge tape drives why celebrate one more?

DATA ELECTRONICS INC.
10150 SURRENTO VALLEY ROAD, SAN DIEGO, CALIFORNIA 92121 (714) 452-7840 TELEX 69-7118

DEI is a registered trademark of Data Electronics, Inc.
CIRCLE 150 ON READER CARD
The world's greatest strides in microsystems are in the Valley of the Sun.

Once again, Motorola is making history. The leader in Semiconductor technology is developing new microsystems at a record pace. The opportunities have never been greater.

And Motorola Country never looked more inviting. With 300 days of sunshine each year, a casual approach to living and a lower cost of living than where you may be now, Motorola's Phoenix could be the perfect site for your next career move.

Find out about the bold new progress of the Motorola team — with innovative hardware and software designs at the "building block" and development systems level of microsystems.

Motorola is leading. Again and again and again.

- Manager, Development Systems Marketing
- Manager of Product Market Planning
- Manager, Hardware Engineering
- Manager, Software Engineering
- Hardware Section Leader
- Software Section Leader
- Applications Systems Engineer
- Product Marketing Engineer
- Software Engineers
- Hardware Engineers
- Product Engineer
- Programmers/Analysts
- Technical Writer
- Printed Circuit Board Designer

Call Ed Larsen, collect at 602-994-6821. Or send resume in confidence to Motorola, Inc., MOS Integrated Circuits Division, P.O. Box 20903, Phoenix, AZ 85036, Department M25.
OUR SOLID GOLD REPUTATION SPEAKS FOR ITSELF.

COMPUTREND
THE SOURCE FOR DATA TERMINALS.
The Definitive Source for Computer Graphics Professionals

If you're involved in CAD/CAM, business or scientific computer graphics, SIGGRAPH/81, the Eighth Annual Conference on Computer Graphics and Interactive Techniques, is the place to be! For years, the conference has been recognized as the leader in providing a sharply-focused perspective on the most advanced hardware, software, theory, applications and capabilities of this challenging aspect of computer technology.

You'll see it first at SIGGRAPH/81

SIGGRAPH/81 features an intensive program of education and exposure targeted to your professional needs:

- The largest exhibition of new state-of-the-art graphics hardware, software and services, featuring over 100 vendors.
- An extensive, 18-course training program — from introductory tutorials to advanced seminars.
- Presentation of 34 technical papers in eight timely topic areas and three technical panel sessions.
- A singular opportunity to make contact with other users, knowledgeable vendor representatives and leading graphics experts.
- A vendor forum for presenting the latest products and applications for business, industry and education.
- Plus, the chance to discuss, compare and evaluate a wide range of computer graphics systems.

If you only attend one conference this year, make it SIGGRAPH/81. It's the definitive source for information, ideas, inspiration and input on effective computer graphics. Plan to join us in Dallas, August 3-7, 1981.

For conference registration information call or write:

SIGGRAPH/81
Conference Office
One Illinois Center
111 East Wacker Drive
Chicago, Illinois 60601 U.S.A.
312/644-6610

Computer graphic by M. Thompson, M. Schecter
QMS Provides
LETTER QUALITY PRINTING CAPABILITY ON IBM SYSTEM 34 & 38

INTERFACE SPECIFICATIONS:
Interface:
Interfaces to System 34 and 38 via twinaxial cable hookup emulating an IBM 5256 printer.
Self Test:
Multiple built-in self test capability.
Cable Thru:
Cable thru feature is standard: Up to 6 devices may be daisy chained together on a single twinax port.

PACKAGING:
Interface is contained in a spare circuit card slot inside the printer. The twinax connectors, self test switches, address switches, cable thru/terminate switch and indicator LED's are all contained on a bracket mounted on the rear of the printer. There are no external boxes required.

PRINT FEATURES:
Supports printer features via simple easy to program sequences using printable characters. Print features include:
- Variable line spacing
- Variable column spacing
- Bidirectional paper feed
- ASCII Character set: 128 characters

Printer Description:
The Xerox Model 1730 is a reliable, high-quality full-character serial printer which provides application flexibility and superior print quality at a low cost. Innovative design features allow the 1730 user to interchange plastic and metalized print wheels on the same printer, a technological breakthrough providing greatly increased versatility in word processing and multiple forms handling applications. In addition, the 1730 mechanism has been designed to contain even fewer moving parts and adjustments than its HyType II predecessors, further enhancing the reliability and maintainability of the printer. Electronics consist of plug-in printed circuit boards, providing ease of fault isolation.

Print Wheel Interchangeability
The Xerox Model 1730 is the first serial daisy wheel printer to offer complete interchangeability between metal and plastic print wheels. Now users can freely interchange between all Diablo/Xerox print wheels, thus having the flexibility to select the appropriate plastic or metal print wheel for the application. And the sophisticated and discerning user does not sacrifice print quality to obtain this versatility. Every aspect of the Xerox 1730 design has been focused on maintaining outstanding print quality.

Contact QMS at 205/343-2767

QMS QUALITY MICRO SYSTEMS
P.O. Box 81250 / Mobile, Alabama 36689 / (205)343-2767

CIRCLE 154 ON READER CARD
Business opportunities and money are more abundant than ever, but putting them together is a challenge.

FUNDING THE COMPUTER INDUSTRY

by Hesh Wiener

Money: the computer industry makes a lot of it. But it's not enough. Demand for computer equipment, software, and computer-related services is growing by leaps and bounds. This is not just good; it may be too good. In order to keep on growing, industry companies can't depend on profits alone. They have to raise outside capital. In aggregate, this total amount may approximate the growth of the industry—some 15% to 30% of its annual revenues—depending on who is analyzing the figures.

Any industry supplier that can't deliver goods on time, relative to its competitors, is going to lose out, so everyone is looking for ways to increase production. This takes money. Things wouldn't be so much of a problem if funds were plentiful and the cost of obtaining money were low; however, money's tight, interest is high, buyers of stock want big returns, and banks are renting the money they lend out at rates that are usurious by historical standards. In other words, it ain't gonna be easy.

As unnerving as things might get in the computer business, high technology is likely to have less to worry about than low technology. The computer industry, in contrast to, say, the steel business, isn't saddled with technologically obsolete plants that once cost millions to build. Because computer companies are on the way up, the size of their investments in old and relatively useless equipment is small compared to their total sales. Also, computer manufacturing, until recently, has not required as much capital equipment to make a dollar's worth of product as, say, chemical production, although there are signs that this is changing as automated assembly and test equipment replaces hired help with soldering guns and oscilloscopes.

Taking pressure off corporate treasurers is the large proportion of value added that comes from thinking. The computer business, particularly software companies and service organizations, uses a lot more brains than banknotes.

Yet only a certain amount of pressure can be relieved. These days, computer industry organizations have to compete for money the way they compete for entry into new applications. For some companies, this may mean settling for slower growth as dreams of great empires turn to nightmares of inadequate cash flow. For others, a well-organized fiscal strategy may provide a real advantage over competitors.

There are no rules in financing companies; at best, there are some widely accepted generalizations. In the final analysis, each corporate treasurer must make—and live with—choices that always involve some uncertainty. The present health of the industry attests to the fact that so far, at least, these choices have been wise ones.

Funds and Gains

Computer industry companies, like all other businesses, get some of the money they need to grow from their profits. But a combination of ambition and opportunity—in the face of generally good profits—has made earnings an inadequate source of capital. Order backlogs for goods and services, emerging new markets, and other temptations have encouraged the industry to grow in size and breadth. The pace of expansion demands that outside capital be added to that which the companies can generate from their profits.

This money comes to companies basically in two forms (although there are a number of variations on the theme): equity and debt. Equity means ownership in the form of shares of an industry participant. Debt is the money the company borrows.

A hybrid form of financing, the convertible debenture, is also used quite a bit in the computer industry. This is, in essence, debt that may be turned into stock at a later date. The conversion occurs if the indebted company's stock reaches some level specified in the terms of the debenture offering. For example, a debenture may pay 8% interest as long as it's debt, but may be turned into stock, at the demand of the issuer, when the stock reaches $100 a share. At that time, each $100 of the face value of the debenture is exchanged for one share of stock. Generally, the issuing company will wait until the stock is higher, say $115 a share, and then make the swap of debt for equity as if the shares were at the $100 level. This makes holders of the debenture happy—they have gotten "bargain" stock—and it also makes the corporate treasurer happy—the balance sheet will show lower debt and greater equity.

Funds, whether debt or equity, are obtained from private investors, from financial institutions, from the investing public, or from a combination of these sources. In general, when one source of capital is in good shape, they all are; conversely, if things are bad in the economy, they are likely to be bad all over. There are, however, differences among sources of capital in terms of what they will charge (or expect) for a given amount of money they put up on behalf of a computer industry participant.

Computer industry companies, depending on the nature of their businesses, may use capital in a variety of ways. For instance, manufacturers use a lot of money to build new plants, to put more and better manufacturing and test equipment in these plants, to increase inventories of parts, subassemblies and finished products, to provide field personnel with better service equipment, and to finance receivables owed by their customers. As more companies decide to go vertical—making, for example, custom circuits they feel will give their products more bang for the buck—they have to plow a lot of money into new facilities. This capital, used wisely, enables the manufacturers to build more computer equipment and to make that equipment more efficient and reliable. In short, the money is used for growth and progress.

Capital to Fund Leases

In the mainframe business, and in business systems, a lot of capital is also used to fund leases. End users of certain classes of equipment may prefer to rent their machinery. Once one major supplier offers to compete in the rental business—IBM, for example—other manufacturers may have to match the competition in financial as well as technical terms. This becomes very important when money is tight, because
users choose rental plans as a way to defer the expense of buying machines. Vendor financing (and third-party financing, too) also takes computers off the balance sheets of user companies and puts them into expenses. Treasurers often like to reduce a company's capital investment by this method.

But not all industry companies are manufacturers and not all manufacturers have to worry about rentals. Software houses use capital to fund product development, to increase marketing, and to carry receivables. This takes less capital per dollar of gross revenue than, for instance, semiconductor fabrication equipment. Thus, software companies are said to be less capital-intensive than manufacturing concerns. Also, minicomputer makers and oem suppliers generally sell their products outright. This means that they have to capitalize for production, not for the financing of customers' installations. Service bureaus have to buy machinery, but their main costs seem to be for communications—which is pay-as-you-go—and for people.

Thus there are significant differences across the industry. But there are also some things various companies have in common, if you are willing to grant some generalizations.

Ulric Weil, the computer industry financial analyst at stockbrokers Morgan Stanley & Co., believes there are some common threads, at least among different classes of industry suppliers.

"At this time, most of the mainframe companies, including IBM," says Weil, "have the kind of cash flow profile that would indicate that they will have to get outside capital. Whether it's debt or equity is another matter. But all the big companies will need some external long-term funding."

"If there's some generalization, it seems to be that in computer technology it

<table>
<thead>
<tr>
<th>OPERATING REV</th>
<th>O.R. GROWTH</th>
<th>CAPITAL EXPENDITURES PLANT &amp; EQUIP</th>
<th>C.E. &amp; P.E. GROWTH</th>
<th>NET INVESTMENT PLANT &amp; EQUIPMENT</th>
<th>CAPITAL TURNOVER</th>
<th>RENTAL REVENUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL</td>
<td>%</td>
<td>$MIL</td>
<td>$MIL</td>
<td>$MIL</td>
<td>$MIL</td>
<td>$MIL</td>
</tr>
<tr>
<td>HONEYWELL</td>
<td>75</td>
<td>2292</td>
<td>8.9</td>
<td>#15^</td>
<td>20.0</td>
<td>8.19</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>2495</td>
<td>18^</td>
<td>27^</td>
<td>50.0</td>
<td>8.75</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>2911</td>
<td>37^</td>
<td>37.0</td>
<td>398^</td>
<td>8.91</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>3549</td>
<td>42^</td>
<td>13.5</td>
<td>495^</td>
<td>8.51</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>4210</td>
<td>69^</td>
<td>64.3</td>
<td>676^</td>
<td>7.29</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>4925</td>
<td>17.0</td>
<td>88</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>CONTROL</td>
<td>75</td>
<td>1218</td>
<td>19</td>
<td>113</td>
<td>10.78</td>
<td>158</td>
</tr>
<tr>
<td>DATA</td>
<td>77</td>
<td>1331</td>
<td>25</td>
<td>118</td>
<td>11.18</td>
<td>167</td>
</tr>
<tr>
<td>BUSINESS</td>
<td>78</td>
<td>1493</td>
<td>30</td>
<td>126</td>
<td>11.85</td>
<td>194</td>
</tr>
<tr>
<td>ONLY</td>
<td>79</td>
<td>2249</td>
<td>(7.7)</td>
<td>176</td>
<td>12.78</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>2766</td>
<td>88</td>
<td>220</td>
<td>12.57</td>
<td>312</td>
</tr>
<tr>
<td>IBM</td>
<td>75</td>
<td>14436</td>
<td>659</td>
<td>2848</td>
<td>5.07</td>
<td>#8506</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>16304</td>
<td>682</td>
<td>3091</td>
<td>5.27</td>
<td>#8900</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>18133</td>
<td>920</td>
<td>3505</td>
<td>5.17</td>
<td>#9055</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>21076</td>
<td>1322</td>
<td>4224</td>
<td>4.99</td>
<td>9781</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>22863</td>
<td>1797</td>
<td>5266</td>
<td>4.34</td>
<td>10069</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>26513</td>
<td>2238</td>
<td>6534</td>
<td>3.95</td>
<td>10069</td>
</tr>
<tr>
<td>NCR</td>
<td>75</td>
<td>2021</td>
<td>96</td>
<td>389</td>
<td>5.20</td>
<td>#236</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>2136</td>
<td>71</td>
<td>377</td>
<td>5.67</td>
<td>#250</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>2311</td>
<td>87</td>
<td>379</td>
<td>6.10</td>
<td>#267</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>2611</td>
<td>91</td>
<td>379</td>
<td>6.89</td>
<td>#304</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>3002</td>
<td>125</td>
<td>432</td>
<td>6.95</td>
<td>327</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>3322</td>
<td>164</td>
<td>517</td>
<td>6.43</td>
<td>336</td>
</tr>
<tr>
<td>BURRoughs</td>
<td>75</td>
<td>1676</td>
<td>75</td>
<td>300</td>
<td>5.59</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>1971</td>
<td>64</td>
<td>322</td>
<td>5.81</td>
<td>386</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>2091</td>
<td>68</td>
<td>337</td>
<td>6.20</td>
<td>433</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>2422</td>
<td>110</td>
<td>386</td>
<td>6.27</td>
<td>479</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>2786</td>
<td>111</td>
<td>429</td>
<td>6.49</td>
<td>506</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>2857</td>
<td>163</td>
<td>517</td>
<td>5.53</td>
<td>497</td>
</tr>
<tr>
<td>Xerox</td>
<td>75</td>
<td>4140</td>
<td>208</td>
<td>1064</td>
<td>3.89</td>
<td>3401^</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>4515</td>
<td>141</td>
<td>1123</td>
<td>3.99</td>
<td>3592^</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>5190</td>
<td>168</td>
<td>1109</td>
<td>4.58</td>
<td>3821^</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>6018</td>
<td>206</td>
<td>1111</td>
<td>5.42</td>
<td>4131^</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>6996</td>
<td>300</td>
<td>1222</td>
<td>5.73</td>
<td>4606^</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>8197</td>
<td>335</td>
<td>1369</td>
<td>5.99</td>
<td>5152^</td>
</tr>
<tr>
<td>DEC (JUNE</td>
<td>75</td>
<td>534</td>
<td>46</td>
<td>124</td>
<td>4.31</td>
<td></td>
</tr>
<tr>
<td>Fiscal yr</td>
<td>76</td>
<td>736</td>
<td>55</td>
<td>154</td>
<td>4.78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>1059</td>
<td>143</td>
<td>265</td>
<td>4.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>1437</td>
<td>67</td>
<td>376</td>
<td>4.82</td>
<td></td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>1804</td>
<td>94</td>
<td>399</td>
<td>4.52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>2368</td>
<td>210</td>
<td>529</td>
<td>4.48</td>
<td></td>
</tr>
<tr>
<td>Prime</td>
<td>75</td>
<td>11</td>
<td>1</td>
<td>2118</td>
<td>3</td>
<td>3.67</td>
</tr>
<tr>
<td></td>
<td>76</td>
<td>23</td>
<td>2</td>
<td>202.4</td>
<td>5</td>
<td>4.60</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>50</td>
<td>7</td>
<td>35.0</td>
<td>11</td>
<td>4.55</td>
</tr>
<tr>
<td></td>
<td>78</td>
<td>94</td>
<td>9</td>
<td>94.2</td>
<td>18</td>
<td>5.22</td>
</tr>
<tr>
<td></td>
<td>79</td>
<td>153</td>
<td>18</td>
<td>101.8</td>
<td>32</td>
<td>4.78</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>268</td>
<td>36</td>
<td>62</td>
<td>4.33</td>
<td></td>
</tr>
</tbody>
</table>

Notes: ^ estimated 1 rental & services 2 information systems only

Source: Sanford J. Garrett

Paine Webber Mitchell Hutchins
pany's gross revenue was $28.2 billion.

The chart above depicts the gross revenues and related capital expenditures in other recent years, and, to a large degree, takes a dollar of assets to bring in a dollar of revenue."

IBM, for example, reported assets of $26.7 billion at the end of 1980. The company's gross revenue was $28.2 billion. Similarly close figures characterize IBM's situation in other recent years, and, to a large degree, describe the way the financial reports of other industry participants look.

Sanford J. Garrett, who advises clients of Paine Webber Mitchell Hutchins on investments in office equipment and computing, agrees with Weil, but adds, "There are a lot of real differences in the industry. A capitalization strategy that works for one company may not be best for another. There are significant differences, for instance, between capital uses for plant and for leasing within a single company."

Esther Dyson, an analyst at Oppenheimer & Co. draws distinctions between capital used by manufacturing and by service companies. She says, "The service sector just doesn't need capital the way the manufacturing group does. To some extent, the service sector can do without capital much more easily than the equipment makers. However, a number of software vendors are now going public. These companies will use the funds for several purposes, and one of the important uses of this new capital will be to fund the development of new or improved packages."

Long and Short of It

One key aspect of financing is its permanence. It's more convenient and less expensive for a company to borrow for the long haul than for the short. Typically, short-term debt is in the form of bonds or other similar instruments. The use of short-term money puts the borrower at the mercy of the bank's prime rate, a number that has proved unstable and unpleasant during most of the past two years. Long-term rates of interest have been lower and have moved less dramatically.

Long-term financing requires more forethought by a company. Some organizations, according to Ulric Weil, "eat into their credit lines up to a point and then go into the long-term market. They use the proceeds of a long-term issue, whether debt, convertible debenture, or equity, to repay the short-term debt that has built up."

Is this the right way to work? "It's really just a matter of financial management style, if you will," says Weil. "There is no recipe."

But the problems of getting capital are more than simply a matter of choices made within a computer industry organization. External conditions have a lot to do with a company's ability to raise debt or sell equity. At any time, interest rates are a reflection of current conditions in the money markets, and recent history reveals that short-term funds can change in cost from 13% to 20% in a matter of a few months. The stock markets can be volatile, too, as investors rush to snap up hot high technology shares one week or dump computer company equities the next. A lot depends on economic conditions, not just the state of a single computer company that is searching for money. The way to get the economic picture is, logically enough, to talk to an economist.

Data Resources, Inc. is an econometric research and forecasting organization in Lexington, Mass. Its founder and chief officer, Dr. Otto Eckstein, is an economist highly regarded by financial planners in the computer industry. Right now, Dr. Eckstein sees some difficulties for any company seeking capital, plus an opportunity to make the most out of current conditions by timely action.

"We at DRI forecast that capital will remain both costly and somewhat scarce," says Eckstein, "and that improvement in the inflation picture will be quite moderate. So we are urging our clients—whether they are in the computer business or any other business—to attempt to procure long-term financing rather than live day to day on bank loans and commercial paper."

High technology companies are hurt

<table>
<thead>
<tr>
<th>RENTAL REVENUE</th>
<th>CAPITAL EXPENDITURES</th>
<th>NET INVESTMENT</th>
<th>CAPITAL TURNOVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROWTH</td>
<td>RENTAL $ MIL</td>
<td>IN RENTAL $ MIL</td>
<td>RENTAL RENTAL</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.4</td>
<td>201*</td>
<td>506</td>
<td>0.91</td>
</tr>
<tr>
<td>14.6</td>
<td>241*</td>
<td>509</td>
<td>1.00</td>
</tr>
<tr>
<td>17.4</td>
<td>261*</td>
<td>495</td>
<td>1.21</td>
</tr>
<tr>
<td>0.4</td>
<td>276*</td>
<td>489</td>
<td>1.44</td>
</tr>
<tr>
<td>14.3</td>
<td>282*</td>
<td>469</td>
<td>1.50</td>
</tr>
</tbody>
</table>

*The chart above depicts the gross revenues and related capital expenditures for selected information industry manufacturers. While there are many differences among the selected companies, certain similarities are clear from the table. For one thing, capital turnover as it relates to plant and equipment investment is quite consistent. The pattern at Control Data is due to its high investment in office equipment and computing-related content, which is not nearly so capital-intensive as the company's manufacturing operations. Rentals are not a significant factor at minicomputer makers, so Digital and Prime have not been viewed from a rental standpoint. The others in the group seem to cluster rather closely in terms of capital turnover for rental, but there is more variance than for the manufacturing side of their businesses.
You can actually see the superior print quality when you use C. Itoh's new daisy wheel impact printers. Besides clear and crisp print characters, you also get the throughput performance you're looking for, at prices never before available to quantity buyers of Daisy Wheel printers.

C. Itoh's Starwriter offers you a print speed of 25 cps while the Starwriter II operates at 45 cps. Both machines incorporate the latest LSI technology and utilize an easy-to-change industry standard 96-character wheel. Starwriter printers are the perfect choice for multilingual and multi-discipline applications.

The two Starwriter models also feature self-test capabilities and a programmable VFU. You'll be able to print up to 163 columns on multiple copies and you can process paper widths to 381 mm (15"). Both models are equipped with front panel indicator lamps and switches.

You can put our printers to work the minute they're delivered. They're plug-compatible and meet either the industry standard parallel interface specifications or serial RS 232 C with voltage or current mode capacity.

So if you're looking for perfection in printing, let our Starwriters do the job. All printers are backed by C. Itoh's warranty and nationwide service organization. For more information, contact C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066; Tel. (213) 306-6700. Chicago Office: 240 E. Lake Street, Suite 301-A, Addison, IL 60101; Tel. (312) 941-1310. New York Office: 666 Third Ave., New York, NY 10017; Tel. (212) 682-0420. Dallas Office: 17060 Dallas Pkwy, No. 108, Dallas, TX 75248; Tel. (214) 596-2974. Represented in Canada by Canadian General Electric.
ONE GREAT SHOW DESERVES ANOTHER

Since the COMDEX show was first established two years ago, and particularly after the recent overwhelming success of COMDEX '80, many vendors and ISOs alike have been telling us that this unique conference and exposition once a year just isn’t enough.

Hello there, COMDEX/SPRING!

The big push is on to computerize America, boost productivity in every office and shop across the land. That’s why Independent Sales Organizations (ISOs) are springing up like dandelions after the rain. Vendors are accelerating their schedule of new product introductions, and their intense search for independent sales representation.

Thus, COMDEX/SPRING, in New York City, June 23-25, 1981. If you’re a computer industry marketer, whether vendor or ISO, you’ve got TWO opportunities each year to get together with the people who really count. You’ve got COMDEX/SPRING in New York in June, and you’ve got COMDEX ‘81 in Las Vegas in November. That’s a one-two marketing punch guaranteed to get the job done!

Who exhibits at the COMDEX shows?

Leading vendors of small computer and word processing systems, peripherals, software and media-supplies-services have been flocking to COMDEX since its inception in 1979. Write or call us immediately for detailed information on COMDEX/SPRING and, among other things, we’ll send you a list of more than 360 such companies which exhibited at COMDEX ‘80.

ISO, as defined in our dictionary.

ISO (ai-ess-oh) Independent Sales Organization. Acronym coined by The Interface Group in summer 1979 as convenient umbrella for all independent third-party sellers of small systems and related products and services. Such as: Dealers, distributors, systems houses, commercial OEMs, computer retailers, manufacturers’ reps., turnkey vendors, office machines/products dealers, software houses, etc. The acronym has gained widespread acceptance, following its introduction by COMDEX.

COMDEX/SPRING’81


For further information, write to COMDEX/SPRING ‘81, 160 Speen Street, Framingham, MA 01701.

Another Conference and Exposition from THE INTERFACE GROUP Producers of: INTERFACE, INTERFACE WEST, FEDERAL DP EXPO, COMDEX, COMDEX/SPRING, THE NATIONAL SMALL COMPUTER SHOW

REV. 3/25/81
It's likely that computer industry firms that plan to borrow in the long-term market will do so as early as they possibly can.

a lot less by this inflation," Eckstein adds, "because they are not highly capital-intensive [compared to older, low technology industries]."

But this difference may not make computer companies more attractive for investors because a lot of the proposed tax changes favor older industries over new ones.

Eckstein puts it this way: "Will 10-5-3 and related provisions [in the tax law that permit faster depreciation of capital assets] help computer sales more or less than they help, say, the modernization of steel mills? I think the answer is less. But the total infusion of money that will occur is a plus. It helps American factories versus those outside the country."

So computer companies will, it seems, have to compete head-to-head with other businesses for money. If they cannot raise funds for the long term, the short-term cost of capital, based on the prime rate, will make things difficult.

Data Resources believes that the prime rate will dip to about 13.5% during 1981 and then rise, perhaps to about 15% by the end of the year. In 1982, according to the DRI forecasts, rates will be a little higher. Things won't be as bad as they have been, according to Eckstein, because it is very likely that "politics will keep the Federal Reserve from raising the rate" to 20% or more.

It's likely that computer industry firms that plan to borrow in the long-term market will do so as early as they possibly can. Near the end of the year, interest in the short-term market will go up, and this has an effect on the cost and availability of long-term funds.

As Otto Eckstein puts it, "When interest starts to rise again, companies that have not gotten out their debt offerings are out of luck. They won't go bankrupt over the situation, but they certainly will have missed the boat."

TURNOVER OF CAPITAL There is a remarkable consistency in the way capital is used—and how effectively—among the computer manufacturers. There is also some consistency among the firms that use capital to pay for machines they will rent to customers.

Sanford J. Garrett, of Paine Webber Mitchell Hutchins, has done a detailed analysis of several leading vendors. The similarities among them are surprising, and attest to the similarity of their underlying business practices.

IBM is a good place to start.

During the past five years, Garrett points out, IBM has grown quite a bit. The average compound rate of growth between 1975 and 1980 was 12.67% as revenues went from $14.44 billion to $26.21 billion to $8.38 billion, an average compound growth rate of 14.86%.

This kind of investment may be what it takes to gain revenues and to face the future. Put another way, without lots of capital, IBM might not now enjoy its gross revenue, customer loyalty, and technological leadership. But the need for additional investment remains a key part of IBM's planning. In its 1980 annual report, IBM says its "requirement for significant capital investment is expected to continue for the next several years."

A dollar invested in factory production facilities by IBM means about $4 in revenues to IBM, based on 1980 figures. This is a drop, as IBM had been getting $5 or more in revenues for each dollar invested in plant and equipment through the latter half of the 1970s. That ratio of revenues to investment in plant—capital turnover—could well turn up again before long, says Garrett, although it is hard to predict just when the turnaround will occur.

The capital turnover rate has generally been dropping across the industry, according to Garrett's calculations, because the industry is "switching from handmade machines to assembly line production," particularly at the high end. It's not that there was no mass production until now, of course; it's just that a lot of things formerly done with labor are now being done by increasingly automated production facilities. Some of this is due to increased volume, some is due to the demands of newer and more complex technologies.

"There is increased standardization under way in the manufacturing at most office equipment and automation companies," Garrett asserts, "and the change is very important. It's part of a chain of events that began when the microcomputer became a component, along with the development of much improved integrated circuits of other types."

In addition to upheavals in the manufacture of information processing equipment, the past few years have been characterized by rapid and, to an extent, unpredictable swings from rental to purchase and back on all kinds of machines. IBM has been caught off guard, and so has the rest of the industry.

In 1978 alone, IBM invested $2.72 billion in its rental base. But the very next year, the company's rate of capital expenditures to support rentals rose 54.6% to $4.21 billion. It has gone up from there, too. Along the way, IBM, which had been buying its own stock on the market with cash from its once-swollen treasury, had to go out and borrow more than $2 billion via a bond issue.

Interestingly, a capital turnover in rental investments is not nearly as great as in plant and equipment. But at IBM, where the recent investments in rental base gear have reduced the turnover rate, each dollar's worth of equipment, on average, still produces $1.30 in rental revenue. This is much less than is produced by an equivalent investment in plant and equipment, but without funding its rental base, IBM could not have achieved its gross revenues. In short, IBM's financing terms have helped encourage users to acquire systems, particularly the 4300 line products with the two year rental plan.

Other companies get different rates of capital turnover, but as in manufacturing, the story is pretty much the same. It takes money to make computers, and in certain market segments—mainframes, peripherals, and small business systems—the manufacturers' rental plans are a vital part of the marketing process.

The minicomputer business is different: the products are small, the profit margins high, and the selling cycle much shorter. But the profit margins are much higher than in the mainframe business, so the financial figures are examined when it comes to raising capital, Digital and Prime both tend to sell equity, assuming market conditions are favorable.

DEC's situation is particularly interesting, because the company's stockholders are not investing in dividends but essentially for the appreciation of their shares.

All the other mini makers have similar situations, although their ability to raise money depends on their momentary financial condition as much as stock market climate. Mini-computer stocks, like minicomputer profits, are, in general, more volatile than those of the full-line companies. So if stock sales are out, the mini companies have to raise capital by borrowing.

BIG SMALL BUSINESS VENDORS The sellers of small business systems, such as Wang, have, on a smaller scale, some of the characteristics of full-line manufacturers. They have to support rental machines to a degree, and they also have to capitalize plant and equipment. They may also encounter significant research and development expenditures, since the shorter design cycle of small machines makes for a fast pace of technological competition.

In revenue growth, this market segment may be more prone to ups and downs than mainframes, the companies in this business may use more short-term debt, simply because planning is not as easy in a volatile environment. As short-term debt mounts up, management may wish to convert it to longer-term capitalization via straight debt, equity
Continental Power Systems presents a unique new design in uninterruptible power sources for all mini, small business and small/medium computers.

The PoweRotor™ UPS System keeps your computer on-line through common power problems such as momentary interruptions, erratic voltages and transient spikes. Yet the PoweRotor generator maintains absolutely constant output frequency essential to computer operation. During a utility outage, the system provides 10 to 30 seconds ride-through for orderly downsequencing or switching to back-up power.

- Installation is easy, with only small footprint area required.
- Lower installed cost than static inverter/battery systems.
- Superior ride-through over motor generator sets.
- Only UPS with 3 year warranty.

Get the complete story on the better UPS from Continental Power Systems, Inc., One Landmark Square, Stamford, CT 06901. 800-243-9145.

Continental Power Systems, Inc.
A member of The Continental Group, Inc.
An international packaging, forest products, insurance and energy company.

CIRCLE 1570 ON READER CARD
If computer industry companies don't get funds at the right time and at the right price, it can cause problems.

offerings, or the issuance of convertible debentures. This last route has been used recently by Wang.

This issuing of convertible debentures is a bit controversial, as it may be viewed as either debt or as equity. If it is seen as debt, the use of convertibles may make a company's balance sheet look weaker, while the same capitalization technique, taken as equity, looks very good.

The ratio of a company's debt to its aggregate capital is considered a measure of fiscal health in financial circles. In general—and with great caution that this is only a rough rule of thumb—a debt to total capitalization ratio of 30% to 35% is "not viewed with undue alarm," according to Ulric Weil. He adds that "beyond that, many questions may be asked. Each company's case must be examined on its own merits."

The implications of Weil's guideline is that companies like IBM, for instance, with little debt compared to equity capital, could borrow great amounts of money before anyone on Wall Street would question the company's financial philosophy. Other companies with similar ratios would be accorded similar treatment, barring unusual circumstances. By contrast, companies that have debt that is more than a third of equity are likely to have a hard time selling more debt, or, if they do not sell debt, they will not be likely to get the lowest interest rates possible.

While manufacturing businesses are relatively easy to view from a capital standpoint, those in the service and software sector are not. These organizations, because they are built on people, not machinery, need less capital per dollar of gross revenue. Looking into the books of a software house or service bureau cannot be done the way it is done in the manufacturing sectors of the computer industry.

This is not to say that software and service companies can't raise capital, but these companies have to be ready to answer different questions than manufacturers if they want to succeed.

It's easier to sell stock, says Esther Dyson, if there is a product-oriented market for a people-intensive company. Examples might be software packages that are uniform from installation to installation or service offerings that are defined with some clarity. The custom software business, particularly if it is not a large one, has a harder time telling its story, no matter how good, to investors.

Funds at Right Time

If computer industry companies don't get funds at the right time and at the right price, it can cause problems. Some organizations may use expensive short-term debt if they can't raise long-term funds; the interest on this debt can be several points higher, and that interest eats up profits.

The intent of each corporate treasurer is to see that his company has funds when they are needed. With high interest, however, having money on hand that cannot be put to use becomes a luxury. So a balance has to be struck. This is aided by a financial philosophy (e.g., a bird in the hand or a buck in the bank is worth two in the bush) and, to a degree, by planning and projections that work out.

During 1980, some economists had predicted that interest would drop in the spring (which it did) and rise again through the summer and into the fall (which it did, but later than some forecasters had predicted it would). Digital Equipment, anticipating a need for increased capital, determined that conditions in the financial markets would be optimal during the second quarter of the year. So on April 1, the company issued $400 million in convertible debentures that paid 8.75% interest and were to be turned into equity on a $72 per share basis. Had DEC waited a couple of months, chances are that the interest on the convertible issue would have been lower; other similar offerings were made by various companies at lower rates later in the spring and summer.

Today, the decision only appears to have been a bit premature in the light of what Ulric Weil called "20/20 hindsight, something with which we are all so gifted." In any event, DEC's stock rose considerably during the rest of 1980 and into 1981, and the company called in its debt, and replaced it with equity before a year had passed from the time of issue. This means that DEC paid out more interest than it might have, but not an amount that had any detrimental impact on the company's business.

Had DEC hesitated and found a higher interest rate prevailing in financial markets, its financing might have been even more costly. It is really a matter of a treasurer's choice, Weil emphasizes, which cannot be blamed on economists, political events, financial market conditions or anything else. Either the company makes choices that work out, or the company has to find a new financial captain.

Expectations about the forthcoming patterns in interest rates are bringing a lot of financing issues to market before the U.S. government goes out borrowing with both hands later in the year. The result of competition for capital and the timing of each company's foray into the canyons of Wall Street will be told in year-end balance sheets and future earnings reports.

Who will end up with the healthiest figures? Nobody knows in advance. But in each industry sector, somebody will. If the companies with the strong financial position can make the rest of their businesses click, they'll continue to enjoy the fruits of a burgeoning business. But if they don't, capital shortages will force them to make hard choices regarding the opportunities that will have to be sacrificed in the name of economy.

Mr. Wiener publishes Computer and Communications Buyer, and Mainstream newsletters and Technology News of America news service.
We’ve Always Offered More Graphics Solutions.

Now CalComp adds the full line of Talos digitizing tablets to what is already the most extensive line of computer graphics solutions available from any manufacturer. Talos gives you a wide choice of digitizers in sizes from 11” x 11” to 44” x 60”, with the option to back-light and rear-project images. And that’s the kind of selection you need for your varied applications, including pipeline layouts, printed circuit boards and data reduction. Plus, they can accommodate conductive materials for digitizing seismographic and well-head logs.

Our newest products, the 800 Series and the Wedge, both feature electromagnetic technology to allow you to digitize from conductive materials, and to give more precise data input and greater data stability.

The flexible 800 Series with MULTIBUS® module lets you use dual tablets, dual cursors, and multiple interfacing for greatly expanded system capabilities.

The Wedge, designed especially for applications using small systems, offers end users and OEMs an affordable yet highly dependable alternative to traditional CRT control devices. And to aid operation ease and efficiency, the Wedge offers a unique five-degree sloped surface.

The 600 Series, using electrostatic technology and incorporating the “active inch” principle, is also available in a wide range of sizes and surface options.

To further expand accuracy and high speed performance, we offer SMART software packages for the 600 and 800 Series. SMART provides local processing of digitized data to let you combine functions and calculations, and much more depending on your working requirements.

CalComp for all the alternatives in computer graphics.

CalComp offers full lines of drum, flatbed and beltedbed plotters; controllers; computer output microfilm (COM) units, and electrostatic plotter/printers. And, new from CalComp, the Graphic 7 display system.

Plus CalComp support. All CalComp products — including Talos digitizers — are backed by the largest professional team of sales, systems and service people in the industry — direct from CalComp. And our worldwide service organization means we can give you fast assistance wherever you’re located.

We have all the solutions to your graphics needs. Call today to see how we can find the right one for you.

CALCOMP
A Sanders Graphics Company

California Computer Products, Inc.
2411 West La Palma Avenue
Anaheim, California 92801
Telephone (714) 821-2011
TWX 910-591-1154

Graphic Sales Offices: Tempe, AZ: (602) 894-9408; Orange, CA: (714) 978-7111; Santa Clara, CA: (408) 227-0936; Englewood, CO: (303) 770-1950; Norwich, GA: (404) 448-4522; Schaumburg, IL: (312) 884-0300; Shawnee Mission, KS: (913) 362-0707; Metairie, LA: (504) 833-5155; Waltham, MA: (617) 899-0834; Southfield, MI: (313) 569-3233; Bloomington, MN: (612) 854-3448; St. Louis, MO: (314) 863-2711; Woodbridge, NJ: (201) 636-6209; Fairport, NY: (716) 223-3828; Cleveland, OH: (216) 362-7386; Dayton, OH: (513) 276-5247; Tulsa, OK: (918) 663-7382; Portland, OR: (503) 241-0974; Pittsburgh, PA: (412) 922-3430; Wayne, PA: (215) 688-3465; Dallas, TX: (214) 667-2326; Houston, TX: (713) 776-3276; McLean, VA: (703) 442-4494; Bellevue, WA: (206) 641-1925

CIRCLE 158 ON READER CARD
Announcing the HP 3000 Series 44.

Our newest, most powerful computer supports everything in the photograph, including the new HP 2680 Laser Printing System. And you can take delivery on the computer in just 12-16 weeks.
Small system price.

The new HP 3000 Series 44 extends our computer family's performance range dramatically. For a system price starting at just $115,000:

- It has the power to handle 4 megabytes of memory, 1.9 billion characters of on-line disc storage, up to 96 terminals, 4 line printers, 7 synchronous data-comm lines and 8 mag tapes.
- In five minutes, on-line users can access an IMAGE data base 1,560 times to enter or update orders. At the same time, the computer will respond to 51 inquiries into the data base, and generate formatted reports for all of them, with subtotals and totals. In the background, it can compile a 1200-line COBOL program 1.5 times. And read, sort and report a 9,000-record file twice. It will do all this while giving each on-line user a response in an average of 1.5 seconds!!

Six years of compatible software.

The Series 44 continues the HP 3000 tradition of compatibility. So it will run the software developed for earlier models. Or for smaller members of the current family.

And if you have a Series 30, 33 or III, you can get Series 44 performance and power by exchanging system processor units.

It also has all those other HP 3000 features—including IMAGE data base management and forms management—that make our computer family so easy to use and program. And we've given it an enhanced operating system, MPE IV, to manage the increased memory and discs even more efficiently than previous versions.

What's more, we made the Series 44 so reliable and supportable that you can get it with an extraordinary service guarantee.

Introducing Guaranteed Uptime Service.

- This is a new maintenance agreement covering the processor and two discs. It guarantees 99% uptime over any three-month period or our service on these critical components is free for the next month**
- For more information about the powerful Series 44 and its remarkable service guarantee, call your local HP sales office. Or write Hewlett-Packard, Attn: Bob Bond, Dept. 491, 11000 Wolfe Road, Cupertino, CA 95014.

*U.S. domestic price includes 1Mb System Processor Unit, 50Mb disc, 1600 bpi tape and CRT console.
**Series 44 and 4Mb memory, 3 120Mb disc drives, 1 1600bpi tape drive, 1 400LPM printer, 24 terminals.
***Initially available in the U.S. only.

CIRCLE 159 ON READER CARD
COMPATIBILITY
...that's the 910

You no longer have to pay high prices for conversational terminals. Now you can get TeleVideo's new 910 terminal at a low price.

- TeleVideo engineering provides you with switchable emulations of the ADDS 25/Viewpoint, Hazeltine 1410, Lea-Siegler ADM-3A, 5A. Four switchable character fonts and five independently-controlled video attributes.
- Microprocessor design offers OEM's the flexibility of code changes.
- You will get TeleVideo's high quality value and features.
- The 910 uses the same monitor, keyboard, and case as our popular 912/920. This means field-proven reliability.

TeleVideo
TeleVideo Systems, Inc.
1170 Morse Avenue
Sunnyvale, CA 94086
408/745-7760
800/538-8725 (outside CA)
TWX 910-338-7633

Nationwide field service is available from General Electric Co Instrumentation and Communication Equipment Service Centers.

The Value Leaders

Santa Ana, CA 714/557-0655; Sunnyvale, CA 408/745-7760; Dallas, TX 214/930-9378; Atlanta, GA 404/255-9388;
Bloomfield, IL 312/351-9850; Morris Plains, NJ 201/267-8805; London +44-950-6964

CIRCLE 160 ON READER CARD
The people in the art department had their radio turned up pretty loud the other day, and we noticed that they were listening to a song called “Computer Games.” Some of us grew up with tunes like Wilson Pickett’s “Mustang Sally,” and we got to wondering: are there kids today who care as much about mag tape as an earlier generation did about mag wheels?

You bet there are; visit a computer store and you’ll see them there. This being the case, it occurred to us that it might be interesting to see what some of these scions of Eniac had to say about computing. We decided to bring four of them to New York to discuss their field in the same roundtable format we use for other computer experts. It seemed reasonable to try to get a diverse group, but the diversity we ended up with was mostly geographic. This is not too surprising; science programs (and personal computers) remain most available to the middle and upper classes in this country, and boys still tend to take more science courses than girls.

Our panelists arrived in New York on a Monday afternoon. We dined with them at one of those high-altitude restaurants for which New York is noted, and stayed that night at a midtown hotel. Tuesday morning we crowded onto an E train—the high point of the trip for several of the panelists—and headed for the World Trade Center to see how computers are used in the commodities business.

Through the good offices of Joseph DiLiberto and Jim McLain of Macro International Group, we learned a bit about what commodities brokers do. Then we hurried over to 4 World Trade where Farhad Froozan, director of computer and technical services for the Commodities Exchange Center, gave us a tour of the exchanges and an introduction to the Quotron system he uses to manage the huge volume of trading there.

Ignoring pleas that we abandon our plans for a roundtable and proceed instead to the observation deck, DATAMATION staffers Deborah Sojka, Wendy Crisp, Bill Musgrave, and Ken Klee then escorted the experts to the 89th floor offices of Macro International for some conversation. Participating were:

- Jonathan Muskin
- John Pencsak
- Roger Shimada
- Corey Kosak
KOSAK: I don’t like working on computers fulltime. I like it as a part-time job.

Corey Kosak, 15, a tenth grader at San Marin High School in Marin County, California. Kosak has over three years’ experience in computing, and currently works with David Fox at the Marin Computer Center and with author Mitchell Waite.

Jonathan Muskin, 13, an eighth grader at Friends Academy in Locust Valley, Long Island. Muskin has over two years’ experience in computing, and has done some programming to facilitate bookkeeping in his father’s medical practice.

John Pencsak, 14, an eighth grader at Westwood Jr. High School in Dallas. Pencsak has over a year of experience in computing, and currently works at the Computerland store in Minneapolis.

Roger Shimada, 16, a tenth grader at Central High School in Minneapolis. Shimada has over six years’ experience in computing and works at the Computer Center at Dayton’s department store in Minneapolis.

How did you all get into computing?

Pencsak: I’ve always looked at magazines. I had a subscription to Popular Electronics and I’d look at the electronics ads. I used to be a calculator freak; I used to look at magazines. I’d like six or seven. I started out a long time ago with one from Radio Shack that cost $9.95, and I got some more for Christmas, one with an alarm on it. Then I got a little TI programmable, and I played with that for a while. Then a Computerland store opened right by where I live, and I went up there one day. They had a kids’ corner, and the kids would go there and play on the little Apple. So, every day after school I would go there. Finally, my Dad bought me an Apple. About a week after that I got a job at the store cleaning windows, and I started adding on to my Apple.

Shimada: I started about six years ago, with BASIC or an HP2000. Since then I’ve picked up FORTRAN, COBOL, and PASCAL. I learned COBOL doing Explorer’s Post at General Mills. They’ve got an HP3000 set up there. PASCAL and FORTRAN you pick up here and there when you can. You use the manuals.

Muskin: I started out in the sixth grade. I was interested in computers, and I started out with BASIC, [TRS-80] Level 1, 4K. I upgraded my system and read manuals. Now I think I’ve learned—mostly self-taught—a lot of languages. I know assembler for the 6502 and the z80, BASIC, FORTRAN, some PASCAL...

You did all this at home?

Muskin: Yes, I started out with a TRS-80 but I gave that to my father so I could get an Apple. And I do all the work he needs for his business—payrolls, appointment keeping, all that stuff. The whole thing is computerized.

Kosak: I began about three and a half years ago, on a Teletype at my school. We were hooked up to Lawrence Hall of Science, and I started out playing Star Trek. Then the school got a PET, and I learned to program in BASIC. My first job was working for a commodities broker. With another person I did programming to keep track of customer accounts. Then David Fox, who started the Marin Computer Center, was working on this program for six micros, called the Starship, a simulation of the bridge of the Enterprise. I helped out with that as a volunteer.

You all have easy access to computers. What do you use them for?

Shimada: Well, there’s a sort of a saying that if you’re a good programmer there are very few applications you can do, except just to amuse yourself.

Have you constructed any games?

Shimada: Oh yes. Right now I’ve got this 350-line BASIC program at home. . .

Pencsak: The first thing everyone does when they get a computer is to make a game. They start out making a high-low (number guessing) program.

Muskin: Yeah, that’s what I did.

Shimada: Games you can relate to.

Pencsak: I’m sure all of us can write pretty good games, but not as good as professionals, not good enough to sell.

A couple of you have worked with larger systems, haven’t you?

Muskin: I’ve been working for Digital Telephone. They make PBXs. They have a PDP-11, and I program in FORTRAN. I just pick up the odd jobs that the programmers don’t have time to do.

Shimada: I’ve worked with an HP 2000 and an HP 3000.

Pencsak: Did you do that over the phone?

Shimada: Of course. You know, you get pampered by CDC Cyber 73s and Burroughs 6700s, making the 2000 look like junk.

Would you rather timeshare or have your own Apple?

Shimada: Well, the Apple can be quicker.

Kosak: But 10MB hard disks are more fun than 5½ inch floppies.

Pencsak: Timesharing can bring you more languages.

Muskin: You can run up your phone bill, too.

Do you do any homework on your computer?
Now there's a software package that can turn a minicomputer into a small-scale data processing center with from 5 to 40 terminals. The UNIX™ System.

UNIX Systems are time-sharing operating systems that are easy to program and maintain. So easy, in fact, that more than 2,000 systems are already in use outside the Bell System.

UNIX Systems give fast and efficient data processing. They feature more than 100 user utilities.

**UNIX System, Seventh Edition, and UNIX/32V System.** The new UNIX System, Seventh Edition, offers greatly enhanced capabilities, including a larger file system and inter-machine communications. The Seventh Edition is designed for PDP-11™ minicomputers. For those needing its capabilities on a larger machine, the UNIX/32V System is available for the VAX-11/780™. The Seventh Edition's improved portability features allow users to adapt it more easily to other computers.

Both the UNIX System, Seventh Edition, and the UNIX/32V System can support up to 40 users with FORTRAN 77 and high-level "C" languages.

**Programmer's Workbench.** For large software design projects, the PWB/UNIX System (Programmer's Workbench) allows up to 48 programmers to simultaneously create and maintain software for many computer applications. The PWB/UNIX System features a unique, flexible set of tools, including a Source Code Control System and a remote job entry capability for the System/370.

Developed for our own use, UNIX Systems are available under license from Western Electric and come "as is". With no maintenance agreements, no technical support.

For more information about UNIX Systems or other Bell System software, complete the coupon and mail to Bell System Software, P.O. Box 25000, Greensboro, N.C. 27420. Or call 919-697-6530. Telex 5109251176.
MUSKIN: I want a good disk operating system, and a lot of passwords so my brother can't break in.

Kosak: I have an Atari at home right now, on loan from the Computer Center. And I like to write programs to try out some of its features, and see what special effects I can get. The Atari has a way you can get 256 colors on the screen at the same time. You can't do that normally. It looks like a rainbow.

Pencsak: I like to play around and modify programs, just to be funny. You all know Lemonade?

(Everyone but DATAMATION is familiar with the game.)

Pencsak: It's a game that comes with the computer. And it teaches you, or it tries to teach you I should say, how to run a small business.

Muskin: It's unrealistic though. You can't expand your business. You can't sell more than 100 glasses unless it's a hot day.

Pencsak: And it gives you hot days.

Muskin: Or rainy days. And when it's cloudy it always rains. It says 30% chance of rain, but it always rains.

Pencsak: Sometimes it doesn't.

Muskin: It always does.

How many of you have computers in your schools?

Muskin: Mine has a few, but you don't use them until the ninth grade. I think they have a TRS-80 and two PETS.

Shimada: We've got eight Apples at my school, two Teletypes, which we call tel-tanks, and a poor excuse for a Digilog. The students learn fast. A lot of them can out-program the teacher in no time.

Kosak: Our school has six PETS. Next year we're getting 15 Apples.

Are there required computer courses?

Muskin: At my school it's once or twice a week. Nothing major.

Pencsak: At my school it's sort of required. They take us out of our math class for three weeks and teach us about the Apple. I think they ought to take us out of history.

Muskin: Yeah, that's what I think.

Pencsak: They need to take history out and put computers in because history has no meaning. You never use history. Why would you want to use history? Do you use history in your job? No.

Kosak: Who cares if Davy Crockett discovered America?

Pencsak: They need to learn computers, because 70% of kids today will use computers when they grow up.

How many years should computers be studied?

Pencsak: A year or two.

Shimada: Enough to learn the basics.

Are computers as important as English?

Shimada: English grows increasingly redundant.

Muskin: And boring.

Shimada: You don't learn anything.

Muskin: Math is more important than English, I'd say.

How do the other students like the computer courses?

Shimada: Well, the course is optional. We have special funding, so...

Pencsak: I guess, with eight Apples.

Shimada: The Apple is a very good game player, and a lot of the kids are interested in games. So of course they decided to draw the line between use and abuse.

Pencsak: If anyone wants to buy an Apple, I have one for sale.

Kosak: You do?

Pencsak: I'm selling mine because I want to get one of the new ones that don't mess up the other TVs. When you turn on your Apple it messes up your parents' TV.

Do you think you have an advantage over other kids because you're learning about computers now?

Muskin: Maybe in the future. When we grow up we can make a career out of it.

How many of you want to make a career out of it?

Muskin: Me, probably.

Pencsak: I do.

Shimada: I want to be a computer science major.

Kosak: I don't know. I don't like working on computers full-time. I'd like it as a part-time job where I can work on it for while, then do something else.

Do you think that computers are a threat to privacy?

Shimada: Not yet. Not with the quality nowadays.

Pencsak: They're extremely dumb.
The new look in low-cost data entry.

It's the brand new HP 2622 block mode terminal from Hewlett-Packard.

With its high-resolution character cells, forms firmware and full display enhancements, the 2622 gives a dazzling screen performance for jobs like data entry and retrieval.

But what makes this terminal look even better is its price—just $2075.

Drawing the most from your system.

The HP 2622 display station goes beyond the standard low-cost block mode features. With its format mode and optional line drawing sets, you can design forms just like the ones your people are used to working with. And there are two full pages of scrolling memory to help make everything picture clear.

But the HP 2622 is more than just a flashy screen personality. It has a typewriter-style keyboard with separate numeric keypad for quick and easy data entry; eight user-definable soft keys; self-diagnostics for high reliability; even an optional built-in thermal printer for hard copy at the touch of a key.

See how good your system can look with the HP 2622. For an eye-opening demonstration, call your local HP sales office listed in the White Pages. Or return the coupon to Hewlett-Packard, Attn: Tom Anderson, Dept. 498, 974 East Arques Avenue, Sunnyvale, CA 94086.

Yes! I'd like more information on the HP 2622 display terminal.
☐ Please send literature on HP's family of compatible data terminal products.

Name

Company

Address

City

State/Zip

Phone

Mail to: Hewlett-Packard, Attn: Tom Anderson, Dept. 498, 974 East Arques Ave., Sunnyvale, CA 94086.
PENCSAK: They need to take history out of the schools and put computers in instead, because history has no meaning.

Shimada: They’re very fast, dumb beasts.
Kosak: I heard a saying that people are smarter than computers, but computers are smarter than programmers.
Shimada: Programmers are smarter than computers, but computers think faster.
Muskin: If the machine’s programmed right, it won’t make any errors.
Shimada: It’s never the machine’s fault.
Muskin: Unless it’s a “Trash-80.”
Shimada: You know, the thing about the “Trash-80” is you should just get the base system from Radio Shack and leave everything else to other companies. Get your software, your disk drives, anything you can get your hands on, from somebody else.
Pencsak: What do you get if you drop an Apple off the World Trade Center?
Muskin: Applesauce.
Pencsak: No, Applesoft. I made that up myself.
Muskin: It figures.
What do you guys think of BASIC?
Muskin: Too slow. That’s why I learned two machine languages.
Pencsak: It’s neat, though. I like it.
Muskin: Well, it’s easy to do something that doesn’t require speed. But for some of the graphics programs I use, like the game Bloody Murder, where I’ve got to get these guys to throw knives at each other, I need machine language.
All you guys have experience on more than one kind of computer. How do you go about learning a new machine?
Kosak: Well, with this Atari I’m using now. I’m in an interesting position. David Fox, the guy at the Computer Center, went to this Atari seminar with about 10 other people, and they got all this inside information. They got the source code for the operating system. So I can do some really neat things, like that color change, that other people wouldn’t know how to do.
Muskin: I moved from a TRS-80 to an Apple. I was familiar with Microsoft BASIC, so I just got the Apple manual and read it that night. I skimmed the book for about an hour, basically to see what different commands they have.
Pencsak: You can read the Apple manual very quickly.
Shimada: Apple publishes the best documentation.
Do you guys read anything besides manuals? Somebody mentioned science fiction.
Muskin: All I ever read is manuals and computer magazines and that stuff.
Pencsak: I don’t even read manuals. I figure it out. Well, machine language manuals I read a little bit. But the main thing is going up to Computerland after school. I learned the basics that way.
If you guys could design your ideal systems, what would they include?
Kosak: Well, let’s see. It’s got to have powerful BASIC in it. It’s got to have what Atari has, many colors. Sixteen colors is suitable, with 16 luminescence values. Graphics is a necessity. It’s got to have a disk drive that works, and a reliable disk system. It’s got to have strong editing capabilities. And abilities for shape tables, to create shapes, then shrink them and rotate them. It’s got to be fast, and it’s got to have a good microprocessor, like a Z80. What else? It’s got to have real-time capabilities and lower case. I need a lot of memory—48K, I guess that’s good enough. A very good disk operating system, and a lot of passwords so my brother can’t break in. I definitely want sound. Two voices, so you can have two notes at once. Music and speech. And I should be able to input stuff through voice recognition.
What about the languages?
Muskin: It’s got to have built-in assembler and monitor. Plus it should speak other languages, like FORTRAN and PASCAL. It’s got to have a built-in compiler, too.
Shimada: Staying within moderate limits, what I’d like is a Z80 microprocessor, 64K static RAM. Load BASIC, anything you want from disk. Disk has to be dual density, not necessarily dual side.
Pencsak: Dual side is bad. I wouldn’t trust it.
Shimada: I wouldn’t trust it either. I want analog to digital, digital to analog. Two good joysticks, buttons, color graphics. That’s basically it, besides full character keyboards. Probably a third shift key so you can generate graphic symbols. User definable fonts. Maybe be even bank switching at the RAM, just for fun.
Muskin: You’re nuts.
Shimada: I could be worse. I could say I want on-the-chip multiplication and division. Oh, and I also want two good, letter-quality printers. For no apparent reason.
Kosak: I want a computer with at least 64K, but you can bank switch. I want a good operating system but a good source code so I can modify it. And the operating systems aren’t
Imagine what data communications will be like in the next few years.

Envision a comprehensive data communications network that provides the kind of flexibility, responsiveness, and cost-efficiency that you've always wanted... digitized voice and data sharing the same bandwidth... distributed work stations integrating both word and data processing... teleconferencing with digitized video images... intelligent switching systems that can store, convert, and route information.

At Racal-Milgo, we're developing a full product line today that will enable you to employ these capabilities tomorrow. And that's important. Because the success of your business will depend more and more on how you manage the precious resource of information. Integrated business communications is the key, and we're planning now to make it a reality.

If you would like to discuss your specific needs for the future, call or write Racal-Milgo, Inc., 8600 N.W. 41st Street, Miami, Florida 33166. (305) 592-8600.

Integrating business communications... your future and ours.

Racal-Milgo
SHIMADA: The students learn fast. A lot of them can out-program the teacher in no time.

residents, I can load a different one from disk or something. And then all the languages: FORTRAN, PASCAL, BASIC.

Pencsak: Let's see, I'm just going to wipe out y'all's systems, I think. I'll have a mainframe, and it'll have ten users...

Shimada: That's not micro.

Pencsak: Okay, I'll do a micro. I'd like 2MB of hard disk. I would like 128K. I would like an operating system that loads in, so like Corey said, you can modify it. I would like color graphics like H-P is using. I'd like 2,655 different shades of color. Seriously, I've seen a computer that'd do that. Two microprocessors. Oh, and a voice synthesizer, and speech recognition.

What's the neatest computer application you guys have come across?

Muskin: I like computer animation. There's a college around here, the New York Institute of Technology, and they have a really sophisticated computer graphics system. It's great, they do all these commercials.

Kosak: The best program that I ever saw, I think, written for a micro, is WordStar, which is made by MicroPro. It's a word processing program that does everything. As you're typing, it centers your text for you and makes sure words don't break, and it justifies. It'll even print for you while you're typing.

Shimada: I know one program I'd really like. I heard about it back in 1976, I think it was. It's a Star Trek game where you have six players on each side, Romulans versus the Federation, because those who know Star Trek know that the Klingons and the Federation have a treaty, and they aren't supposed to fight. And so you have six players on six terminals, early in the morning before people get on the system, and you use the digitizing tablet and try to establish your dilithium trade routes here and there.

Pencsak: My favorite is VisiCalc. It's the number one program.

Kosak: Anyone here use What'sit? It's a database. For example you tell it Joe's birthday is March 12, and it stores that on the disk. And you can cross index and ask for all the people whose birthday is March 12. A business can use it for a customer database. Phone numbers and pertinent information can be cross indexed.

What will you be doing the next time you sit down at a computer?

Pencsak: Right now I'm working on an alarm system type thing. I bought this thing from a guy in my Apple group. It's called an I/O board, and it'll read eight switches. I can use 1-bit memory locations to see which door is open. I have a picture of our house on a high-res screen, and when the door's open it shows up there.

Kosak: With David Fox at the Computer Center I'm rewriting some games so they can be played on the Apple. They're being published by a company called Adventure International. The first ones are called Six Micro Stories, and you're like a character in a novel. The plot'll be going along, and what you do affects the outcome of the story. Those are out already. There's another one that isn't out yet, and it's called His Majesty's Ship Impetuous. It's also an adventure novel, but it's a bit longer. And we're working on this big project for the Atari, which is a secret so I can't talk about it.

Shimada: I'd like to write up a catalog program for the Apple that is similar to the one developed by Lawrence Hall of Science, giving where the file begins and ends and the file length. It's not easy to write when you think about it.

Maybe to sum up, you would be willing to make some predictions about the future of computing.

Pencsak: It's going to be a way of living. It'll be like a tv. Every home's going to have one. It'll be as popular as a tv ever was. It's going to be like a telephone. Everybody will use them.

Use them for what?

Muskin: Household jobs.

Kosak: A nice thing would be a computer that does all the things you have to go places for. Like airline ticketing. Also you could get news from it, find out what's happening in the world.

Shimada: They'll be used for education, too.

Muskin: Yes. Maybe in the future all computers will be able to hook up to timesharing systems, besides being personal microcomputers. So if a kid needed help in algebra, there would be a good educational program there for him to use.

Shimada: Perhaps an on-line tutor.

Pencsak: Oh, there's going to be school at home in the future. In the future there won't be any more public schools. People will sit in front of their little crts...

Muskin: That's great. I love that.

Pencsak: With the teacher's little synthesizer voice saying, "Shaddup!"

Kosak: And no history. It won't teach history.
Thinking of Data Base for Your Small System?

Check these results from MDBS:

Leonard Overton, President of LS Business Systems, reports:

"The MDBS data base system is now the foundation for our future application products. This is because MDBS helps us to produce more flexible applications... quicker. System design changes are made easily. Time required for loading and debugging is greatly reduced."

Check these features and support:

MDBS is more complete—

✓ Network and hierarchical data structures
✓ Non-procedural query language
✓ Host language support including: BASIC, COBOL, FORTRAN, PASCAL, PL/I
✓ Data base recovery
✓ Data base restructure utility
✓ Available for popular Z-80, 8080, 6502, 6800, and Z-9000 based systems

MDBS has complete documentation—

✓ DBMS Guide and Primer for fundamentals
✓ MDBS systems documentation

MDBS has complete service and support, including—

✓ System updates and enhancements
✓ Training
✓ Phone consultation
✓ Newsletter

So if you're thinking of data base, check with us.
Use the coupon below... or better yet, give us a call today.

YES, please send me more information on the remarkably flexible MDBS Data Base System.

Name __________________________ Title ________
Company ______________________________________
Address ______________________________________
City _______________ (State) ______ (Zip) ______
Phone __________________________

MAIL TO: Micro Data Base Systems, Inc.
Dept. D
P. O. Box 248
Lafayette, IN 47902

CIRCLE 168 ON READER CARD
Data and Voice PBX

The Information Switching Exchange (ISX) from Datapoint is an entirely digital PBX that can switch any combination of data, voice, text, or other digitized traffic. Designed as a modular system, the ISX can range in capacity from 100 to more than 20,000 voice and data ports. The system can concurrently handle hundreds or thousands of connections, providing routing, selecting the least expensive carrier, and monitoring the priority of the message originator. ISX also continuously runs self-diagnostics, automatically reporting critical problems to Datapoint's national service center. Keeping with Datapoint's thrust into the office of the future, the ISX works with the firm's ARC systems, integrating the ARC local co-ax network with other Datapoint office automation products.

ISX handles voice as digitized data, using phone sets from Datapoint or other vendors. Text and data travel at up to 56Kbps (synchronous or asynchronous), using intelligent or nonintelligent Datapoint equipment or RS232-compatible terminals and computers from others.

ISX is comprised of the Data Management System (DMS) and a switching/process control subsystem, which is itself comprised of a Central Switching Unit (CSU) and one or more Remote Switching Units (RSU). ISX needs only telephone instruments and terminal devices to form a complete communications system. The CSU handles central switching, control, call processing, and external communication functions for the switching and process control subsystem. Local switching and interfacing to the CSU is performed by the RSU for
Everyone Working on Network Software Should Stop.

We've Started Giving It Away.

Introducing a one-of-kind communications system called C/30. Based on a microprogrammable mini and priced under $25,000, what makes the C/30 special is that it comes with all the communications software you need to build a network of any size. Efficient, cost-effective, packet-switch software.

Only BBN Computer packet-switching gives you true adaptive routing, both node and network transparency regardless of hardware, plus speed and message control. All field proven for over a decade on the world's largest packet network.

If you've discovered network hardware is easy to come by and network software impossible to find, stop. Our new C/30 gives you the best of both. And at this price, it's like getting the software absolutely free.
Both terminals and telephones. Communications between devices connected to the same RSU (up to 350 ports) will be routed locally, without the intervention of the CSU. Messages destined for other devices connected to the user's ISX will travel from originating RSU to the CSU and then on to the RSU connected to the destination device. Traffic to the outside world will leave via the RSU closest to the destination—either the originating RSU or, via the CSU, another RSU. Interswitch Links (ISL) between RSUs and the CSU run at 4Mbps over coax cable, microwave links, or a version of DataPoint's LightLink optical data link.

The DMS allows dynamic reconfiguration of the ISX. New phones may be added, numbers may be changed, and extensions can be moved via the DMS without interrupting the ISX.

A typical ISX with 888 ports, comprised of a CSU, three RSUS, three co-ax ISLs, a DMS (6600 processor, 20MB of disk, and a 160Kbps printer), five attendant consoles, and 96 central office trunks, carries a price tag of $614,010. The above equipment is all for switching; a companion complement of station equipment, consisting of 425 DataPoint InfoSet Is (single-line phones), 72 multiple-line InfoSet Is, 144 standard keys, and 75 standard single-line sets, prices out to $226,950. Typical installation charges run $26,329, while station cabling prices out around $65,500. Monthly maintenance is $3.27 per active port.

**FOR DATABANK 310 ON READER CARD**

### HUMAN ENGINEERED KEYBOARD

Last year at NCC, Panasonic introduced a small business computer with keyboard the likes of which we'd never before seen. Now the company is selling that keyboard as a new product here in the states (we won't call it unique because Fujitsu markets a similar unit in Europe). Dubbed the keymat, the mechanism should appeal to oems needing a simplified man-machine interface in dp or control applications. The 8085 microprocessor-based keymat includes a switch panel and one removable cartridge or 24 user-defined window-shade overlays. The switch panel has 96 variable keys, 24 page select keys, 12 function keys, and 48 fixed indicators with status lights. Each of the 24 pages (or overlays) can carry up to 96 user specified legends. The microprocessor controls selection of the pages, and transmits, via an rs232 interface, the page number, key identifier, and cartridge identifier.

With 96 legends per page and 24 pages, each cartridge can have up to 2,304 legends. Up to 15 cartridges can be uniquely identified, so, by switching cartridges of pages, nearly 35,000 legends are available to the designer. The keymat also includes a numeric keypad. Pricing is still a bit soft, but Panasonic says the range should be between $1,500 and $2,000 per unit, depending on quantity.

**FOR DATABANK 311 ON READER CARD**

### HUMAN ENGINEERED KEYBOARD

**GRAPHICS TERMINALS**

Tektronix has continued its forward momentum in the computer graphics market with the 4110 series of terminals. While maintaining compatibility with the firm's existing 4010 series, the new terminals are built with eight shades of grey and raster scan displays—offer significant local intelligence and greater communications flexibility.

The initial 4110 offerings consist of the 4112 moderate resolution 15-inch raster scan terminal, the 4114 19-inch direct view storage tube (DVST), and the 4114 Option 31, which adds color enhanced refresh to the 4114. Display technology accounts for the major differences between the terminals: raster scan is dynamic, with selective erase, and grey-scale capabilities, while DVST offers higher resolution line drawing and fill (without grey tones). Stored DVST images cannot be selectively erased: the entire stored image must be erased, but can be redrawn with the desired vectors deleted in a fraction of a second without host processor intervention. Option 31 presents refresh vectors in an orange-red, providing contrast to the standard green phosphor image of the DVST.

Both DVST and raster scan 4110s have 16-bit Intel 8086 microprocessors that provide graphics functions such as move and draw as well as two-dimensional transformations. Each allows images to be defined as segments that can be independently manipulated. Both raster scan and DVST versions use the same graphics data structures, and each has a proprietary processor that translates these structures into displayed images (either stroke graphics for the DVST or raster scan for the 4112). The common graphics data structure allows interchanging image data from 4112s to 4114s, and vice versa. Both terminals have 4096 by 4096 addressable points, with 640 by 480 points displayable on the 4112, and 4096 by 3120 displayable points on the 4114. Panning and zooming allow 4112 users to move over the entire image area. Both terminal types allow definition of a scrolling dialog window that shows communications with the host without interfering with the graphics image. The raster scan 4112 allows definition of up to 16 independent viewpoints, each of which can be separately zoomed and panned.

Thirty-two KB of RAM is standard in the 4110 series, with expansion to 600KB in the 4112 and 8000KB in the 4114. The 4112 can be configured with a single 512KB floppy drive, while the 4114 can have two drives. Diskettes of image data can be interchanged between 4112s and 4114s. Both terminals offer standard rs232 interfacing, with current loop optional. The 4114 can operate at sustained communications rates of up to 19.2Kbps, while the 4112 runs to 6000bps. The 4110 series can optionally use a three-port rs232 interface to connect peripherals; the interface allows concurrent operations, such as plotting and background spooling.

Base price for the 4112 is $9,600 with a single memory plane for line drawings. Two more memory planes may be added, allowing eight shades of grey or three independent line drawings. The 4114 starts at $17,500 or $19,500 when equipped with Option 31. Tektronix, Inc., Beaver- ton, Ore.

**FOR DATABANK 300 ON READER CARD**
As managers become more adept at applying the computer to business forecasting, operations analysis, hierarchical consolidation, cash management and other applications, it often happens that the people doing the planning become more sophisticated than the planning tool they are using.

**FCS-EPS: More than a modeling system**

FCS-EPS is designed to bring the full power of the computer into the hands of financial management. It is an easy-to-apply system, yet it is extremely hardware efficient for tightly scheduled minicomputers and mainframes. Over 150 functions built around a "Business English" are pre-programmed for rapid initial use of FCS-EPS; should you wish to extend any model or system function, the FCS-EPS language may easily be applied to do so.

Additional modules work directly with the basic system to allow multi-divisional information processing and presentation of output:

- **Financial Graphics** — FCS-EPS includes extensive report formatting with optional financial graphics output.
- **Hierarchical Consolidation** — for any number of entities: automatic currency conversion, inflation factoring, sensitivity analysis and cross-sectional reporting.
- **Forecasting and Analysis** — with all statistical, "what if" and risk analysis functions.
- **Data Management** — including a powerful, relational database management system.

There has never been an end-user decision support system like FCS-EPS. But don't take our word for it. Write for our free booklet, "Selecting and Evaluating Financial Planning Systems." Or call EPS, Inc. today. We'll be glad to show you firsthand why FCS-EPS is the one decision support system that stands out from all the rest.

**EPS, Inc.**
8600 West Bryn Mawr Avenue
Suite 970
Chicago, Illinois 60631
800-323-2150
Illinois: 312-693-2470

See Us At The North America Society of Corporate Planners Annual Conference in New Orleans, June 7-10, 1981.
HARDWARE

interfaces. As many as four tape drives can be attached to the peripheral interface board using a single ribbon cable. The Mark III carries an oem list price of $5,500, with quantity discounts ranging to 40%. Deliveries are quoted at 60 days. POINT 4 DATA CORP., Irvine Calif.

FOR DATA CIRCLE 304 ON READER CARD

BLOCK-MODE TERMINAL

Hewlett-Packard has broadened its display terminal line with the introduction of the HP 2622A, the least expensive block-mode terminal in the company’s product line. Targeted at on-line data entry applications, the 2622A comes with two pages (of 80-character lines) of memory, screen-labeled user-programmable function keys, four display enhancement modes—reverse video, underline, blink, and half-bright—and a format mode supporting protected and unprotected fields. Options include a line-drawing character set for creating forms, and an integral thermal printer. The optional printer can copy the screen contents, including line drawing characters. It prints 60 or 64 lines per page in normal mode; in a compressed mode it can print full 132-character lines sent from the host. In addition to operating in block mode, the 2622A can operate in line-modify and character modes. Rs232 interfacing is standard, with current loop available as an option. The 2622A is software-compatible with the HP 2640. Base price for the 2622A is $2,075; the optional integrated thermal printer is $1,210, and the line drawing character set is an additional $105. Oem and volume end user discounts are offered. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 302 ON READER CARD

COLOR TERMINAL

Matrox Electronic Systems Ltd., a Canadian firm that has been making video interface boards and the like for several years, has now entered the intelligent terminal market with its CTM-300, an eight-color CRT termi-

ware-compatible with the HP 2640. Base price for the 2622A is $2,075; the optional integrated thermal printer is $1,210, and the line drawing character set is an additional $105. Oem and volume end user discounts are offered. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 302 ON READER CARD

COMMUNICATIONS TESTER

The Network Control Div. of Digilog has developed the MSU III dual diskette mass storage unit for use with its DLM III Data Line Monitor. The storage unit can be used to trap, record, and playback over 400k of communications data and control sequences for fault analysis, testing, and operator

DECK® COMPUTER SYSTEMS

COME IN SMALL PACKAGES!!

The SMS Disk System 11A is a powerful table top DEC computer system. Using the latest Winchester disk storage, the SMS 11A has a high-density disk with 400MB of formatted storage that also offers the following benefits:

MAXIMUM PERFORMANCE AND CAPACITY

• 8.9M bytes of formatted Winchester disk storage plus 1.2M bytes of usable floppy disk storage
• Fast data transfer of 427K bytes/sec for Winchester and 63K bytes/sec for floppy

INDUSTRY COMPATIBILITY

• Automatic recognition of DEC RSX, ROSET and IBM disk formats
• Increased performance of DEC's RT-11 and RSX-11M operating systems
• Emulates DEC RDY2 floppy disk system

CONVENIENT "MINUTE-PER-MEGABYTE" BACKUP

• Only 60 seconds required for Winchester backup onto 1.2M byte floppy drives
• Standard RT-11, RSX-11M, and SMS utility software supports partial or selective file backup and load operations

UNSURPASSED RELIABILITY

• Modular construction and modular parts ensure long MTBF and short MTTR.
• Offline system and drive test.
• On board fault validation corrects Winchester cosmic and disk operation.
• CRT based interactive diagnostics ease system test and fault isolation.
• Automatic bootstrap from CPU, memory and Qbus before software loading

EXCEPTIONAL DATA INTEGRITY

• Winchester disk file management eliminates permanently flawed disk areas.
• Automatic error retry recovers soft or temporary errors.
• DEC Error Correction Code ensures corrupted data without system shut down.
• Passworded Qbus encryption requires on field adjustments and provides maximum security for those who desire them most.

AVAILABLE SOON!!!

Look for 20M byte and 30M byte DEC computer systems in the near future.

Scientific Micro Systems

777 East Middelfield Road
Mountain View, CA 94043
(415) 964-5700 TWX: 910-379-6577

CIRCLE 171 ON READER CARD

WESTERN REGIONAL OFFICE

(602) 978-6621

MIDWEST DISTRICT OFFICE

(312) 966-2711

EASTERN REGIONAL OFFICE

(617) 246-2540
It has brightness, clarity and sharpness that you can actually see. DuPont RECRON High Definition COM silver film has a new emulsion that produces easy-to-duplicate images in reductions of 42x, 48x and higher. That means more information in less space. Wide processing latitude assures you of excellent results under a variety of conditions.

The film comes on a CRONAR® base protected with a new anti-static treatment. The base is only .004 inch thick, up to 25% thinner than conventional acetate COM films, so you can get more film on a spool and reduce reloading time. This base is really durable and withstands repeated duplication without damage.

RECRON High Definition COM silver film comes backed up with chemicals, processor and a nationwide network of DuPont Technical Representatives to make it all work most economically for you.

Send for your film sample and in-depth information about it. Mail the coupon today.

---

Mail this coupon today.
DuPont Company, Room 36794
Wilmington, DE 19898
Please send me the fiche of RECRON High Definition COM silver film. I'm interested in high quality.

Name:
Title:
Company:
Address:
City:
State: Zip:
Phone:

Industrial Photo Systems

*RECRON is a DuPont registered trademark for its microfilm, microfilm processors and chemicals.
HARDWARE

training. The MSU III can operate unattended, trapping full-duplex traffic at rates of up to 19.2 Kbps. MSU III pricing starts at $3.575 in singles. DIGILOG INC., Network Control Div., Horsham, Pa.

FOR DATA CIRCLE 300 ON READER CARD

COMPANY SYSTEM

Harris Corp. has added the model 300 computer system to the midrange of its family of 48-bit systems. Capable of supporting as many as 48 interactive user terminals, the system can have up to 2 MB of real memory and includes hardware support for virtual memory in excess of 12 MB. Intended for multiple concurrent functions, the H300 handles multistream batch, multiple RJE, and sensor-based real-time processing, in addition to timesharing.

Running under Harris’s Vulcan operating system, the H300 supports a number of programming languages, including FORTRAN (three versions), BASIC, COBOL, RPG, Pascal, APL, assembler, and SNOBOL. The TOTAL database management system and Task inquiry language are available, as is a query language/report writer dubbed A27. Communications packages are offered for a number of protocols, including CDC 200 UT, Univac 1004, IBM HASP II multileaving, 2780, 3780, and 3270 emulation.

A packaged system, including 192 KB of error correcting memory, system console CRT, 80 MB of disk, and a 1600 bpi tape drive sells for $104,950. HARRIS CORP., Computer Systems Div., Fort Lauderdale, Fla.

FOR DATA CIRCLE 303 ON READER CARD

MULTIPROTocol MESSAGE TERMINAL

Sidereal’s Micronet 6 offers dual workstations, work processing, and multiprotocol communications. Its six communications ports can be configured for any combination of Telex, TWX, DDD, or leased lines. Micronet 6 supports concurrent message preparation, transmission, and reception. It can function as a message switch, receiving a message, performing any necessary code conversion, and forwarding the message in a different protocol.

The multiprocessor-based message terminal can be programmed using MAPL (Micronet Application Programming Language). The company already has a library of programs (which can be further customized by a user as desired). Applications preprogrammed include maintaining and using a directory of frequently called numbers, routing a message to multiple addresses, automatic dialing, connect, disconnect, retry, and message logging. Message logging allows the terminal to provide a daily log of messages sent and received, along with estimated billing, and a histogram of traffic volume by time period.

This is no ordinary offer!
Put more meaning and direction into your career

AES Data Ltd. is a high technology leader in the Canadian micro-computer industry. We manufacture and distribute a full range of hardware and software word-processing systems known throughout the world for their dependability and technical excellence.

Thanks to continuing demands for our products, we are offering intermediate and senior opportunities for top-flight technical software specialists, to keep us growing strong. Expert knowledge is especially sought in the areas of rigid disc applications, IBM protocols, general communications software, data base and records management systems. Candidates should possess a minimum of 3 years’ experience with exposure to any of the above or a systems software development environment as well as a Bachelor’s degree in either Computer Science or Electronic Engineering.

Our state-of-the-art work environment is project-oriented. This is a situation which gives you the feeling of meaningful involvement, creating a high level of interest in day to day work. It’s a stimulating environment which encourages your participation in a wide range of technically challenging and interesting projects. The clincher, it lends itself to the development of diverse and well-rounded skills. Isn’t that what you’ve always wanted in a computer related career?

We offer an outstanding compensation package including a complete range of company-paid benefits.

Opportunities exist in both Montréal and Toronto. For immediate consideration, please submit your resume in complete confidence to:

Mr. Donald Bolduc, Manager Human Resources AES DATA LIMITED 1111 - 46th Avenue Lachine, Québec H8T 3C5

Mr. Brian Celentano, Personnel Administrator AES DATA LIMITED 2330 Millrace Court Mississauga, Ontario L5N 1W2 (416) 826-0801

NO AGENCIES PLEASE

CIRCLE 173 ON READER CARD

226 DATAMATION
Add a new dimension of speed and reliability to your minicomputer with economical, high-capacity BULK MEMORY from Dataram.

The world leader in minicomputer-compatible disk emulation systems. Dataram’s wide range of disk emulations — twice as many minicomputer interfaces as anyone else! — brings the proven performance of BULK MEMORY to your application requirement.

Dataram’s BULK CORE and BULK SEMI systems operate at speeds which are orders of magnitude faster than the mechanical disks which they replace, and do it with the reliability inherent in all-electronic devices. What’s more, BULK MEMORY provides up to 8.0 MB in a 15¾” chassis, and offers dual-port capability to enable BULK MEMORY to be shared by two host minicomputers.

If you have a minicomputer and are looking for a way to get more for your storage dollar, Dataram has a BULK CORE or BULK SEMI system ready to work for you. If your minicomputer is not listed below, tell us about it. We’d like to add your name to our growing list of BULK MEMORY users.

<table>
<thead>
<tr>
<th>DEC® PDP®-11</th>
<th>DEC LSI-11®</th>
<th>DEC PDP-15</th>
<th>DATA GENERAL NOVA®</th>
<th>DATA GENERAL ECLIPSE®</th>
<th>ROLM 1602</th>
<th>PERKIN ELMER</th>
<th>MODCOMP</th>
<th>HONEYWELL 316 and 516</th>
</tr>
</thead>
<tbody>
<tr>
<td>BULK CORE</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>BULK SEMI</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>DUAL PORT</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

DEC, LSI-11, and PDP are registered trademarks of Digital Equipment Corporation. Eclipse and Nova are registered trademarks of Data General Corporation.
Hardware

Communications protocols handled by the Micronet 6 include Telex (50bps), Gateway Telex, TWX, DOD (110bps to 3000bps). InfoCom classes 1, 2, 3, and 4 (50bps to 1200bps), freewheeling leased lines, 83B3, 85A1, 8A1, and 8B1 leased lines, and JBM 2780/3780 bisynchronous. Configured with a single workstation, 30cps dot-matrix printer, two 8-inch floppy drives (2.3MB total capacity), and one Telex required of the connection of any DTE port to any DCE port to 19.2Kbps.

by the Micronet 6 include Telex (50bps), (50bps 300bps), (DTE) and data communication equipment asynchronous Rs232 circuits, T-Bar's and receive-clock signals, control signals, Gateway Telex, TWX, and secondary receive and send data lines, and JBM lines, 83B3, 85A1, 8A1, and 8B1 leased lines, 83B3, 85A1, 8A1, and 8B1 leased lines, and JBM 2780/3780 bisynchronous. Configured with a single workstation, 30cps dot-matrix printer, two 8-inch floppy drives (2.3MB total capacity), and one Telex required of the connection of any DTE port to any DCE port to 19.2Kbps.

The idea of creating yet another high-powered microcomputer, this vendor has decided to carve its niche with an inexpensive portable microcomputer using mature technology. Built around a Z80A microprocessor, the unit includes 64k of memory, dual 100kb minifloppies, 5-inch crt (organized as 24 lines of 52 characters), IEEE-488 interface, Rs232 interface, and a typewriter keyboard with numeric keypad; the keyboard is hinged and snaps over the case to provide full-duplex operation; for transferring to terminals and computer ports. Each full-duplex port can operate asynchronously or synchronously. Asynchronous rates range from 19.2Kbps, while synchronous operation runs to 64Kbps. With an external clock, the synchronous rates can be any speed up to 64Kbps; an internal clock allows six switch-selectable data rates: 1200bps, 9600bps, 19.2Kbps, 56Kbps, and 64Kbps. When configured with the backup system, switchover occurs automatically if any high-speed components fail or if a fiber breaks. A redundantly configured LDM-9500 multiplexer sells for about $6,000. DIGITAL COMMUNICATIONS CORP., A M/A-COM Company, Germantown, Md.

Q. Take the mainframe vendor's name off your line printer and what have you got? A. Probably the same Dataproducts line printer MTI sells for thousands less.

Why pay more for a nameplate? The Dataproducts line printer you buy from MTI is probably the identical printer your mainframe vendor sells under his name. The MTI interface is as compatible and software transparent as the vendor's interface. So why pay thousands extra for his name?

Why wait three to six months? Your mainframe vendor could give you a waiting period of from three to six months. Not MTI. We are an authorized stocking distributor of Dataproducts line printers. That means we usually can deliver your line printer system immediately.

We're plug-compatible, too. MTI printer controllers connect directly to the bus of the CPU and are available for all the following minicomputers: DEC, IBM Series/1, Data General, Perkin-Elmer (Interdata) and Hewlet-Packard. In addition, we supply communications interfaces for many protocols. So call MTI today and save time and money.

New York: 516/482-3500, 212/895-7177, 518/449-3959
Outside N.Y.: 800/665-8016
New Jersey: 201/227-5552
Ohio: 216/464-6668

Introducing complete on-line network monitoring, testing and control.
For people who think they can’t afford it.

No matter what size network you have, it isn’t worth a dime if it’s not operating. That’s why Codex designed the DNCS 200 Network Control System. It spots trouble anywhere in your communications network. It even lets you correct problems—often before they disrupt operation.

Dects, isolates, and corrects problems. Fast.

These functions are controlled by one easy-to-use DNCS system at your central site. So right away you know exactly what needs to be fixed. If line quality has degraded, DNCS 200 can command your modems to fall back to a lower speed to maintain operation.

Or reroute service to dial lines. Or switch spare modems for faulty ones.

It speaks your language.

DNCS 200 speaks simple English. It’s a menu-driven system with no fancy commands to learn, no sequences to memorize.

Besides English, DNCS 200 speaks the second language of network managers everywhere. Network up-time. You gain it without increasing your manpower requirements, without changing your current operation. Which means you can deliver improved network performance without hurting your bottom line.

Low-cost, high-powered network control.

DNCS 200 is the latest addition to Codex’s COMMAND capability—a total commitment to network management and control. If you want to manage your network more effectively, but don’t have a large operating budget or staff, DNCS 200 is the system for you. Call or write us for more information.

Codex
A Subsidiary of
MOTOROLA INC.

We’ll get you through
"I just installed the most flexible graphics software available..."

"It sure paid off."

A revolution was taking place. We learned computer graphics dramatically improved the decision-making process. Graphics software with "FLEXIBILITY" was the only way to make it happen. We already had some basic graphic software. It was hard to maintain and not adequate for our needs. Our users were demanding more productive and higher quality tools.

After installing DISSPLA* and TELL-A-GRAF®, ISSCO trained our users so that we were discovering profitable new applications immediately. Before ISSCO left our center, all of our output devices were interfaced. Field-proven code, maintenance, support, and ISSCO's 11 years of experience—for me it really paid off.

TELL-A-GRAF's* English-like commands made graphical representations of the information in our data bases simple and easy to access. We now can produce a graph with only one command and as needs dictate we can easily adjust any aspect of our graphics to enhance understanding. Both our highly demanding computer specialists and our secretaries easily learn to chart or graph the masses of data already in our computers. ISSCO GRAPHICS imbedded in existing applications programs has become very popular.

For us, installation of DISSPLA* and TELL-A-GRAF® was the right decision.

ISSCO GRAPHICS run on IBM, DEC, CDC, CYBER, CRAY, BURROUGHS, PRIME, UNIVAC, and HONEYWELL.

Call or write now for more free information. 714/452-0170
4186 Sorrento Valley Blvd., San Diego, CA 92121
Atari equipment and receive qualified programmers can use opers. Authors will receive quarterly during the contest year. To yet to be determined. The business, education, and sys­ tems of the best programs cash. a grand prize of $75,000 other sites and opening dates have to be determined. The company will also offer periodic technical training seminars for software developers.
T-COM handles all network management functions outside of the user’s application program. Security also is isolated from the user; the monitor’s security system automatically verifies user IDs, security codes, and access levels, determining which applications are available to a given user at a given terminal.

T-COM allows programs to be written for use by a single terminal, then it provides run time control so any number of terminals can concurrently use the application. Six run time control tasks spare the developer from concerns of terminal communications and intertask control. Input control receives terminal entries, performs edits, and passes the data on to the appropriate task. Output control handles transmissions to terminals, and performs necessary screen-handling functions. Error control catches and corrects transmission errors without disturbing the user program; uncorrectable errors are identified for the user program, as well as terminal and console operators. Console control gives the system console operator means to interact with the system. An Activity Distributor performs security checking. User Task Control distributes application program requests to the appropriate T-COM control module.

T-COM supports applications written in COBOL, NEAT, or FORTRAN using any file access method or DBMS. A CALL or INVOKE command provides application program access to on-line terminals. The system also supports interactive screen generation; screen formats are maintained outside the application program, thus allowing modification without extensive impact on the user’s code. Automatic program buffer mapping creates statements for inclusion in the user’s code to handle data traffic between program and terminals. Upon request, T-COM can generate documentation, including screen formats, program buffer requirements, network descriptions, user descriptions, etc.

The T-COM on-line transaction processing monitor carries an introductory price tag of $9,500. CINCOM SYSTEMS, INC., Ventues Div., Cincinnati, Ohio.

SOFTWARE SPOTLIGHT

IDMS DATABASE TOOL

Database administrators can more easily and accurately specify and modify the embedded pointers assigned within the prefix of each IDMS record by using a schema preprocessor called Pointers. Instead of explicitly assigning positions for all possible NEXT, PRIOR, and OWNER pointers for all sets the record participates in, a Pointer user codes only minimal definitions. The pre-processor then determines a consistent assignment of pointer positions, and inserts appropriate descriptive lines into the schema.

Known as IDRIS, the operating system is of the general purpose variety, designed for the 16-bit Motorola microprocessor. It includes an assembler and a text editor. The operating system carries a $2,000 price tag.

Supporting the Bell Labs-developed programming language, the C compiler sells for $1,000. The Jensen and Wirth Pascal compiler also sells for $1,000. CHROMATICS, INC., Tucker, Georgia.

OPERATING SYSTEM & COMPILERS

For use with its MC68000-based CGC 7900 color graphic computer, Chromatics released a multitasking operating system, and compilers for the programming languages C and Pascal.

KALLMAN ASSOCIATES

5 Maple Court, Ridgewood, New Jersey 07450 (tel) 201-652-7070

To Test the French Market
To Find Distribution for Your OEM Products
To Increase Export Profits

CONSIDER

PRINTEMPS INFORMATIQUE 82

International Exhibition of Computer Equipment
March 23-26, 1982 Palais des Congres, Paris

This international trade fair is open only to data processing buyers and professionals. One low “package” price includes booth, furnishings, promotion and much more. Put your products before more than 9,000 prime prospects at Printemps Informatique 82. For complete details contact:

KALLMAN ASSOCIATES

5 Maple Court, Ridgewood, New Jersey 07450 (tel) 201-652-7070

CIRCLE 178 ON READER CARD
The ADABAS Answer: UNCHAIN YOUR DATA BASE!

If your company's information needs are changing fast, the last thing you want is a DBMS that puts severe handicaps on the productivity and flexibility of your people.

But, practically speaking, that's just what chain-pointer DBMS systems do. All their logical relationships are hard-wired into the physical data. So, when it comes to meeting the dynamic data access and update requirements of a growing company, these systems simply get too tied up in their own structural limitations to deliver effective, flexible data management.

That's one big reason why the DBMS answer for a company on the move is ADABAS, Software AG's easy-to-use — and easy-to-maintain — DBMS. Our inverted list architecture separates logical relationships from the physical data. This gives you remarkably flexible access to, and control of, the data base.

With ADABAS, you decide exactly what your data base relationships will be and change them anytime you want, to meet special corporate needs. Without any effect whatever on the data base or on existing programs.

That's one big reason why the DBMS answer for a company on the move is ADABAS, Software AG's easy-to-use — and easy-to-maintain — DBMS. Our inverted list architecture separates logical relationships from the physical data. This gives you remarkably flexible access to, and control of, the data base.

With ADABAS, you decide exactly what your data base relationships will be and change them anytime you want, to meet special corporate needs. Without any effect whatever on the data base or on existing programs.

A lot of software companies like to claim they have the answer to DBMS cost effectiveness, programmer productivity, and throughput efficiency. Only ADABAS provides the architecture to support claims like these 100%.

Like to know more? Simply fill in the coupon and mail it to us today. We'll help you unchain your full data management potential.

When effective data base management is the challenge - ADABAS is the answer.

Name ________________________
Title __________________________ 
Company ______________________
Address ______________________
City __________________ State __________________
Zip __________________ Telephone __________________
Type of Computer __________________ 
Operating System __________________

SOFTWARE AG OF NORTH AMERICA, INC

Reston International Center
11800 Sunrise Valley Drive, Reston, Va 22091
(703) 860-5050

Affiliates: ADABAS Software Ltd. Derby, England (44) 332 3725/35) • Arabian Data Systems Jeddah, Saudi Arabia (966-9866) • CONSIST Sao Paulo, Brazil (269-4445) • Dataanalyse AB Stockholm, Sweden (08-218410) • Fraser Espanola S.A. Madrid, Spain (4561350) • R.D. Nickel & Associates, Inc. Cambridge, Canada (519-653-6142) • Pan American Computer Systems Buenos Aires, Argentina (863-3790) • Silesta Sistemi S.P.A. Milan, Italy (1-842446) • Software AG Darmstadt, Germany (06151-84072) • Software AG of Far East Tokyo, Japan (03-276-0258) • SPL (Australia) Pty. Ltd North Sydney, Australia (226-922-3268) • SPL (Israel) Ltd. Givatayim, Israel (03-777-8860) • Systems Programming (PTY) Ltd. Sandton, South Africa (783-4250) • TEGS Paris, France (225-96-83) • Teleinformatica de Mexico SA Mexico, Mexico (905-530-8033) • Volmac B.V. Utrecht, Holland (031-3039421)

CIRCLE 180 ON READER CARD
Since 1957 DP professionals have counted on one magazine to help them do their job better. Because this industry just won't stop changing and growing. You have to keep up with what's going on or you quickly get weeded out.

The magazine, of course, is DATAMATION. The magazine that for 24 years has been written by the DP professional for the DP professional. The magazine with "how-to-do-it better" articles; budget, mini-computer, mainframe and salary surveys; new computer applications; advanced technology impacting users; and more . . . all integrated to help the DP professional make the new technology pay off.

This long-time high reader involvement makes a fertile environment for data processing vendors since only the best of the crop—those with the right combination of job title and buying influence get picked to receive DATAMATION magazine. 144,185 DP professionals world-wide dig into DATAMATION magazine every month. If you're selling to the DP market you'll want to be there.

Technical Publishing
Want high performance raster graphics?

Sanders Associates’ new Graphic 8 offers you up to 256 simultaneous colors. High resolution. Dynamic operation with double-buffered refresh memory...

Plus upward-instruction compatibility with the Sanders stroke refresh Graphic 7 and its color and 3D options.

But there’s more.

Both display systems – Graphic 7 and Graphic 8 – bring you built-in test, FORTRAN support, remote or local operation, interfaces to most computers, and other important user-oriented features.

Sanders' stroke refresh Graphic 7 and new raster Graphic 8 display systems: they put the best of both worlds at your fingertips.

For more information, write or phone Sanders Associates, Inc., Information Products Division, Daniel Webster Highway South, Nashua, NH 03061. 603-885-5280.

The Graphics People

SANDERS

CIRCLE 182 ON READER CARD

See us at NCGA booth 520.
Now the world's leading producer of computer software for data analysis—SPSS® Inc.—and the world's leading producer of graphics software—ISSCO®—have developed the most useful graphics package you can find—at any price. It's SPSS Graphics: the state of the art in versatility, range of options, simplicity, and "artistry".

Management graphics in one easy step.
Backed by the power and simplicity of the SPSS Data Analysis System, SPSS Graphics allows you to operate directly from large amounts of data to produce elegant graphs and charts. There's no need to involve data processing people. You do it yourself: data in/graphics out!

Take control over form and content.
You choose the colors and/or shaded patterns as you wish. Use or modify a wide range of automatic "artistic" decisions too: label placement, margins, legends and scaling, for example.

Exclusive interactive preview capability.
Produce hundreds of graphs—preview them on a graphics terminal—decide which to use—and have graphs drawn on a hard copy device—all in one step! You may combine independent graphs (pie charts, bar charts and/or line graphs) on a single page, in any order.

Other SPSS Graphics features: simple or fancy displays; pie charts with "exploded" segments; bar charts with bars that extend above and below a given point; line graphs with color and/or pattern shading between the lines; automatically generated summary statistics; directly generated graphs of statistical functions; and complete use of SPSS data management facilities.

And, as you'd expect, SPSS Graphics was developed with the user in mind. It's a research and management tool that's easy to use, easy to learn, highly sophisticated, flexible, portable, and economical. With SPSS Graphics, you can have complete data summary and display facilities for less than you'd pay for a report writer alone!

To appreciate the simplicity and elegance of SPSS Graphics, call or write:
Marketing Department
SPSS, Inc.
Suite 3300, Dept. D6-81
444 N. Michigan Avenue
Chicago, IL 60611
312/329-2400

See for yourself why SPSS Graphics is another reason to choose SPSS—the largest selling data analysis system in the world!
DIGITAL HARMONY: ON THE COMPLEMENTARITY OF MUSIC AND VISUAL ART
by John Whitney

John Whitney is an artist; his medium is the computer. An award-winning avant-garde filmmaker and a pioneer in computer graphics, Whitney invented the slit-scan motion control process used in such movies as 2001: A Space Odyssey, Star Wars, and Superman. His work has won him grants from IBM and the National Endowment for the Arts and earned him a place in nearly everything ever written about computer art.

A driving force in Whitney’s career has been his faith that the artist can use modern technology (i.e., the computer) to integrate music and visual art and thereby create a major new art form. This belief in the complementarity of music and art is nothing new, and Whitney does not claim to have invented it. It probably goes back as far as music and art themselves, and has been a major aesthetic theme during the 19th and 20th centuries. What Whitney does claim is that he is the first to actually produce “visual music,” which he calls digital harmony.

In his very first sentence, Whitney defines the parameters of his book: “. . . the exploration of a single hypothesis. . .” That is no exaggeration. With the single-minded zeal of an evangelist he explains how digital harmony differs from everything that came before, and how it is destined to be nothing less than “a major evolution of 20th century art technology.” He refers to himself as a “media revolutionary training underground for the day which is dawning even as I write this book.” Digital Harmony: On the Complementarity of Music and Visual Art is the manifesto with which he hopes to launch his revolution.

He begins with a brief description of his early, unsuccessful attempts at producing visual music through abstract films. A breakthrough finally came in the early 1940s with a series of film collaborations with his brother, James. In these, the brothers produced a sound track using an ingenious device that employed pendulums and adjustable weights. The motion of the pendulums, although soundless, was registered visually on the sound track portion of the film, producing a strange, unique “music” when played back. This invention also allowed them to create the music frame for frame, along with the action in the film. The Whitneys used this technique in their Five Abstract Film Exercises, which won First Prize at the First International Experimental Film Competition in Belgium in 1949.

But however exciting the results, the film medium failed to offer Whitney the key ingredient of visual music—that is, a generative building block, or “visual scale” capable of fluid movement. Then he discovered the applicability of the computer, a device that offered, for the first time in history, the power to make complex patterns flow.

Having found the proper instrument, Whitney applied the musical/mathematical rules of differential, resonance, and harmony to structure the motion of graphic elements, producing a visual scale. For the interested reader, Whitney provides a sample of such a scale, mapped out on a two-dimensional coordinate field. “RD,” a radius differential factor (the Y-coordinate), and “TD,” an angular differential factor (the X-coordinate), are the parameters used, and a set of dots provides the graphic element. Applying harmonic rules to determine a set of RD and TD conjuncts, Whitney uses differential motion to create a series of elegant patterns. Each pattern represents a “note” for composing visual music. Countless note variations are made possible by assigning different values to TD and RD and/or introducing ZD, for example, as a coordinate for a volumetric field.

What renders the computer-generated patterns especially useful as notes—and herein lies the major point—is the fluidity of movement between them. The computer offers this movement as no film animation technique can. Whitney films various sequences of movement, and then edits them into a composition. It is this process of structuring the final product that separates the artist from the technician.

Whitney then offers potential digital harmonists the information they need to
make the scales. He lists the equipment, and even provides a sample program. Black-and-white and full-color reproductions indicate some graphic possibilities. To illustrate how the action might look, he offers a "flip-book," a sample sequence of patterns on the upper-right-hand corner of each page.

The author has produced a number of films using digital harmony theory. But for his revolution to triumph he needs recruits—converts from the more traditional, "static" art forms. We are warned that "in a technological aural/visual universe, music must become bisensory..." and we are given the final command: "It's up to you, do it yourself. Do it!"

But before contemporary artists toss out their paints and brushes and replace them with Andromeda Systems LSI-II and Tektronix 4002 graphic display terminals, a hard look at the digital artwork reproduced in the book is recommended. For the most part it is represented by full-page, multi-color circular patterns, reminiscent of kaleidoscope images—not unlike recent computer renderings of the DNA molecule. Some are quite lovely. The most intriguing visuals are the stills from Whitney's 1973 film Arbesque. From these 10 to 20 frame sequences, we can get an idea of the way Whitney builds an image and moves between various states of complexity and simplicity, chaos and order. All have the appearance of delicate color-line drawings. Some are arresting: dynamic; others are more mundanely decorative, more mechanical.

But Whitney would object to this line of criticism. The book, he reminds us, is about movement—the "structuring of time"—and this cannot be shown in book form:

"The illustrations, on the page, in ink, illustrate stasis and fail totally to show the line of time as experience."

Now Whitney finds himself in the same bind as many artists and art historians who deplore printed reproductions of artwork but feel compelled to use them in books and articles. The format (90 pages of text, 81 pages of indexed materials, with an emphasis on visuals) and price of the book are dictated by the requirements of those expensive "static" reproductions. The importance given them by the book's very design forces one, or at least encourages one, to look at them and judge them as finished pieces.

Throughout the text, Whitney draws generously on examples from the more classical forms of art and music, citing specific artists, composers, styles, and works. This is fine—and absolutely necessary. We often have to explain the new in terms of the old. Where, however, are the illustrations of these works? There are no reproductions of artworks other than Whitney's own. Odder still, a book based on the visualization of musical theory contains not one line of musical notation. These omissions do not greatly mar the book, but they represent a missed opportunity for some interesting reinforcement and variation.

When writing about the mechanics of his process, Whitney is at his best—clear and strong. In more reflective moods, he tends to rely on easy slogans ("... 20th century music is in crisis"; "The nature of art has become uncertain"; "... music must become bisensory") and cumbersome prose:

"Digital systems procedures greatly improve the method of making music by several magnitudes of importance."

"The repeatability and the accessibility we gain... systematically improves its 'materiality'."

One needn't know much about visual art or music to understand Digital Harmony; the book is not burdened with loads of technical language. Whitney describes clearly the development and mechanics of a process—"a single hypothesis"—that may serve as a point of departure for exciting explorations in the young and ever-broadening field of computer art. As a process, digital harmony has merit; as a book, it's a bit thin. As a revolutionary manifesto that aims to reshape our aesthetics... well,
The first of a new breed of communications satellites is providing secure voice, video, high-speed data, and electronic mail services for U.S. business firms and industries. The powerful SBS satellite is the first domestic communications spacecraft to operate at frequencies of 12 to 14 gigahertz. This means that small antennas with diameters of 5.5 to 7.7 meters can be used in urban areas for business communications without causing interference to terrestrial microwave systems. The satellite has an outer cylindrical panel of solar cells that drops down in orbit to expose an inner panel. The telescoping feature nearly doubles the power. Hughes built SBS for Satellite Business Systems, a company owned jointly by Aetna Life & Casualty, Comsat General Corp., and IBM Corp.

New radar technology may help solve increasingly nagging problems facing military strategists. The Track-While-Scan Quiet Radar, under exploratory development at Hughes for the U.S. Army Missile Command, would stand little chance of being detected, jammed, or destroyed by enemy radiation-seeking missiles. Quiet Radar differs from conventional radars in that it does not emit huge bursts of power in a sweeping pattern. Rather, it emits a low-power continuous-waveform signal while shooting out thousands of tiny narrow beams in a rapid-fire, randomly selected sequence. Extremely low sidelobe emissions and rapid random switching between many frequencies make detection of the radar difficult.

More than 15 years after its launch, NASA's Pioneer 6 spacecraft still transmits data via a Hughes traveling-wave tube. The interplanetary probe measured the sun's corona, studied solar storms, and measured a comet's tail. It also made many discoveries about the sun, solar wind, solar cosmic rays, and solar magnetic field. Pioneer 6's primary TWT operated more than 122,000 hours from launch in December 1965 until February 1980. Then, due to a low voltage condition, the backup TWT was switched on. The Hughes Model 214H TWT, which operates in the S band with 8 watts of power, was developed under contract to TRW.

Career growth opportunities exist at all levels at Hughes Support Systems for a variety of engineers qualified by degree or extensive work experience. They include systems engineers and software and hardware design engineers for major simulation and test equipment programs. Also, field engineering posts throughout the U.S. and the world offer travel, autonomy, and responsibility for the life cycle of Hughes electronic systems. Phone collect (213) 670-1515, Ext. 5444. Or send your resume to Professional Employment, Dept. SE, Hughes Aircraft Company, P.O. Box 90515, Los Angeles, CA 90009. Equal opportunity employer.

Measuring millimeter-wave impedance is easier now by using a new IMPATT-sourced millimeter-wave reflectometer instead of slotted lines and hybrid impedance bridges. Because of its unique design, the Hughes device can sweep the full 75-to-110 GHz bandwidth automatically without time-consuming point-to-point measurements. It uses such advanced technology as broadband isolators and detectors to reduce the effects of unwanted reflections and mismatch error, a 1-KHz square wave modulator that delivers increased sensitivity and dynamic range, and a rotary vane attenuator for constant attenuation with frequency.

REPORTS AND REFERENCES

ONLINE INFORMATION DIRECTORY
The "Directory of Online Information Resources," now in its seventh edition, covers nearly 280 bibliographic and nonbibliographic databases. Each of the databases is described, and the information necessary to contact the vendors and producers is listed. The directory is updated semiannually, and is available from CSG Press, 11301 Rockville Pike, Kensington, MD 20795, for $18.50 per copy (or on a two-year subscription basis, four issues for $48).

WORD PROCESSING REPORT
Delta Epsilon, the business education graduate fraternity, surveyed more than 300 word processing installations managed by members of the International Word Processing Association (IFP), the organization that funded the survey. The primary objective was to determine the effectiveness of current word processing and administrative support education programs. The study results showed 55% of the supervisors surveyed felt entry-level wp operators had inadequate grammar skills, and 49% of the supervisors said operator spelling skills were not up to par. Entry-level operators were also criticized by 40% of the supervisors for poor punctuation and proofreading skills. When evaluating themselves and other entry-level word processors, the operators agreed with the supervisors. The percentages vary slightly: 70% of the operators felt grammar skills were inadequate, 62% felt punctuation skills were lacking, 58% felt that proofreading skills were poor, and 49% felt spelling skills were inadequate. A 400-page analysis of "Study of Selected Business Organizations with Word Processing Installations to Determine Implications for Business Office Education" is available for $50, or an 80-page monograph for $8 per copy from Delta Epsilon, Gustavus Adolphus College, St. Peter, MN 56082.

VENDOR LITERATURE
FLOPPY CARE
If you've ever wondered exactly how to handle and care for your floppy diskettes, this vendor's brochure may clarify your questions. It lists handling and storage techniques which apply to all vendors' flexible diskette products. DYSAN CORP., Santa Clara, Calif. FOR DATA CIRCLE 350 ON READER CARD

SOFTWARE/ SYSTEMS DEVELOPMENT/ MIS PROFESSIONALS
Robert Kleven and Co. has been providing confidential and industry-knowledgeable placement for software development/ systems development/MIS professionals since 1969. Our clients, some of the top companies in the industry, are seeking solid professionals with in-depth knowledge of these disciplines: Programming, Systems Analysis/Design, Data Base Applications, Applications Programming, Compiler Development and Language Design.

We have a variety of positions available for professionals who possess experience in applying the latest techniques in one or more of these areas: Software Design and Development; Technical Support; Computer Sciences; Assembly or Block Structured Languages such as PASCAL, ALGOL, "C" LISP, PL/J; Higher Level Language Programming; Data Base Design; Compiler and/or Operating Systems Design; Technical Writing; Microprocessor Programming; Software QA; Software Tools and Methodology Development; Computer Architecture; Computer Performance Measurement, Firmware, Microprogramming.

Let Robert Kleven and Co. enhance your career. We will provide you with career path counseling and no-cost resume preparation. Client companies assume all fees.

Robert Kleven and Co., Inc.
Industrial Relations Management Consultants
1-800-225-8999
Telephone (617) 861-1820
Member: Massachusetts Professional Placement Consultants
National Computer Associates
Affiliate: Nationwide Representing Equal Opportunity Employers M/F

AUTOMATIC SURVEILLANCE
"Unattended Communications Network Surveillance," automatic alarms, and reconfiguration capability are discussed in an eight-page booklet from this vendor. The booklet illustrates how faults can be detected automatically at the central communications center and corrected before the user complains. DIGILOG, INC., Horsham, Pa. FOR DATA CIRCLE 352 ON READER CARD

"THE FCC AND YOU"
This booklet reviews new FCC regulations that control EMI emissions rules applying to computer device manufacturers. Subjects discussed in the booklet are the devices affected, what the restrictions are, the filing and effective ruling dates, rule enforcement and penalties, EMI emission levels, and cost trade-offs on EMI suppression. SIERRACINI/POWER SYSTEMS, Chatsworth, Calif. FOR DATA CIRCLE 353 ON READER CARD

DSS CHECKLIST
Geared to help the manager select and evaluate decision support systems, this vendor's booklet compares decision support software in terms of modeling language, data entry, "what if" capabilities, report generator, user orientation, hierarchical consolidation, statistical and forecasting needs, etc. EPS, INC., Chicago, Ill. FOR DATA CIRCLE 354 ON READER CARD

SOFTWARE/ SYSTEMS DEVELOPMENT/ MIS PROFESSIONALS
New England/ East Coast/ Nationwide

If you have one or more years experience in any of the following:

- IBM 360/370/3033/3081
- VM CMS CICS DFS VSAM CMS 370 DCF VSAM CMS 370
- ASSEMBLER MVS
- HONEYWELL 6000 SYSTEMS LEVEL 6, 6A, 40, Dual 16M/32M COBOL GCOS 2/MP
- UNIVAC 1100/1105 OR 40 SERIES 60S/50OS/1100OR OR 1110/1120/1125 1120
- TP CMS QP ASC 11 COBOL
- DEC PDP-11/23/34/44/45/70 VAX 11/78 HESX EMAS RSTS E XLAN VMS MACRO 11
- BASIC 2, FORTRAN ASSEMBLY LANGUAGE
- NR 850/850/90000 VAX IMMS STORE/TV TRAN PRO NEAT 4 COBOL ON-LINE SPECIAL NEEDS FOR CP
- HURD RHODES 2800/730/730/720/700/3012/HAI ALL SOFTWARE NEEDED

and would like the most individualized job search in data processing today on a company fee paid basis, nationally, send your resume in confidence to:

SOUTHERN COMPUTER SERVICES
P.O. Drawer 2629
SARASOTA, FLORIDA 33579
813-361-9285

Please DO NOT circle reader service number. Merey send resume in confidence.
TELEPHONY/SYSTEMS DESIGN ENGINEERS

Picture an Exceptional Career in an Exceptional Location...

and You Picture GTE in Phoenix!

At GTE Automatic Electric Laboratories, you would be responsible for anticipating new developments in next generation telecommunication products. As part of Systems Research, you will play a vital role in determining how new technology can meet the needs of future communication requirements. The challenge of future voice/data/wide-band services is yours to meet.

Our tremendous growth and current expansion has created positions for professionals with a BS/MS/PhD degree in Electrical Engineering, Computer Science or related discipline and experience in the following areas:

• SWITCHING RESEARCH
  Minimum of 4 years experience in circuit/packet switching techniques. Responsibilities include study of alternative switching configurations and interfaces to control arrangements for multi-service, wide-band systems.

• CONTROL RESEARCH
  Minimum of 6 years experience in real time control structures. Responsibilities include analysis of alternative control structures leading toward selection of next generation architecture. Capabilities in performing hardware/software trade-offs required.

• SIGNAL DISTRIBUTION RESEARCH
  Minimum of 4 years experience in carrier/multiplexing design. Knowledge of digital transmission required. Responsibilities include analysis of various distribution techniques for multi-service signals.

If you're the kind of person who enjoys a warm, sunny climate, uncongested communities, recreation and entertainment ranging from fishing, snow skiing and backpacking to spending an evening at the theater or symphony, you belong in Phoenix.

GTE provides competitive salaries, a complete benefits package including relocation assistance and a chance to change your lifestyle!

For immediate consideration, send your resume or letter of interest to: GTE Automatic Electric Laboratories, Manager of Manpower, Dept. BB0681, 11226 N. 23rd Avenue, Phoenix, AZ 85029.

GTE Automatic Electric Laboratories

GTE | Research and Development

An Equal Opportunity Employer M/F/H
Isn't it really challenge and growth you are looking for in your career? Well, no one can offer you more exciting opportunities in Information Services than Bechtel, a world leader in the Engineering and Construction Industry. With expansion into new markets and technologies, we can assure you of growing challenges in the Information Services Organization located in our San Francisco world headquarters, as well as offices located in Walnut Creek, California; Los Angeles County, California; Ann Arbor, Michigan; Gaithersburg, Maryland; and Houston, Texas.

We have a lot going for us: a tradition of success, an environment of opportunity and security which our diversity brings, and a bright, challenging environment. We are looking for you, an EDP professional, to share our success. You will be able to work on state-of-the-art projects using the latest hardware.

The Environment:

Hardware—Univac 1100/80's IBM 3033, regional locations equipped with IBM 4300s, IBM System 34s and 38s working with SNA

Mainline System Software—EXEC 8, System 2000, MAPPER


Language—COBOL, RPG, PL/1, FORTRAN

Our needs include:

• Large-scale systems development experience.
• Hands-on experience with IMS and CICS in a design environment
• Experience in quality assurance, configuration management, data base analysis, systems software, systems design and applications' development.

If your capabilities and experience qualify you for these challenges, consider this: In addition to career growth, Bechtel offers competitive salaries and an excellent benefits package including a DENTAL plan, medical and life insurance. A credit union, employees' club, and tuition refund program are available to employees.

For further consideration, send your resume to: Patricia Mabutas, Bechtel Power Corporation, Employment Dept. 15-8-81, P.O. Box 3965, San Francisco, CA 94119.

ADVERTISING OFFICES

Sales Manager: John M. Gleason
New York, NY 10103
665 Fifth Ave.
(212) 499-2579

Eastern District Managers:
A. Treat Walker, John A. Bartlett
New York, NY 10170
420 Lexington Ave.
(212) 682-7760

New England District Mgr.: William J. McGuire
Needham Heights, MA 02194
10 Kearney Rd.
(617) 449-1976

Southern District Mgr.: Warren A. Tibbetts
West Palm Beach, FL 33408
7621 West Lake Dr., Lake Clark Shores
(305) 964-6269

Midwest District Mgr.: Joseph P. Gleason
Chicago, IL 60601
3 Illinois Center Building, 303 East Wacker Dr.
(312) 933-3308

Western District Managers:
Alan Bolte, Jr.
Los Angeles, CA 90035
1801 S. La Cienega Blvd.
(213) 559-5111

James E. Filliardt:
Mountain View, CA 94043
2680 Bayshore Frontage Rd., Suite 401
(415) 965-8222

U.K., Scandinavia, Benelux
Tullo Giacomazzi, Martin Sutcliffe
Technical Publishing Co.
130 Jermy Street, London, SW1 4UJ, England
Tel: 01-839-3916
Telex: 914911

France, Spain
Gerard Lasfargues
32 rue Desbordes Valmore
750 16 Paris, France
Tel: (1) 504 97 94

Italy
Luigi Rancati
Milano San Felice Torre 7
20090 Segrate, Milano, Italy
Tel: 2-7531445
Telex: 311010

Switzerland
Andre Lehmann
ALAS AG, CH-6344 Meiershappel/LU
Tel: (042) 64 2350

Japan
Shigeru Kobayashi
Japan Advertising Communications, Inc.
New Ginza Building, 3-13 Ginza 7-chome
Chuo-ku, Tokyo 104, Japan
Tel: (03) 571-8746

Israel
Igal Elan
Daphna St. 24
Tel-Aviw, Israel
Tel: 260020

James B. Tafel, Chairman
John K. Abely, President
Robert L. Dickson, Exec Vice President
Calverd F. Jacobson, Vice President-Finance
Walter M. Harrington, Vice President and Controller

Technical Publishing
The Clark Publishing Corporation
A budget-management report from United Way

At United Way, volunteers carefully review the budgets, operating patterns and track record of agencies asking to become part of the United Way organization.

They scrutinize the various functions performed by the agency, look at the kinds of people it helps, and evaluate its success in delivering its services.

But what happens when a new service agency wants to become a United Way organization — especially when there may be two or more equally qualified organizations equally in need of United Way support? Who chooses? And on what basis?

The answer to this question is often complex. And sometimes it can be an agonizing decision to admit one agency instead of another.

The people decide

But the bottom line is that volunteers do make the decisions after carefully weighing all the pros and cons. It's sometimes a hard process, but it's as fair as we know how to make it.

Volunteers work free of charge doing everything from collecting money to deciding how it will be used, so administrative costs are kept low.

And that's how United Way works so well. And why.

United Way
Thanks to you it works.
For all of us.

**MAKING THE TOUGH DECISIONS**

**EDP SPECIALISTS**

**career search opportunities**

$18,000-$60,000

**MIS DIRECTOR** to $60,000. Our internationally known financial institution seeks aggressive exp’d DP pro for large telecom & network systems. True state-of-the-art environment. Degree pref. Refer GR.

**SR. ANALYST-COMPUTER TECHNOLOGY** —$45,000 + full relocate. This petroleum giant is developing a state-of-the-art teleprocessing network. Familiarity w/ latest IBM systems software req’d. High level second language helpful. Client has exceptional benefits including full relocation pkg to beautiful suburban setting. Refer MF.

**DP CONSULTANT** to $45,000. Leading edge oppy for Health Care DP pro to manage & direct large scale environment. Our international firm seeks degree + computer pro w/consulting bgd. High vis & growth. Refer GR.

**COMPUTER SALE$** to $40,000. Several clients in DC area seek 2-3 yrs exp in hardware sales to Gov’t. May consider good Gov’t software sales exp. Refer DM.

**PROGRAMMER ANALYST** to $28,000. Secure financial institution seeks COBOL programmer w/IBM bgd to work in a “state-of-the-art” shop in Baltimore suburbs. Refer DM.

**PROGRAMMER ANALYST** to $26,000. Major U.S. Corp in scenic, low cost Virginia area seeks strong COBOL programmer w/IBM bgd willing to train in DL-1. CICS. Refer DM.

**PROGRAMMERS — CHESAPEAKE BAY TO $25,000. Prestige industry leader seeks analyst & sci programmers exp’d in Fortran 6/0 or COBOL on IBM system. Opt for fast track to mgmt & lateral training program. Excellent benefits & relocation package. Refer JC.

**SEARCH OPPORTUNITIES**

We are searching for people like you to match with our client’s requirements.

For consideration, please send resume to Professional Employment, Dep’t JF-13, 3939 Fabian Way, Palo Alto, CA 94303 — or call (415) 494-7400, Ext. 4121. An equal opportunity employer, m/f.

**Computer Software Quality Assurance Specialists**

Use your formal computer science background and experience in software quality assurance, management and applications to develop and apply new standards to software engineering management.

Ford Aerospace & Communications Corporation, on the San Francisco Peninsula, has an immediate opportunity for individuals to independently analyze software project structures, identify and document project problems, recommend corrective actions, and provide direct support to projects where necessary in implementing actions.

You will need 5-8 years’ related experience plus U.S. citizenship and a current security clearance. The successful candidates may be required to undergo a background investigation.

For consideration, please send resume to Professional Employment, Dep’t JF-13, 3939 Fabian Way, Palo Alto, CA 94303 — or call (415) 494-7400, Ext. 4121. An equal opportunity employer, m/f.

**Ford Aerospace & Communications Corporation**

Western Development Laboratories Division

**FOX/MORRIS**

personnel consultants

**CONTACT OUR NEAREST OFFICE ABOUT THESE AND OTHER FEE-PAID OPPORTUNITIES**

**OUR UNIQUE COMPANY-OWNED OFFICE SYSTEM ASSURES PERSONAL CONFIDENTIALITY:**

**PHILADELPHIA, PA 19102—G. Romagna, 1500 Chestnut St., 215/561-6300**

**ATLANTA, GA 30308—R. Jennings, 47 Perimeter Center, 404/393-0033**

**Baltimore, MD 21204—C. Newman, 409 Washington Ave., 301/664-4500**

**Charlotte, NC 28202—E. Stone, 1742 Southern Nat'l Ctr., 704/375-0600**

**CLEVELAND, OH 44131—D. Thomas, 4601 Rockside Road, 216/324-8565**

**McLean, VA 22102—D. Miller, 1710 Goodridge Drive, 703/700-1393**

**New York, NY 10036—J. Dean, 1211 Ave. of the Americas, 212/840-6930**

**Pittsburgh, PA 15222—B. Sayers, 4 Gateway Center, 412/322-0410**

**Princeton, N.J. 08540—J. Dean, Route #1, 609/452-8135**

**WILMINGTON, DE 19899—J. Clark, 3516 Silverside Rd., 704/375-5888**

**Houston, TX 77098—Q. Smith, 3000 Richard Ave., 713/523-5988**

**Los Angeles, CA 90071—A. Jackson, 707 Wilshire Boulevard, 213/633-3001**

**San Francisco, CA 94111—W. McNichols, 601 Montgomery Street, 415/392-4353**

**Florham Park, N.J. 07932—W. Teizer, 248 Columbia Turnpike, 201/968-1571**
<table>
<thead>
<tr>
<th>ADVERTISERS’ INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTWARE &amp; SERVICES</td>
</tr>
<tr>
<td>Allen Services Corporation</td>
</tr>
<tr>
<td>Allen Services Corporation</td>
</tr>
<tr>
<td>Allen Services Corporation</td>
</tr>
<tr>
<td>Amcor Computer Corp.</td>
</tr>
<tr>
<td>American Used Software Co.</td>
</tr>
<tr>
<td>Atlantic Software Inc.</td>
</tr>
<tr>
<td>Central Canada Software Research</td>
</tr>
<tr>
<td>ComPuter Accounting Systems</td>
</tr>
<tr>
<td>C-S Computer Systems, Inc.</td>
</tr>
<tr>
<td>Dataware, Inc.</td>
</tr>
<tr>
<td>Duquesne Systems, Inc.</td>
</tr>
<tr>
<td>Duquesne Systems, Inc.</td>
</tr>
<tr>
<td>EPS, Inc.</td>
</tr>
<tr>
<td>Federated Consultants, Inc.</td>
</tr>
<tr>
<td>Mathematica Products Group</td>
</tr>
<tr>
<td>SAMS/SCM 1981 Joint Conference</td>
</tr>
<tr>
<td>S-Cubed Business Systems</td>
</tr>
<tr>
<td>SI Associates</td>
</tr>
<tr>
<td>Benson C. Stone &amp; Associates, Inc.</td>
</tr>
<tr>
<td>Vertex Systems Inc.</td>
</tr>
<tr>
<td>DP MARKETPLACE</td>
</tr>
<tr>
<td>Rental Electronics, Inc.</td>
</tr>
<tr>
<td>BUY SELL LEASE</td>
</tr>
<tr>
<td>C.D. Smith &amp; Associates, Inc.</td>
</tr>
<tr>
<td>Thomas Business Systems, Inc.</td>
</tr>
<tr>
<td>Unitronics</td>
</tr>
<tr>
<td>PERSONAL COMPUTING</td>
</tr>
<tr>
<td>AP Publications</td>
</tr>
<tr>
<td>Mensa</td>
</tr>
<tr>
<td>Micro Management Systems</td>
</tr>
<tr>
<td>JOB MARKETPLACE</td>
</tr>
<tr>
<td>Aetna Life &amp; Casualty</td>
</tr>
<tr>
<td>The Ohio State University</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOFTWARE SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOFTWARE for 11 &amp; VAX*</td>
</tr>
<tr>
<td>The AMERICAN Plan</td>
</tr>
<tr>
<td>A family of “high technology, state of the art” proven SOFTWARE products for DEC* 11 &amp; VAX.</td>
</tr>
<tr>
<td>DRS</td>
</tr>
<tr>
<td>• In use for 10 years... over 150 sites</td>
</tr>
<tr>
<td>• The acknowledged technology leader in DBMS</td>
</tr>
<tr>
<td>MODEL</td>
</tr>
<tr>
<td>• Interactive business modeling system for VAX</td>
</tr>
<tr>
<td>• Complete facilities, including linear programming</td>
</tr>
<tr>
<td>PAC</td>
</tr>
<tr>
<td>• Family of project management software</td>
</tr>
<tr>
<td>• Over 600 systems installed, from the world leader</td>
</tr>
</tbody>
</table>

Send For A FREE BRIEFING BOOK

AMERICAN USED SOFTWARE COMPANY
P.O. Box 68, Kenmore Station, Boston, MA 02215 (617) 437-7600
*DEC & VAX are registered trademarks of Digital Equipment Corporation

CIRCLE 500 ON READER CARD

**FILECOMP**

A HIGH SPEED FILE COMPARE UTILITY

DOS and OS versions available

The first efficient File Compare routine to truly go beyond IEB COMP. Extended features include optionally omitted fields, hex or character printing, variable error limits and file alignment after extra or missing records. For more information call or write today.

The Conversion Software People

Dataware, Inc.

2585 Elmwood Avenue
Buffalo, New York 14217

(716) 876-8722 • TELEX: 91519

CIRCLE 504 ON READER CARD
All Hands on DEC

Good news for PDP-11. It's smooth sailing for financial modeling, analysis and consolidation applications, as FCS-EPS is now working on all DEC systems including System 10, 20, and VAX.

FCS-EPS is the comprehensive package for developing decision support systems with a minimum of time and effort. More than just a modeling tool, FCS-EPS is a sophisticated, open-ended system utilizing a financially-oriented language easily applied by non-technical people. "What if", analysis, statistical analysis, risk analysis, hierarchical consolidation...it's all within the grasp of the financial information user with FCS-EPS.

Find out more about what to look for in truly user-oriented financial planning systems. Write today for our free brochure:

"Selecting and Evaluating Financial Modeling Systems"

CIRCLE 505 ON READER CARD

**SDM/70™**

**INCREASES DATA BASE PRODUCTIVITY**

AT JOY MANUFACTURING

According to Paul A. Taylor, Data Base Analyst at Joy Manufacturing Company, "While applying SDM/70 to the departmental needs of Data Processing Systems Development, Atlantic Software's SDM/70 was used as A COMPLETE SYSTEM FOR DATA BASE DEVELOPMENT AND MAINTENANCE."

Mr. Taylor went on to say that the immediate benefits realized by Joy included:

- better communication between Data Base Analyst and System Designers,
- more efficient use of manhours,
- less effort at project tracking,
- smoother transition from testing to implementation,
- easier coding of Data Base descriptions."

Joy also reports that "one of the most outstanding results of SDM/70 was the consideration of testing during the System External Specification phase of the development process."

"By planning ahead, the last minute entanglement of testing and debugging was reduced to a manageable routine."

If you are migrating to an On-Line Data Base environment, consider SDM/70, our industry's leading structured methodology. It can truly help you improve the demands upon and the productivity of your valuable resources.

Write to:

Robert P. Woolf, Exec. VP

ATLANTIC SOFTWARE INC.

320 Walnut St., Phila., PA 19106

(215) 922-7500

CIRCLE 507 ON READER CARD

**MSM**

**for Shared TAPE and DISK Mounts**

Transparency manages shared TAPE and DISK mounts.

- **MSM automatically controls TAPE ALLOCATIONS among your systems.**
- **MSM also works for SHARED MOUNTABLE DISKS.**
- **Allows more efficient TAPE DRIVE UTILIZATION.** Your tape drives will be treated as a single combined pool, rather than several smaller ones. This will have a tendency to reduce overall drive requirements.
- **Allocates confusing operator burdens.** Without MSM, operators must manually coordinate device usage among the various systems.
- **ELIMINATES COSTLY RE-RUNS due to inadvertent mass-system tape allocation.**
- **Provides a SINGLE-SYSTEM IMAGE with respect to device allocations.**
- **MSM is COMPLETELY COMPATIBLE with the standard operating system allocation philosophy.** MSM simply extends it to cover all systems in your complex.
- **MSM is the ONLY TRANSPARENT APPROACH to handling SHARED TAPE and SHARED DISK allocation.**

MSM now runs with MVS, SYSL, MVT, VSI and MFT.

New SORTSWAP feature allows MSM to reduce the scope of allocation "blockage" when a IBM tape SWAP occurs.

MSM can be installed in 10 MINUTES — NO IPL is required.

Requires NO SYSTEM MODIFICATION whatsoever.

Additional overhead caused by MSM is INSIGNIFICANT.

MSM is now being used in well over 100 installations throughout the world.

To Acquire MSM, or for more information...

Toll-Free 800-343-7533 x 203
( in OH: 513-690-1200) x 203

**PDP-8 MODULE EXCHANGE**

We have hundreds of PDP-8 modules in stock from the CLASSIC-8 through the PDP 8-A. If you have a module failure and need quick response, call us. We will send you a replacement module overnight, or same day service if you want it over-the-counter at the nearest airport. Then, send us your repairable module for the exchange credit. Ask for our exchange rates.

Contact Brier (214) 428-5300, ANSWEREX: 278-4031

Federated Consultants, Inc.

1218 S. Ervay

Dallas, TX. 75215

CIRCLE 508 ON READER CARD

**COMPUTERS IN AMBULATORY MEDICINE**

Joint annual meeting of the Society for Computer Medicine (SCM) and the Society for Advanced Medical Systems (SAMS)

October 30-November 1, 1981, Washington D.C. preceding the Symposium on Computer Applications in Medical Care.

Tutorials include office appointment and billing systems, how to analyze databases and computerization of medical records and codes. Sessions will address primary and specialty care medical information systems, their integration with hospital systems, ambulatory administrative management, and selection of hardware and software for medical computing. Exhibits in conjunction with SCAMC.

Contact: SAMS/SCM Conference, Ste. 311, 4405 East-West Hwy, Bethesda MD 20014 (301) 530-7120.

SAMS/SCM Members $115 • Non-Members $165 + 12 hours CME plus 3.5 hours per tutorial • 12 ACOG cognates.

CIRCLE 509 ON READER CARD

**NEW LIFE FOR 1401 PROGRAMS**

CS-TRAN converts your 1401 object programs to COBOL for the mainframe or mini of your choice.

CS-TRAN is the only translator that accepts your object programs, patches and all, yet allows you to include actual COBOL paragraph names and record definitions.

If you'd like more details about new life for your 1401 programs just call or write Russ Sandberg.

C-S Computer Systems Inc.

90 John Street. Nez York, NY 10008 - 212-349-1535

CIRCLE 510 ON READER CARD
ATTENTION SHARED DASD AND SHARED TAPE USERS... YOU NEED SDSI/STAM

- SDSI protects data integrity by guarding against concurrent update from multiple CPUs.
- SDSI automatically improves system performance by eliminating device RESERVES.
- STAM eliminates RESERVE LOCKOUTS.
- STAM provides operator and TSO users information about distant conflict conditions.
- STAM requires no system or user program modifications and installs in minutes.
- STAM automates the sharing of tape and DASD devices thus allowing allocation decisions to be made faster and reducing the possibility of human error.
- STAM makes more efficient use of tape pools thus allowing you to reduce tape drive requirements.
- STAM provides global operator communication and control.
- STAM eliminates job re-runs due to multiple tape drive allocation error.
- STAM requires no system or user program modifications and installs in minutes.

TWO ALLEGHENY CTR.
PITTSBURGH, PA 15212
PHONE 412-322-2600
TELEX 902 803

MPGSWIFT for TP applications
Maximize staff productivity and customer service with MPGSWIFT

Ease of Use
Learn to write TP applications in one day

Ease of Installation
Install in one hour

Maintenance
Add terminals, files, programs while MPGSWIFT continues to operate

Language Support
 Cobol, Assembler, PL/1, Fortran, RPG, RAMIS

Evolution
Entry level to large network without reprogramming

Productivity
Online program development with one-half the effort
Over 100 installations, DOS, DOS/VS, and DOS/VSE

Productive software for business data processing from
Mathemtica Products Group
P.O. Box 2392 Princton, New Jersey 08540 609/799-2600

COBOL
FOR DEC RSX-11M VER. 3.2 USERS
Compile and execute large COBOL programs
- Compilation capacity exceeds 5000 lines
- Dual task runtime can use up to 128K byte memory space
- Virtual array support

ADVANCED SET OF ANSI-74 FEATURES
- String and Unstring
- Corresponding
- SORT using integral SORT package
- Indexed files without requiring RMS-11K
- Segmentation

SINGLE SYSTEM BINARY LICENSE ... $3950
MANUALS ALONE ... ... ... ... ... ... ... ... ... $25

BENSON C. STONE & ASSOCIATES, INC.
P.O. BOX 28658
SAN DIEGO, CALIFORNIA 92127
(714) 485-7779

KEEP IT SIMPLE
Interactive COBOL?
Menus, menus, menus...?
Changes—what if...?

UCP Universal Control Program.
- grants you freedom to create.
- automatically builds menus as you build or takeover programs.
- self documenting.
- grants user access by function name, but only to those properly authorized.
- comes ready to run on your Data General COBOL system.
- will let you know who did what, when and what took the time.
- "HELP" will always list your options.
- comes with source programs.

For details call: USA: Emec Inc. (305) 457-9400
UK: Group NH Ltd. (990) 20435
Continental Europe: Gradata AG, Switzerland
or write: SI ASSOCIATES
Box 59, A-1035 Vienna, Austria, Europe

DEC RSTS
DBMS SOFTWARE
DEC GOLD STAR RATED
TCP MILLION DOLLAR AWARDED
AMBASE A complete application development tool and DBMS, increasing the productivity of programming staffs worldwide from 100-900%
- DATA MANAGEMENT SYSTEM
- REPORT GENERATOR
- QUERY LANGUAGE
- SCREEN FORMAT GENERATOR
- AUTOMATIC CODE GENERATOR

DECAM COMPUTER CORP.
500 Plantation Drive, Louisville, KY
502/858-0800
Regional Offices: Atlanta, CA/San Jose, CA

IBM
RPG II System 3, 32, 34
Software Packages
- GENERAL LEDGER
- ACCOUNTS RECEIVABLE
- PAYROLL
- ACCOUNTS PAYABLE
- INVENTORY
- ORDER ENTRY-INVOICING
- GENERAL LEDGER
- ACCOUNTS RECEIVABLE
- PAYROLL
- ACCOUNTS PAYABLE
- INVENTORY
- ORDER ENTRY-INVOICING

Technical Publishing
COMPETITOR RATING

DATAMATION, magazine
1981 MAINFRAME USER SURVEY AVAILABLE NOW.

The 6th annual comprehensive analysis of EDP users' present equipment status, buying plans and attitudes toward the market has just been completed. This up-to-date report is essential data for industry analysts, planning and marketing executives as well as computer users. This 300+ page report is $750 plus postage and handling. $700 postage paid, if payment is enclosed with the order. $350 for each additional copy.

For more information call Shirley Stirling or Kathy Murray, 800-223-0743.

CIRCLE 510 ON READER CARD
**MOVE THE GOODS.**

**USE THE DATAMATION MARKETPLACE ADVERTISING SECTION**

CALL KATHY 800-223-0743 OR SHIRLEY 800-223-0746

---

**PERFORMANCE MANAGERS AND ANALYSTS . . .**

You’ve tried solving your performance problems with hardware monitors, sampling software monitors, unsatisfactory billing systems, SMF and RMF inadequacies, simulators. Now, try the premier product in the industry! QCM. QCM is the only complete system that precisely monitors ALL hardware and software processes, accurately bills ALL operations and IMPROVES performance . . . ALL on a full-time basis. Let us show you how QCM has meant control, efficiency, confidence and dollars to our customers.

---

**PREVENT “Wild Cards” IN YOUR DATA**

with . . . **SUPER-MSI**

Multiple Systems Integrity Facility

**SHARED DASD USERS:**

- **PROTECTS YOUR DATA INTEGRITY by** preventing simultaneous destructive updates by jobs in different systems.
- **Eliminates RESERVE Lock-outs (both performance Lock-Outs and “deadly embrace”)**
- **DOES NOT SACRIFICE RELIABILITY as** do other approaches to the problem.
- **Newly extended VSAM Dataset Integrity options.**
- **Inform Operators and/or TSO users (as appropriate) about the precise task (job, TSO user, etc.) causing dataset conflicts.**

**In Europe:**

Mr. J.A. Kaluzny
UNIVELY CORP. • 15 Darmstädter Str. 2 Hamburg 36 • West Germany
Tel: 040 3490 2229

---

**SOFTWARE CHANGE CONTROL**

Universal Cross-Reference Program Automatically Generates Installation Wide Cross-References Between Main-Lines And External Sub-Routines.

When a sub-routine changes it is essential to find out what other programs are calling it because they all have to be re-linked or re-compiled! Files used and macros called references are also generated.

Now available for COBOL and PL/1 shops with OS or VM setups.

---

**This free new catalog offers 4,931 “like new” electronic instruments for sale.**

All the electronic equipment offered has been recently removed from the inventory of Rental Electronics, Inc. and comes with a money back guarantee. To take a look at a very large variety of well-priced electronic test equipment and instrumentation . . .

Phone toll-free (800) 225-1088

In Massachusetts, call (617) 273-2777. Or, you may get your free new catalog by writing:

REI Sales Company
19527 Business Center Dr.
Northridge, CA 91324

---

**CENTRAL CANADA SOFTWARE RESEARCH**

P. O. BOX 425
STREETSVILLE STATION
ONTARIO CANADA LSM 2B9
(416) 826-8473

CIRCLE 519 ON READER CARD

---

**DUQUESNE SYSTEMS INC**

TWO ALLEGHENY CTR.
PITTSBURGH, PA 15212
PHONE 412-323-2600
TELEX 902 803

---

**JUNE 1981 247**
BUY, SELL, LEASE

DEC

SYSTEMS & COMPONENTS

C.D. SMITH & ASSOCIATES, INC.
12605 E. Freeway, Suite 318
Houston, TX 77015
713-451-3112

JOB MARKETPLACE

Experienced Systems Programmers/Programmer Analysts

Send resumes to: Mary Scott, (203) 273-3790, Recruiting Office, /Etna Life & Casualty, 900 Asylum Avenue, Hartford, CT 06156. An equal opportunity/affirmative action employer.

PERSONAL COMPUTING

DISCOUNT TRS-80® DEALER AS01
COMPUTER SPECIALISTS

FREE COMPUTER CATALOG UPON REQUEST

$ DISCOUNT $ on TRS-80's
26-3001 4K Color........... $253.00
26-1062 16K III........... $972.00
26-4002 64K DRIVE........ $340.00
1-800-841-0860 TOLL FREE
MICRO MANAGEMENT SYSTEMS, INC.
Downtown Plaza Shopping Center
115 C. Second Ave., S.W.
Cairo, Georgia 31728
(912) 277-3120 Ga. Phone No.

The Ohio State University invites applications for the position of Director - Academic Computing. Ph.D. degree and extensive knowledge of the computer field are required as well as five years of appropriate experience. Salary is negotiable. Application deadline is June 30.

Send inquiries to:
Dr. Dorothy Jackson
Associate Provost
Office of Academic Affairs
The Ohio State University
190 N. Oval Mall
Columbus, Ohio 43210

An Equal Opportunity/Affirmative Action Employer

WHAT'S YOUR I.Q.?
FIND OUT FOR $8

Mensa, the non-profit international high I.Q. society will send you your confidential score. For a standard I.Q. test you take in the privacy of your home or office, send $8 check or money order to cover processing to Mensa, Department 122, 1701 West Third Street, Brooklyn, New York, 11223. If you’ve scored at or above the 98th percentile on any major I.Q. test, write for free brochure.
Join Aramco Services Company in Houston for excellent money, benefits and a challenging career

When Aramco Services Company hires you for a data processing position supporting Aramco operations overseas, you'll earn a fine, competitive salary. And you'll participate in very attractive benefits programs.

You'll also gain EDP experience that you probably could not duplicate anywhere. Your work will be in support of Aramco, the largest oil-producing company in the world.

 Phenomenal overseas operations depend on Houston people

In Saudi Arabia, Aramco is involved in dozens of incredibly large and complex projects. Probably nowhere else in the world is modern technology being employed so widely. Aramco Services Company in Houston plays a significant role in all of it. If you have the qualifications, we have the following openings now in Houston.

 **Systems Analysts**

We're looking for an individual with a minimum of 10 years' experience in a primarily large IBM compatible environment. Proficient at technology investigations, special studies in areas like graphics, word processing, mass storage, network directions, and/or any similar emerging technologies.

We are also looking for a systems analyst with 4 years of DP experience, with at least 2 years on staff or the applications development areas. This position is administrative in nature involving budgeting, contracts, project control, and DP chargeback. There is an excellent opportunity for advancement to a supervisory role.

 **Data Dictionary Analyst**

We need someone with a minimum of 3 years' experience in IMS, at least one of which involves data dictionary use, including data dictionary planning, standards, procedures, etc.

 **Data Base Analysts**

A minimum of 3 years' experience is required in IMS data design for online systems. Familiarity with logical relationships and secondary indices is a must, and ADF and/or PL1 would be helpful.

 **Data Base Support Analysts**

Required is a minimum of 2 years' experience in IMS system support, including use of BTS, IMS utilities, and DB performance and tuning tools (IMSPARS, IMSASAP, DB and DC monitors, etc.)

 **MVS Systems Programmer**

Successful candidate will need a minimum of 7 years of systems support, including at least 3 years supporting MVS. You must also be familiar with SMP-4 and JES2. TSO support and NJE support would be helpful, as would ACF2.

 **General Systems Programmers**

Needed is 3 years of DP experience, with at least 1 year of installing program products, managing DASD environment, troubleshooting systems problems (JCL, compilers, dumps, etc.).

 **Commercial Programmers**

Required is 2 years of DP experience, as well as familiarity with PLI, OS/MVS, JES2, JCL, and IMS DB/DC. Some experience with systems analysis and structured techniques is required. Also experience with projects involving treasury, industrial relations and payroll areas.

We also need Commercial Programmers having a minimum of 3 years' experience, and familiarity with PLI, TSO, IMS DB/DC, OS utilities, and MARK IV/SAS. You will be responsible for developing and maintaining software in our operations, purchasing and traffic systems.

 **Commercial Analysts/Programmers**

Required is a minimum of 3 years' experience in design, analysis and programming of commercial applications systems, and a minimum of 2 years in IMS on-line DB/DC and PLI. ADF and MARK IV experience are highly desirable.

 **Training Analyst**

Needed is 3 years of DP experience one of which is in an EDP training-related capacity. You'll coordinate and assist in the administration of departmental training programs.

 **Standards & Procedures Analyst**

We're looking for someone with 3 years of DP experience in systems analysis and technical writing. You'll develop standards, procedures and manuals, and conduct research and analysis to ensure quality and consistency of documents.

All positions require a BS or BA in Computer Science, Math, Business, or related field.

Send your résumé in full confidence, or write for more information to: Aramco Services Company, Section DM0601JC04A, 1100 Milam Building, Houston, Texas 77002.
Convert to CICS... Automatically.

Break the chains with DASD's new automatic translator. Automatically converts your System/3 CCP RPG programs to standardized, modularized CICS/VS Command Level COBOL.

There's more. It also converts all screen references to CICS RECEIVE, MAP/SEND/READ-NEXT/WRITEREWRITE instructions. Generates complete routines for MAPFAIL, IOERR, END FILE, DUPKEY and others. And converts screen definition from DFF to BMS... automatically adjusting for attribute byte differences between CCP and CICS, and producing either CICS/VS Version 1.4 or 1.5, plus printed diagnostics.

This is one of many DASD translators now available—all proven and thoroughly documented. From the list shown here, select those you're interested in. Then send or call for more information.

DASD can provide any level of conversion service, from simple per-line/per-program conversions through complete turnkey projects. We're the conversion specialists.
INTEGRATED CIRCUIT INDUSTRY
Is Important To You,

STATUS '81 is VITAL

...as an overview on:

- WORLDWIDE BUSINESS CLIMATE
- FORECAST OF SEMICONDUCTOR PRODUCTION/CONSUMPTION
- KEY APPLICATIONS AND TRENDS
- MILITARY/AEROSPACE MARKET
- CUSTOM AND SEMICUSTOM ALTERNATIVES
- PROFILES OF TOP IC MANUFACTURERS
- IC MANUFACTURING ECONOMICS
- KEY TECHNOLOGIES

This annual state-of-the-art report is the definitive executive reference for the integrated circuit industry.

Price $95
Additional copies $55 each.
(Shipped postpaid if payment is included with order)
Postage & Handling: $5 per copy in U.S.
$15 Overseas/Air Mail

INTEGRATED CIRCUIT ENGINEERING CORPORATION
15022 N. 75th Street • Scottsdale, Arizona 85260
Tel: 602-998-9780 • Telex: 165-755 ICE SCOT

CIRCLE 206 ON READER CARD
JUNE 1981 251
Telex proudly brings you another first. A new generation of 278 displays teamed with a new 281 desk-top printer.

So now your 3278/3277 plug-compatible display stations from Telex can have instant access to data. And an instant record. For the files. For the boss. For anything. Your operators can stop tying up costly printers. Or hand copying data from the screen. In addition, the new 281 attaches to Telex's 277 display products as well as our new 278 product line.

The new 278 displays give you a choice of larger display capacities. In addition to the standard 1920 character display, you can now order 2560, 3440, or 3564 character displays. Each with an independent 25th line function.

Options include a new response time indicator that displays system response from the host to your Telex terminal. Other features designed to enhance your operator productivity include a new row and column indicator for cursor position. A keystroke counter. Over 30 keyboard layout selections. And other extras.

With more than 50,000 terminals shipped worldwide, Telex continues to be your first 3270 terminal alternative. For more information about the new Telex 278-277/281 combination contact Telex Terminals Marketing.

Toll free (800) 331-2623.
Attempts at reducing program maintenance costs have proven to be wastefully expensive and obviously unsuccessful. This is partly because currently acceptable documentation methods affect maintenance costs only minimally. There is a simple way to prove this point. Give two programmers the same modification specifications to the same program. Permit only one access to the documentation folder. Do not be shocked when you discover there is no appreciable difference in their resulting modification completion time. This in spite of the substantial price that was paid to install either the company’s or the vendor’s documentation package.

The blame for excessive maintenance cost must be placed at dp management’s door. The heads of the corporations cannot recognize this failure because there are no successes with which to compare it. Dp publications also deserve some blame. They claim to be very aware of this overburdening budget item called maintenance cost, yet they continue to publish only articles about currently accepted (and sure to fail) program documentation methods.

The emphasis for program documentation should be where the name implies. That is, in the program (source coding) and nowhere else. Yet I know of no dp department that has its major program documentation efforts there. There’s another problem: using the excuse of standardization in database processing, some dp managers have permitted the COBOL copy library (created from the database dictionary) to use the same data names as the assembler copy library. In one stroke of genius, they have nullified the most important reason for the very existence of the COBOL language—understandability through the use of English. Assembler data names are limited to eight positions and are not very meaningful.

The result is coding instructions such as:

IF MEDTRNTP = 'A' PERFORM ALL-TRN THRU EXIT-1.

(If you understand the above instruction, you are psychic.) Proper COBOL coding would have looked more like this:

IF MEDICARE-TRANSACTION-TYPE EQUAL 'A' PERFORM 150-ALLOWANCE-TRANSACTON THRU 160-ALLOWANCE-EXIT.

Multiply the former type of instruction manystand in any given program and you can visualize a great contributor to excessive program maintenance cost.

By the way, many managers do not limit their COBOL copy library to the assembler copy library data names, but the COBOL data names they do permit are not much more meaningful; ergo, the same results.

As a project leader, I developed a system that dramatically reduces program maintenance cost at the project level. The effort needed is far less than what is necessary for current unrewarding methods.

The following is an excerpt of the new system’s resulting source coding:

0300-PATIENT-ADMISSION. IF ADMIT-RECORD-ERROR-FREE EQUAL 'YES' PERFORM 0800-ADD-TO-PATIENT-FILE THRU 0850-ADD-TO-PATIENT-FILE-EXIT ELSE PERFORM 1010-REPORT-ADMIT-ERRORS THRU 1050-REPORT-ADMIT-ERRORS-EXIT. 0350-PATIENT-ADMISSION-EXIT.

WHEN THE ADMIT RECORD IS FOUND TO BE FREE OF ERRORS IT IS ALSO AN INDICATION THE KEY TO THE PATIENT FILE WAS NUMERIC. THIS KEY MAY STILL BE INVALID AND THAT WILL BE DETECTED WHEN AN ATTEMPT IS MADE TO ADD THE PATIENT RECORD TO THE PATIENT MASTER FILE.

The time needed for the additional coding is more than made up for during debugging and testing because of the program’s understandability.

This system cannot make logical programmers out of illogical programmers or structured programmers of nonstructured programmers. What it does do is to make all programmers (no matter their capabilities) write source coding which is clearly understandable, self-documented, and standardized.

At this juncture, I should say that my project was 99% COBOL. Though this new system and its processor are strictly COBOL-oriented, I feel sure the same idea can be tailored to other programming languages.

The main obstacle is dp management, and at this point, I have yet to overcome it. I have described this new package to numerous data processing managers without success. Perhaps the reason is that this system can only be utilized when writing new COBOL programs. Therefore, its effectiveness in terms of maintenance cost will not be realized until the ratio of new to old COBOL programs becomes significant. How long this takes will vary with each company’s stage of development.

Most managers do not wish to expend effort or show expenditures for anything new unless it can bring immediate and apparent results. But the bottom line is that each COBOL program currently being written is another banana for the (excessive maintenance cost) monkey on management’s back. Management has these alternatives: to continue as it is, risking progressive deterioration, or to accept a new, simple approach and get that monkey off its back.

—Jerry Silner
New York, New York
MOVING ALONG...

Well the guy from the computer center was right. We do move computers and equipment around as if they were bags of potato chips. Just about the time we get all our intercomputer network communications settled down, one of the powers-that-be decides we really don’t want the CDC computer “colocated” with the number one IBM system; it really should be moved to Skansonia where all the other CDC computers reside.

It’s a way of life. Some computer personnel do nothing but work out the details of the next move—it’s even written that way in their job descriptions. This brings me to the reason for this tale.

With the frequency of computer center changes, it became pretty obvious our multiple computer center network was being negatively affected. In the past, those of us at network control found out about a move just as it was happening and if (when) things went wrong, we fixed them on the fly.

After a lot of grumbling, a group of us put together a case history of what had been going on for the past 18 months. After that, we met with as many computer center people as we could and tried to project what was going to happen. Once we had a plausible story, off we went to our network managers and their committees. The result was inevitable: network control was assigned the responsibility to analyze the effect of computer center moves and to ensure that no adversities befell network production.

The first few months were a nightmare. It still amazes me...
Is Your Income Keeping Pace with the Computer Salary Boom?

To find out, call today for our new 1981 Computer Salary Survey... It's FREE!

Salaries of computer professionals have risen this year by as much as 20%. Is yours keeping pace? How does your current salary compare with those of other professionals at your level of responsibility and experience? Is your income growth keeping up with inflation? Are you making as much money as you should—or could be? Is your career heading in the right direction?

Now you can easily find out, simply by calling Source Edp and asking for your copy of our just-released, 1981 Computer Salary Survey and Career Planning Guide. It's yours, free!

National salary averages for 1981 are shown for each of 48 categories including programming, software, systems design, data communications, mini/ micro systems, data base, EDP auditing, computer marketing, management and many others—at various levels of experience.

The Survey also defines each level of responsibility, shows you how to establish career goals, develop a plan of action, evaluate your progress, take corrective action when necessary and in general, keep your career growth on the best possible course.

This is a career tool every computer professional should have, especially if you have most of your career ahead of you.

The 1981 Computer Salary Survey and Career Planning Guide has been compiled by Source Edp, North America's largest recruiting firm devoted exclusively to the computer profession. Since 1966, our annual Survey has helped thousands of computer professionals make the best decisions for their future. And now, at the threshold of sweeping changes in the industry, this new Survey can be of particular importance to you.

Call for your free copy of the 1981 edition today—in strict confidence, and with no obligation whatsoever to use our services.

Source Edp
North America's largest recruiting firm devoted exclusively to the computer professional. Client organizations assume our charges.

Call today for your FREE report

Simply phone the Source Edp office nearest you

If unable to call, write Source Edp, Department D6 Suite 227
2 Northfield Plaza
Northfield, IL 60091
312/441-5200

(When writing, please be sure to indicate home address and current position title.)
how many little things that are the lifeblood of a multicomputer network can be overlooked. Communications, for example. The story about moving a CDC computer to Skansonia is true. Both the CDC and the number one IBM computer used to sit side by side. Both computers are part of our network. Intercomputer communications between the two systems was accomplished via a wide-band channel-to-channel connection. Data rates on the order of 50Mbps could be supported. This rate so exceeded our needs that nobody ever thought to measure our actual transmission rates. Once the CDC computer was moved to Skansonia, none of us had any idea what rate of remote intercomputer communications would be required.

The textbook solution is to analyze current performance data for the communications link, and size the new circuit accordingly. So much for the textbook. Like many computer systems, performance data containing the specific numbers we needed wasn’t available. Oh, we had some manually generated counts of the number of messages sent in each direction between the two systems, but nowhere did these counts show the size of the messages. A message could be one word or a million; there was just no way to tell. (The solution in this case was finally worked out by one of the network control people along with a bright soul from the IBM computer staff: a simulation of the past month’s work was performed using data extracted from the CDC accounting tapes.)

Unfortunately, the above case was typical. Almost every time we started to coordinate a move, we lacked a critical piece of data. We had to make special efforts to gather the necessary numbers. This caused delays (some of them difficult to explain to senior management), and sometimes friction among participants.

The solution is not quick, easy or inexpensive. A conscious effort must be made by all of us in the computer industry to specify performance instrumentation as part of functional requirements. In the case of our network, if we specify that a communications link must meet a specific data transmission rate, then the ability to monitor the actual data rate should be specified, too. This is not “gold plating”; it is a necessary tool to determine if requirements are being met efficiently and cost-effectively.

Even this approach is no panacea. It is, however, a first small step along a path that will allow us to do our jobs better and establish in the minds of our customers the notion that computer people are the professionals we claim we are.

—David A. Feinberg
Seattle, Washington

Answers to puzzle on p. 254
ABBR NAMERAS
PALE ADAMVILE
PLUGCOMPATIBLE
JAMESHMALOON
ELY EINEOCEAN
GUTSTELLA
BARESARIISON
TEL CORPORATION
HOCOTEBEEFY
ANABASFED
REPELIKITEBVI
DOWNTHEDRAIN
COMPETEWITHIBM
AREA CLANALEE
DOWN TSK KERN
Not enough? Then perhaps you should take a closer look at MICOM's new one-day Seminar, *Data Communications for Minicomputer Users*.

Like many people new to data communications, you are probably getting started with a minicomputer from DEC, Data General, or Hewlett-Packard. Whatever your minicomputer, the MICOM Seminar will help you recognize and understand the available alternatives to help you send data most cost-effectively between your remote terminals and your computer. In layman's language, we will teach you the basics of data communications and what all the 'buzz words' really mean. You will learn how to eliminate the effect of phone line 'glitches' and how to select the right modem for your application. You will also learn the 'tricks of the trade', how to get the best out of the telephone company, and what equipment you will need to keep telephone line costs to a minimum. In addition, the comprehensive Data Communications Glossary included with the Seminar Notes will be a permanently useful reference source.

With more than 2,000 attendees, our 1980-1981 Seminar Series produced an overwhelmingly positive response: "a great seminar...", "it would be hard to make it better...", "the Seminar Notes are outstanding...", "I liked the section on 'tricks of the trade'..."

Our 1981-1982 Seminar Series will cover 50 locations, starting in September 1981. If you attended a previous Seminar, you may wish to attend again as a refresher or send your friends or associates to get the latest information in this fast moving field.

Space is limited, so call or write today for our 4-page Seminar brochure which includes a description of the Seminar, enrollment information, our 1981-1982 schedule, and a reply card for registration. We think you will find it a worthwhile investment for you and your company.
We know it's not easy. Because, even though they're slow and noisy, those old Teletype® teleprinters just keep chugging away.

But once you've seen our replacements, the microprocessor-driven 42 and 43 BSR, you won't want to wait another minute.

The 42 and 43 BSR's (Buffered Send/Receive) are the newest members of the Teletype 43 family. Designed to give you flexibility never before available in a 5- or 8-level multipoint private line system.

You get 80 keyboard selectable options, more efficient editing and a choice of several printers. Plus, they're quieter, faster, more compact and easier to maintain than your old teleprinter.

And, because they're compatible with your old selective calling system, you can bring them in one at a time.

Finally, you'll never have to worry about reliability because the 42 and 43 BSR's are part of the proven 43 family of teleprinters.

In fact, the only thing you'll have to worry about with your new Teletype teleprinter is how to say goodbye to your old Teletype teleprinter.