DATAMATION 80®

NOVEMBER/4.00 U.S.A.

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Speed isn't their only advantage—they handle beautifully. Data densities of 200/556 cpi or 556/800 on the 7-track unit and 800 cpi, 1600 cpi or 800/1600 cpi on the 9-track. The format is NRZ1/PE.

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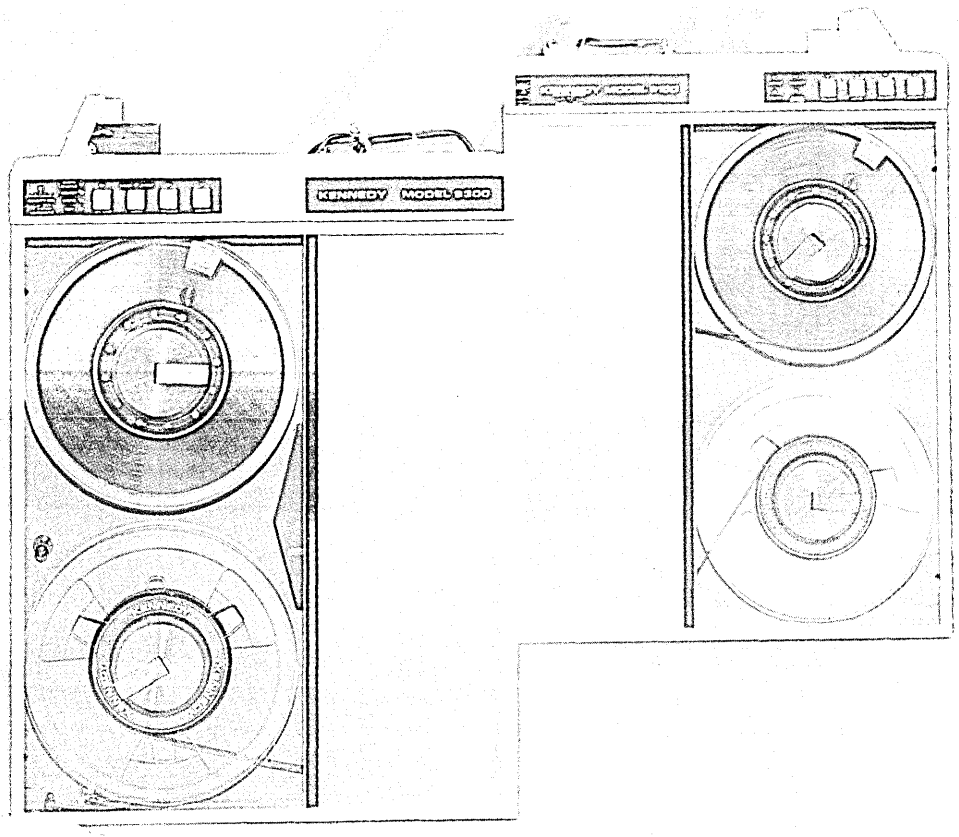

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If you need a low-cost business computer that can do both word and data processing, the AM Jacquard J500 is your solution—and that's a fact. It is the most powerful stand-alone system available, so it figures that it can handle all your word and data processing needs. And at a cost you can handle, because it's like getting two systems for the price of one.

The J500, a major advance in business computers, is the stand-alone version of our multi-function, multi-station J100 with all of its software capabilities. It has 128K bytes of memory, high-speed throughput and expandable storage capacity.

The J500 system supports both line and character printers and can be augmented with telecommunications devices which allow it to

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So any way you figure it, the J500 is the one system for all your word and data processing tasks. Today and tomorrow. And that's a fact, too.

For more information, 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.

LET'S TALK ABOUT FACTS AND FIGURES.

CIRCLE 4 ON READER CARD

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THERE'S NO COLD SHOULDER HERE

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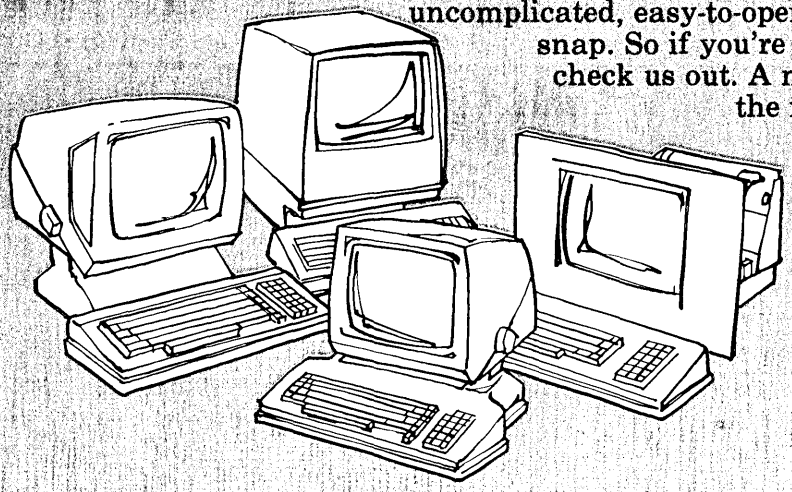

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DATAMATION 80

NOVEMBER 1980/$4.00 U.S.A.
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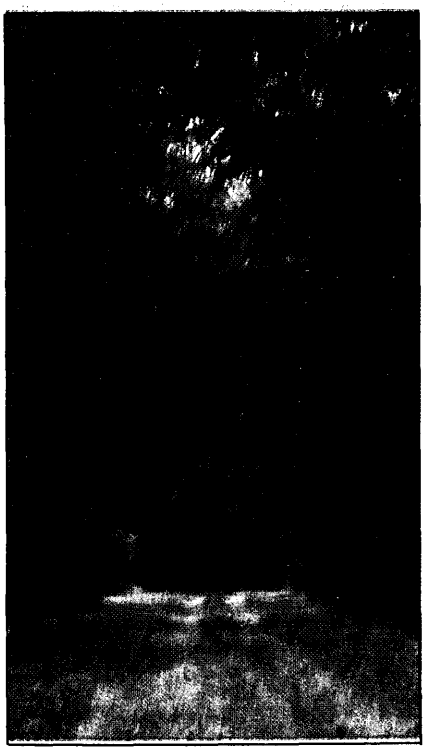
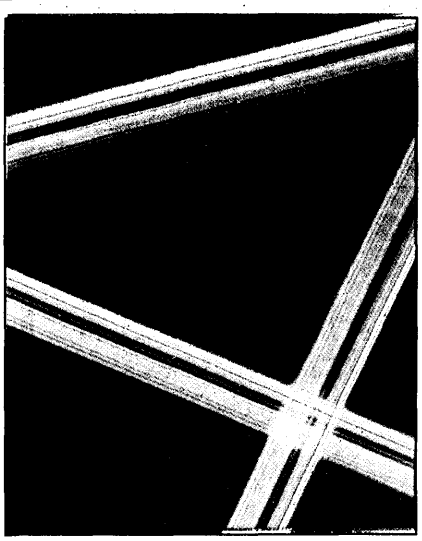
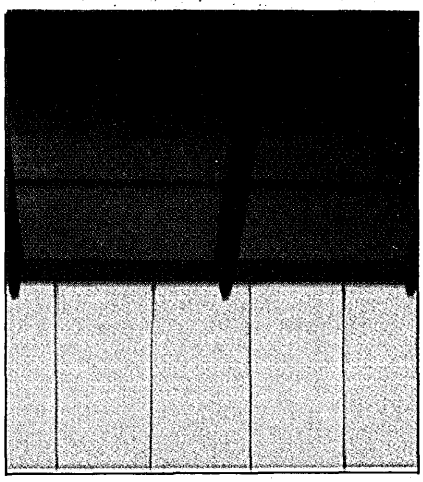
This issue, 159,615 copies

FEATURES

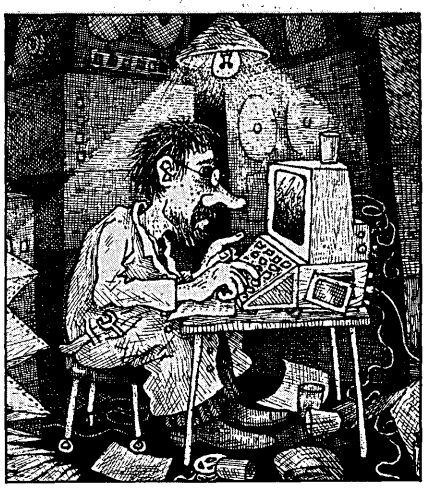






NEWS IN PERSPECTIVE

DEPARTMENTS



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"Our NCR operating software makes our programmers more effective."

Richard Shurley, Capital City Press,
Publishers of STATE-TIMES and MORNING ADVOCATE

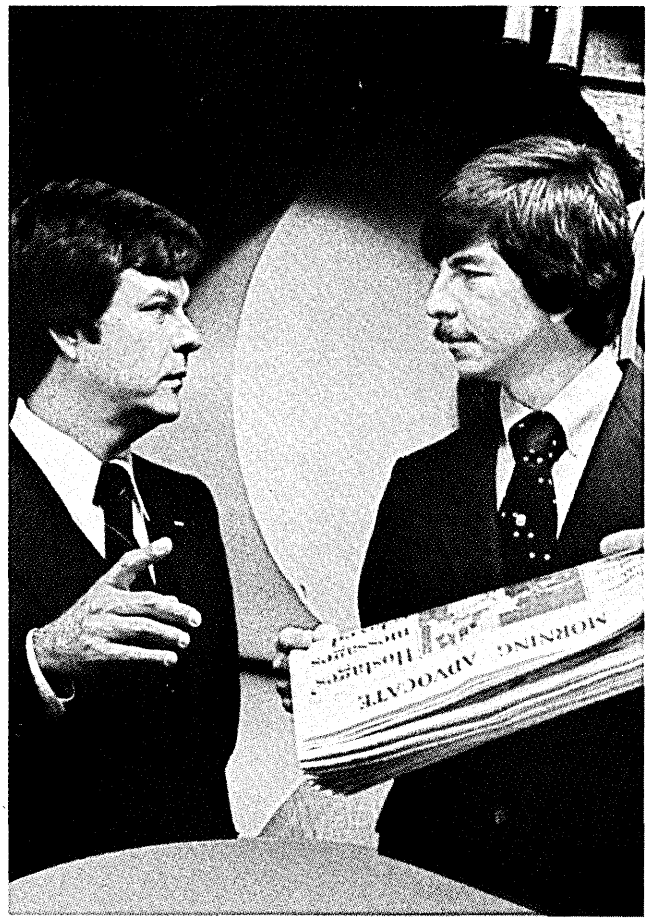
SHURLEY:
We've come a long way in a short time. With NCR's advanced software we've gone from a simple batch system to an online virtual memory system that gives us direct access to the data base. In less than two years. We now have the system we need to respond quickly to the needs of our management.

NCR's MILLER:
You were one of our software pioneers, too.

SHURLEY:
We were NCR's 11th VRX site. And the first to install VRX TOTAL, VRX TRAN-PRO and VRX TRAN-QUEST.

NCR's MILLER:
It's very unusual for one user to step out front so often.

SHURLEY:
We kept coming back for just one reason: it kept paying off. It's hard for anyone with data processing experience to believe what we have accomplished with a small, efficient staff and NCR's versatile basic software. Our programmers have really broadened their potential.



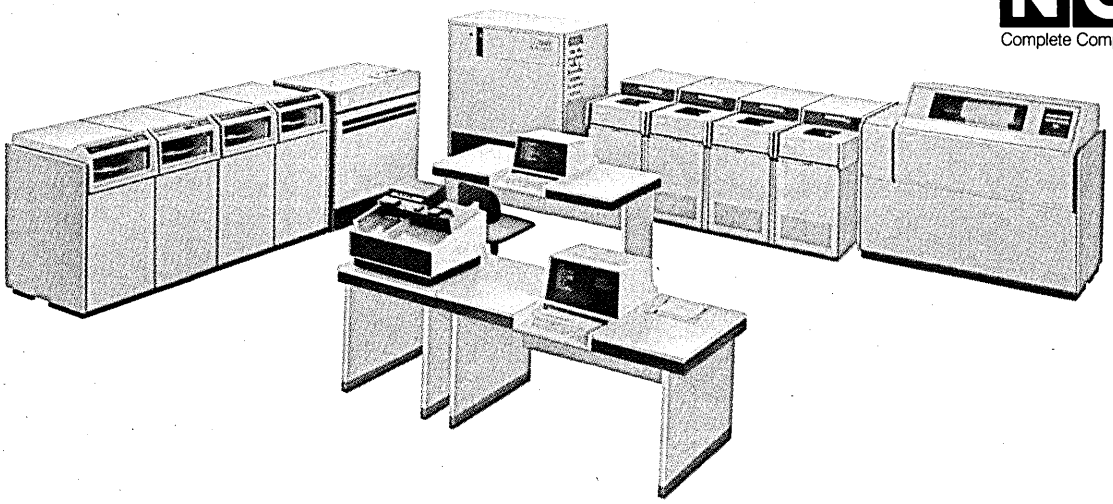
Richard Shurley (right) is Data Processing Manager of Capital City Press, Baton Rouge, Louisiana. Thomas Miller is the NCR representative.

* * *

VRX (for Virtual Resource Executive) is NCR's most sophisticated operating system. TOTAL is the data base management system. TRAN-PRO simplifies transaction processing. And communications programming. TRAN-QUEST makes it easy for anyone to get exactly what he needs to know out of the data base. But only if he is authorized to pass through the security barrier.

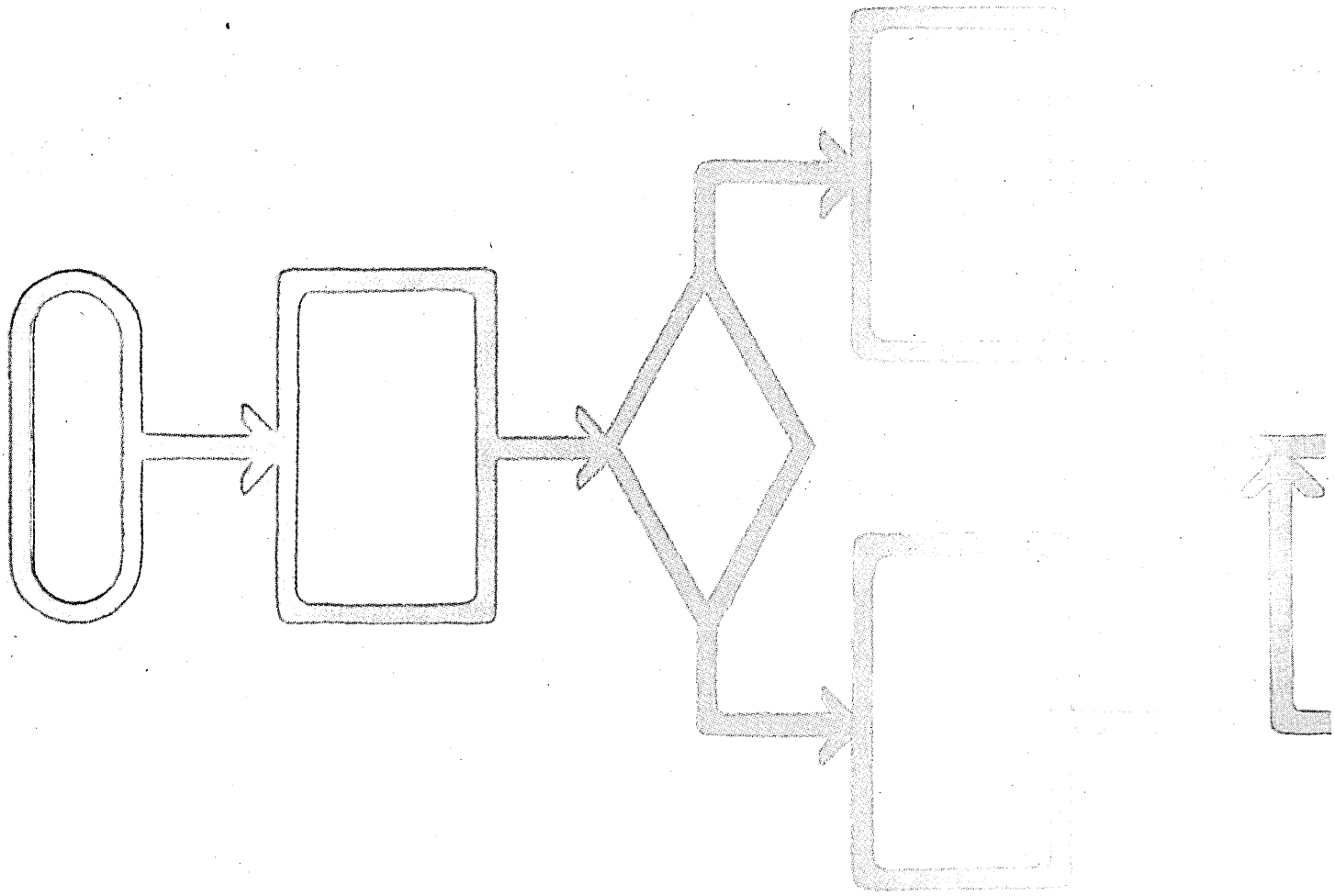
In inflationary times, programming efficiency is a particularly important objective. To find out how NCR can help you keep your costs down, phone your local NCR representative. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

NCR
Complete Computer Systems



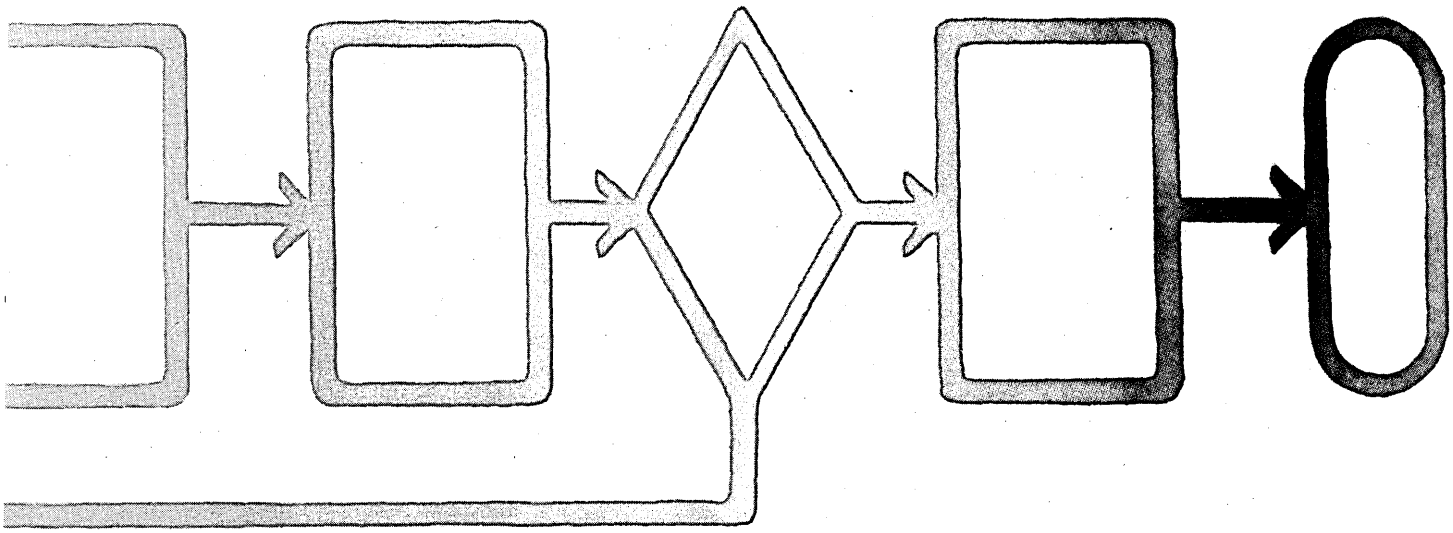
An NCR computer can make it happen for you, too.

CIRCLE 7 ON READER CARD



Logical designs for information management.

From discoveries as fundamental as floating point arithmetic and the use of subroutines to the latest advances in bubble memory and laser technologies, Bell is an experienced innovator.



By applying the same innovative thinking to your business needs, we design new configurations to manage information more productively.

We offer the latest advances in data transmission. Our Dataphone® digital service is the nation's most extensive end-to-end digital network. Our Dataphone II service transmits over dedicated telephone lines at 2400, 4800 or 9600 bps, and has three levels of self-diagnostic capability. Our Dataspeed® 4540 communications terminals complement either service, and have 3270-compatibility. And our 43 teleprinter is compatible with virtually all time-sharing networks.

◇ Applying our knowledge to your information management needs is a process that begins with one call to your Bell Account Executive. ⊂⊃

The knowledge business

LOOKING BACK

NOVEMBER/DECEMBER 1960

Frank Cole, Douglas Aircraft, Missiles & Space Systems Engineering, sang the praises of using "Small Computers in a Large Computer Environment." Cole's department, responsible for seven of the 45 Douglas computers, was the largest departmental user within the company. The seven computers ranged from an IBM 709 system (a 7090 was on order) down to four Bendix G-15Ds. Cole stated, "There is a mistaken impression that small problems belong on small machines and large problems belong on large machines. Actually, all problems belong on the largest machines available—if cost is a primary concern." He then asks, "Why provide the small direct access computer at all?" and answers his own query with three reasons why small computers should be in an engineering organization. First, for immediate access for small problems requiring rapid service; secondly, since the small machine is no more expensive per hour than the engineer, halting the machine and on-line monitoring are permissable; and, thirdly, certain design problems should be located at the engineer's fingertips—and this may include the computing phase. Douglas Aircraft had trained nearly 300 engineers and technical employees to use the G-15 by means of an initial eight-hour, in-plant course. The company had anticipated the number of potential users requesting instruction to diminish, but as it turned out, the more people who completed the course, the longer the waiting list became. Douglas had also expected the G-15s to be in use about 80% of the time. After a year and a half, usage ran about 125%.

NOVEMBER 1970

IBM's three key 360 architects—Fred Brooks, Gerrit Blaauw, and Gene Amdahl—had all left IBM by November 1970. Amdahl was the last to leave; an alleged "conflict of interest" was said to have prompted his departure. The problem arose when IBM perceived Amdahl's position on the board of Compata (a company run by Lowell Amdahl, Gene's brother) as a conflict. This was difficult to understand since Compata was not a financial threat to IBM, pulling in roughly $1 million in revenue during 1969 while IBM came close to $7.2 billion that year. Gene had also been with IBM for about 12 years, and served on the Compata board for only five years. It was rumored that Gene, who was vacationing at the time the November 1970 issue was written, would soon be forming his own company.

The U.S.S.R. was negotiating to buy computers from Siemens (West Germany) and Olivetti, and had placed orders with ICL. Nevertheless, Thomas J. Watson, IBM chairman, returned emptyhanded after his two-day Moscow visit. His report to the press was simply that he didn't think there was a market for computers in Russia at the time. Meanwhile whispers continued that the Belgrade secret police were installing a 360/40—presumably for nonmilitary use.

Featured in this issue was "Anatomy of a Merger," by W. David Gardner. The article detailed the preacquisition planning, actual negotiations, and long-term predictions for the Honeywell-GE computer operations merger. It is reported that prior to the merger, GE was at a make-or-break point with its Information Systems Group (ISG). The group's overall picture was not profitable, nor could Hilliard W. Paige, vp and group executive, predict when it expected to cross over into the black. Project Shangri-La, a three-month, intensive think tank, was arranged in Florida for the entire ISG. The purpose was to develop a master plan for an advanced product line that would eventually boost GE into the number two spot in the industry. The advanced product line was planned to compete directly with IBM, stressing compatibility. Had the plans been implemented, Project Shangri-La would have cost approximately $450 million to $500 million (speculators had much higher estimates) and could conceivably have catapulted GE into the number two place. However, the GE group in charge of giving the necessary go-ahead, known as "The Three Wise Men" (Reginald Jones, vp of finance; Robert Estes, vp of legal services; and John McKetterick, vp of advanced planning) kept hedging until the whole plan crumbled. Within a couple of months, GE was looking for a buyer for the ISG and found Honeywell.

—Deborah Sojka

Introducing the Spinwriter 3500Q.

A new 30 cps, high-MTBF character printer for the word processing industry.

It's here. The new Spinwriter Model 3500Q medium-speed solid character printer from NEC.

The Model 3500Q sets new cost-of-ownership standards for today's most demanding office printing tasks. New design standards. New durability standards. New cabinetry standards. While maintaining functional compatibility with current Spinwriter models.

The Model 3500Q uses a single circuit-card and approximately 60 per cent fewer parts than current Spinwriter models. Thus, its physical size and weight are reduced by a third—making it easier to incorporate in any office system. And it sets a new industry durability standard: 3000 hours MTBF.

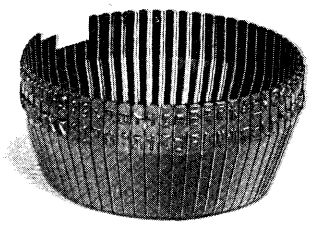
Add a 30-minute MTTR, 30-million character print thimble life, 360,000-character film ribbon and a new economical price, and you attain cost-of-ownership advantages unparalleled in character printer history. Operation and maintenance are further simplified because the Model 3500Q requires no factory or field adjustments or lubrication. And just three major spare parts are needed to support the printer hardware.

The NEC Spinwriter Model 3500Q has an average print speed of 30 CPS, handles forms up to 16" wide, and uses all existing NEC thimbles, with up to 128-character versatility. It also comes with an industry-standard interface, numerous ease-of-use features including an operator display panel, and a range of forms handling options that include sheet feeder options, document inserter, forms tractors, bottom feed, and cut-sheet guide with sensor.

The NEC Model 3500Q Spinwriter. It's here just when you need it most.

To find out more, call your nearest NEC sales office today.

NEC. Going after the perfect printer.



NEC

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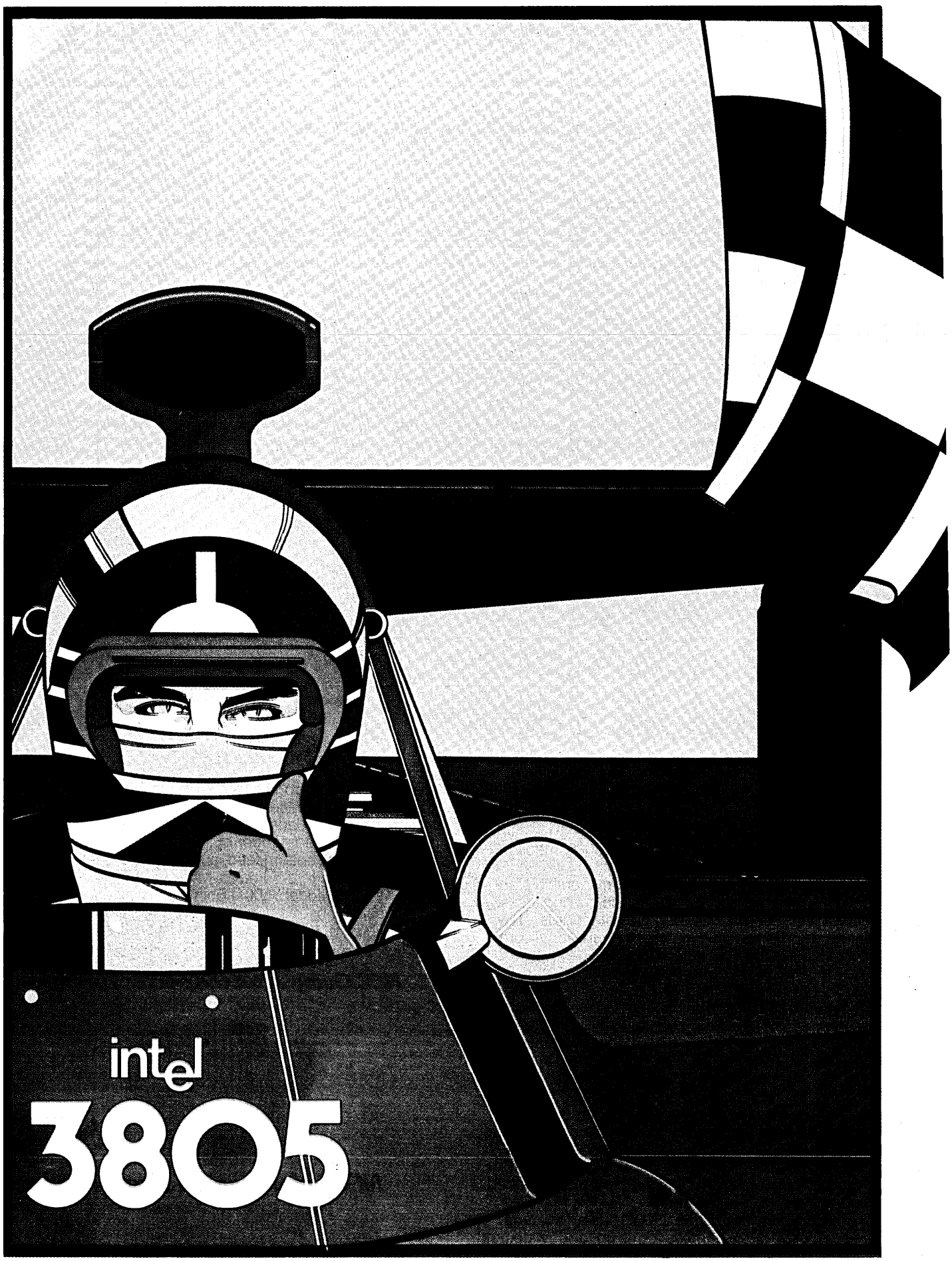
CIRCLE 10 ON READER CARD


intel
3805

The 3805 Supercharger.

Your system races ahead with Intel's Native Mode FAST-3805 semiconductor disk.

Supercharged. That's Intel's new Native Mode option for the FAST-3805, our high performance semiconductor disk. The only one of its kind, Native Mode FAST-3805 offers unmatched speed, reliability and capacity for unleashing IBM 370, 303x, 4300 and compatible CPUs.

Set new track records.

FAST-3805's Native Mode revs up your operation by allowing your CPU to work at full potential. With performance up to ten times faster than traditional disks, Intel's semiconductor paging device triples disk traffic—and without adding channel or controller capacity.

Native Mode FAST-3805 improves mainframe performance by reducing by an average of 70 percent the number of CPU instructions required to set up a paging I/O. This reduction greatly extends the life of your present computer by giving you back substantial amounts of your CPU resources.

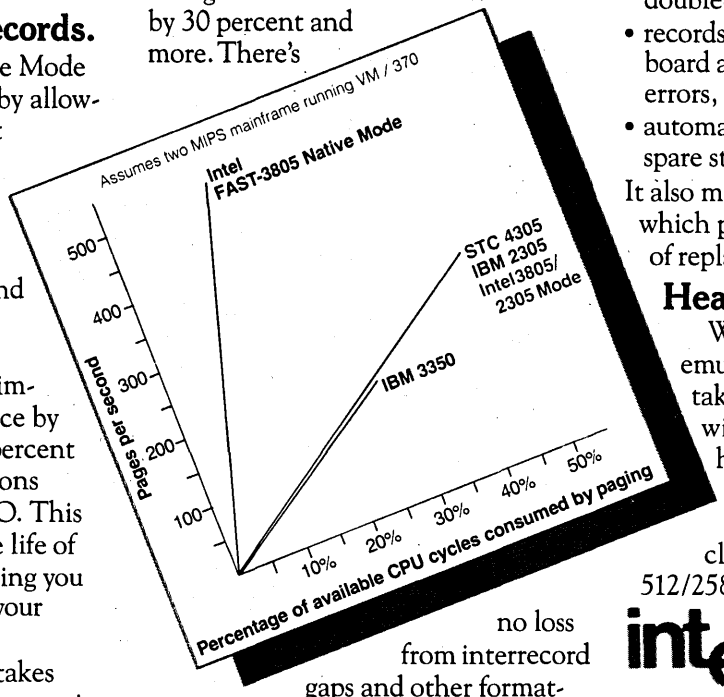
Native Mode FAST-3805 takes advantage of the inherent characteristics of semiconductor random access memory to achieve a paging rate of up to 530 4k-pages per second per controller. That's almost double the maximum paging rate of a 2305—and triple that of the 3350—while using less than half the CPU cycles.

Native Mode utilizes Fixed Block Architecture—a simple and highly efficient addressing scheme—which further increases the semiconductor disk's already exceptional performance. Data transfer is started with a sequence of only two commands (in contrast to six commands for a rotating disk).

FAST-3805 gives you a standard transfer rate of 1.5 to 2.0 megabytes per second per channel. Our two-byte wide option yields transfer rates of 3.0 to 4.0 megabytes per second per channel.

Boost capacity.

By putting all storage into productive use with Fixed Block Architecture, Native Mode boosts FAST-3805 storage in most environments by 30 percent and more. There's



no loss from interrecord gaps and other formatting inefficiencies associated with rotating disks.

And with storage capacity incrementally expandable from 12 to 72 megabytes, you can increase the paging capacity and, therefore, the work load on your present system without upgrading your CPU, memory, and channel/control devices.

No pit stops.

The FAST-3805 utilizes proven state-of-the-art semiconductor technology throughout. To further ensure accuracy and reliability, it has its own computer based on the 8086, Intel's powerful new 16-bit microprocessor. Making the FAST-3805 "self-healing," this on-board computer:

- automatically performs sophisticated error detection and correction functions (including the first commercial application of double-bit ECC),
- records in its own memory, the board and device location of any errors, and
- automatically relocates data to spare storage.

It also maintains diagnostic logs which pinpoint the devices in need of replacement.

Head for the FAST track.

Whether your needs require emulating an IBM 2835/2305 or taking a fixed-block approach with Native Mode, you'll be heading in the right direction with Intel's FAST-3805.

To get on the FAST track, clip the coupon below or call 512/258-5171.

intel delivers solutions.

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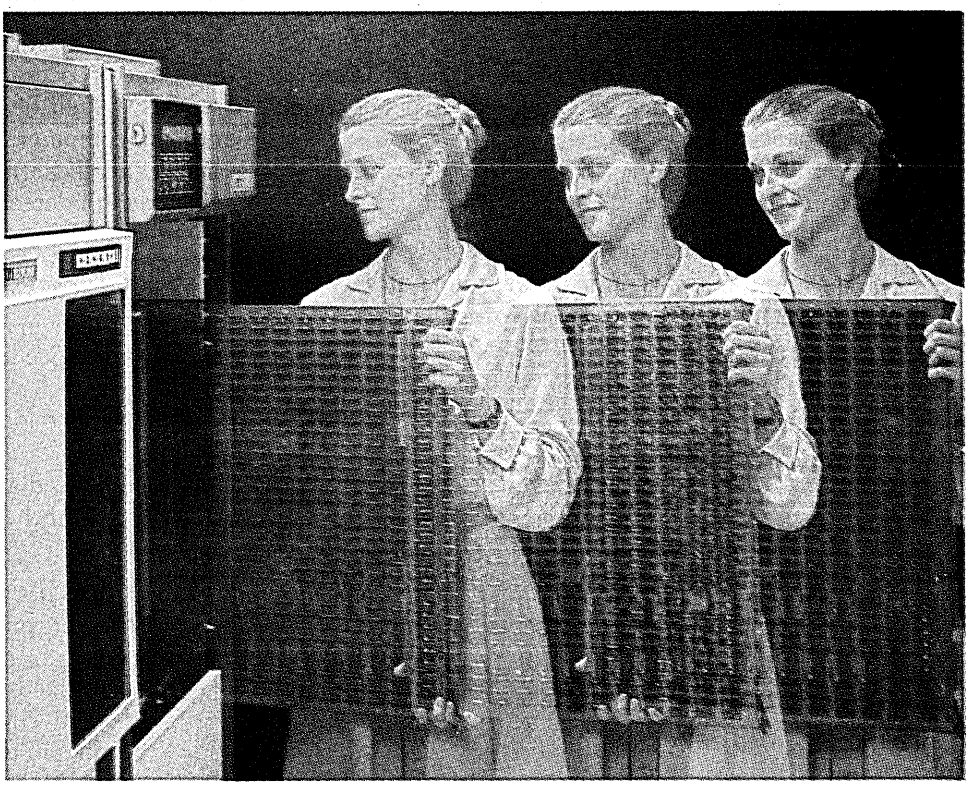
CIRCLE 8 ON READER CARD

BTI 8000 32-bit multiprocessor system

Now you can grow by plugging in resources instead of changing computers



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

The secret is Variable Resource Architecture (VRA): a flexible mix of hardware resources controlled by a single, self-regulating operating system.

Hardware resources consist of multiple processors, memories, and input-output channels operating in parallel without the complex internal networking normally associated with such arrangements. The result is mainframe performance at substantially lower costs, plus unequalled flexibility.

You can tailor the BTI 8000 to serve over 200 on-line, interactive users. Or to handle large batch loads. Or to do a lot of each.

Furthermore, you can vary processing capability over a *tenfold range* by merely adding or deleting hardware modules. Differences in configuration are invisible to user software, and no reprogramming or recompilation is required.

Key features of each BTI 8000 system include:

- From one to eight 32-bit CPUs controlled and coordinated by one shared operating system.
- Up to 16 megabytes of main memory.
- Fail soft architecture.
- Secure multi-user operations.
- Demand-paged virtual memory.
- Simultaneous use of ANS COBOL 74, ANS FORTRAN 77, PASCAL/8000, and BASIC/8000.

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

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COMPUTER SYSTEMS

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CIRCLE 12 ON READER CARD

LOOK AHEAD

OF BIRDS AND BOOB TUBES	Rumor has it that Satellite Business Systems has been quietly buying up as much available bandwidth as it can on cable television franchises in major metropolitan areas across the country. The firm has acquired long-term leases (we hear 30 years mentioned) in areas ranging from Manhattan to Southern California. Cable is of course one answer to the dilemma of what you do with all that data once it comes down from the big bird.
THE MIPS RACE IS ON	With the announcement of a 29 MIPS machine, the Acos 1000, Nippon Electric has served notice that it, too, is active in the large-scale mainframe market. But we hear that the other two competitors who were there earlier, Fujitsu and Hitachi, are working separately on scientific supercomputers that will be faster than the current champ, the Control Data Cyber 205. The 205, yet to be shipped, is said to run at 800 million floating point operations per second, a peak rate achieved on long vector runs. But the Japanese hope to exceed that, and do it on short vectors.
THE LAST OF THE DINOSAURS?	Amdahl's success with the V/8, the potential of National's ASC 9000 from Hitachi, and -- probably the most painful -- Siemens' sales of the big Fujitsu machines in Germany, have all sparked rumors of a 3034 introduction. The definition of the H Series, unless IBM gets more explicit about it, may be debated even after IBM makes its expected big machine announcement. Some analysts who expect to see H evolved rather than unveiled predict one more 303X, albeit with more modern innards, to stave off the challenge of the barbarians.
DATAPOINT DEBUT	Watch for Datapoint to announce a new 32-bit processor this month. As mentioned earlier in these columns, the new machine, code named Cedar, is expected to function with the ARC. Also coming with Cedar, we hear, is a new "high-tech" operating system.
THE BACK-END APPROACH	Could IBM have already introduced the back-end processor of the future? The file processor for the H Series? Some analysts, like ADL's Frederic G. Withington, argue that the possibilities of the 4341 Group 2 with 8 megabytes of cheap memory and big disks behind the 3380 controllers might prove very exciting in file processing. Sophisticated vendors may move into it before IBM starts talking about it. The 4341 can support data

LOOK AHEAD

streaming at 3 megabytes per second into memory and, managing the memory as a buffer, it can link with a primary host through channel adapters.

THAT'S LOGIC

Recent disclosure that IBM technicians had implemented the logic portion of the 370/138 on a 5,000 circuit bipolar chip using gate array technology created a stir among the circuit mavens and others -- more because of the chip (Schottky-clamped TTL) than the 370 implementation. Yet, in the whispers heard from other R&D labs, it seems that others -- Honeywell, at least -- have created comparable chips in advanced VLSI development.

A 3705 SUCCESSOR?

IBM may finally announce its long-awaited successor to the 3705 front-end communications processor, probably in the second quarter of next year. Strange how IBM never seems to get as excited about getting mugged in one little corner of the market (here, by Tandem and Comten) as many industry analysts expect.

PINNING DOWN XTEN

Xten, the elusive Xerox network, now plans to begin operating in 20 cities in January 1982, expanding to 50 cities by the end of that year. A pilot test of local microwave distribution links will begin in 10 cities with "a handful of users" in July '81, we hear. The first Xten offering will be volume sensitive digital data using circuit switched technology at speeds from 300 bps to 56 Kbps. Operating at 10 GHz, Xten reportedly has signed agreements for fixed antenna locations in 21 cities and has tested potential interference problems at the higher frequency. Other network services will include document distribution and teleconferencing, which will be limited to slow scan applications that will run on the 56 Kbps channels. Xten is expected to offer direct links to Ethernet local data networks from the cellular microwave loops for use in downtown locations.

VOICE IS WHERE IT'S AT

A number of industry forecasters have said that the real potential in electronic message systems rests with voice messages rather than electronic mail. A small company in Dallas called ECS Telecommunications, Inc. apparently agrees. The two-year-old venture start-up firm is about to begin major deliveries of its Voice Message Exchange (VMX) system and expects to have 20 in-house versions installed by the end of 1981.

The first VMX system was installed several months ago at 3M Co., and since then ECS has met escalating demands by using two of its systems to establish voice mail services in New York and

(Continued on page 43)

Think what your programmers could do if your users did their own reports.

Answer/DB, the latest Implementation System from Informatics, is the new on-line software tool for report generation. It lets non-DP people develop their own report requests at a terminal — in an English like language — with as few as four simple statements.

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CIRCLE 13 ON READER CARD

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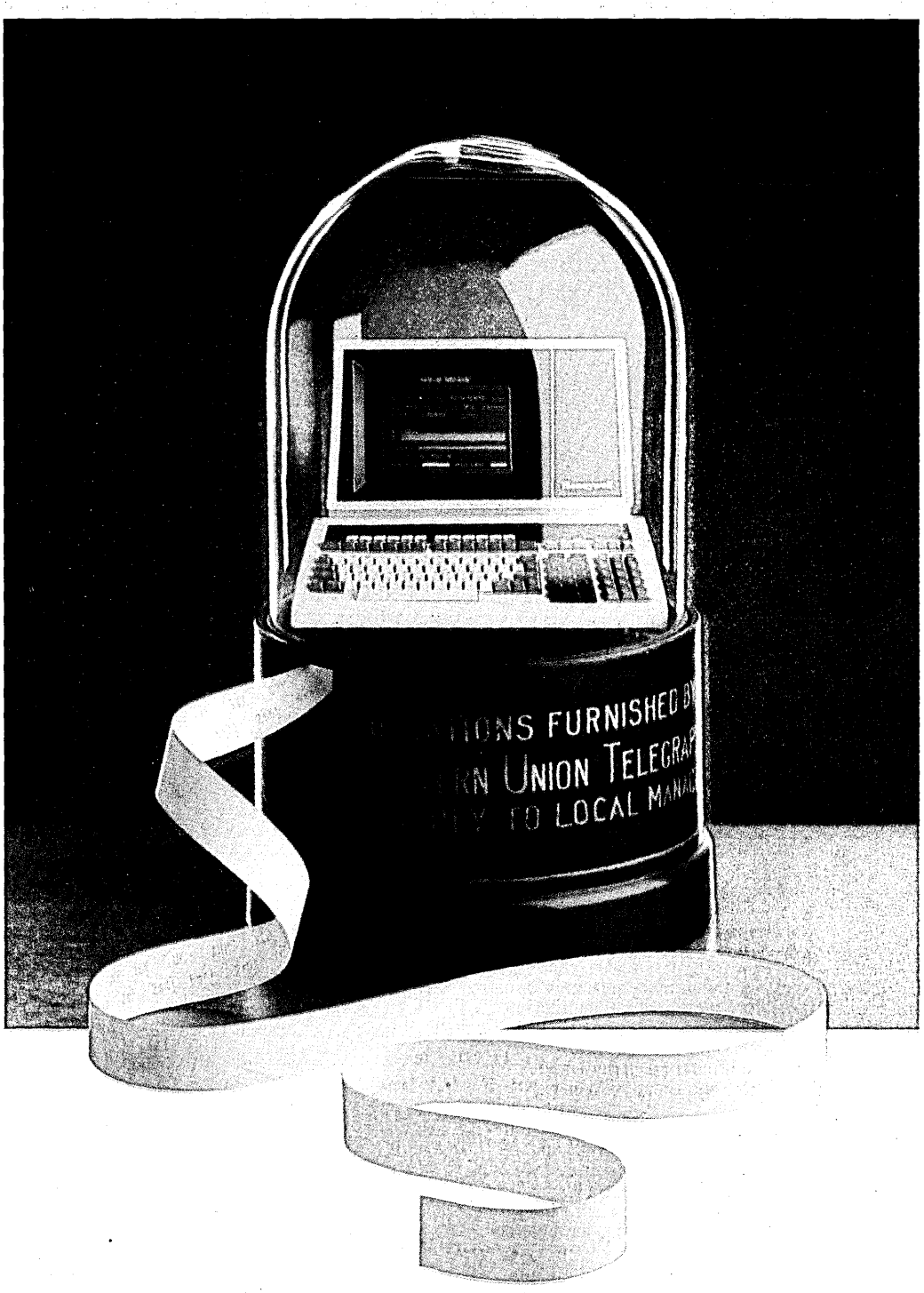

Transaction processing is keeping The Reserve Fund, Inc. in-the-know.

Mutual funds require an extraordinary degree of information control.

The Reserve Fund, Inc. is no exception.

This 2 billion dollar money market fund handles more than 5,000 transactions a day.

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In order to meet this demand for data, Reserve Fund has turned to Honeywell's transaction processing system, TPS-6.

Together with four Level 6 computers, TPS-6 makes it possible to do immense amounts of production work while simultaneously developing new programs.

Their four Level 6 Systems give Reserve Fund all the flexibility and back-up they need. Information flows easily.

For example, terminals are used to enter purchase orders and to provide quick answers to customer inquiries.

At the same time, the system is also maintaining an on-going record of all transactions.

As you'd expect, security is a great concern. But thanks to features built into TPS-6, Reserve Fund has developed effective safeguards.

Every operator has an ID number, a password, and a specific security clearance. Access is carefully regulated.

As a further precaution, the system has a built-in time-out feature that automatically clears the screen after a specified period.

Thanks to capabilities like screen data formatting and multiple key access to files, Reserve Fund has been able to tailor a system that's both effective and efficient.

Current information is always available. When it's needed. Where it's needed.

Reserve Fund invested in information control. And their investment is paying off big.

For more information, write Honeywell, 200 Smith Street (MS 487), Waltham, MA 02154.

Honeywell

CIRCLE 14 ON READER CARD

CALENDAR

NOVEMBER

Canadian Computer Show & Conference, November 11-13, Toronto, Ontario.

The second largest computer show held in North America is sponsored by the Canadian Information Processing Society. Products to be displayed include minicomputers, peripheral hardware and software, consulting and contract programming, time-sharing, etc. Contact Reg Leckie, Industrial Trade Shows of Canada, 36 Butterick Rd., Toronto, Ontario, Canada, M8W3Z8.

Pacific '80 Conference on Distributed Processing, November 11-14, San Francisco.

Cosponsored by the ACM and its chapters of the Pacific region, the conference will hold tutorials on Nov. 11, with conference meetings on the 12th through the 14th. Contact Robin Williams, IBM, K55-282, 5600 Cottle Rd., San Jose, CA 95193.

INFO/MFG, November 18-20, Chicago.

The first show devoted entirely to the information needs of manufacturing companies. A "Guide to INFO/MFG," listing exhibitors and products to be demonstrated, is available. Contact Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017.

Western Educational Computing Conference, November 20-21, San Diego.

Conference will feature the use of computing in education for instruction, administration, and research. Luncheon speeches will be given by Grace Hopper and Bernard Luscombe. Contact Ron Langley, Director, Computer Center, California State University, Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840, (213) 498-5459.

DECEMBER

IWP Canadian Conference, December 2-4, Toronto, Ontario.

Office automation from the Canadian perspective will be discussed in this, the fourth annual Canadian Conference. Contact Mark Hertzog, International Word Processing Assoc., Mayland Rd., Willow Grove, PA 19090, (215) 657-3220.

Fourth International Online Information Meeting, December 9-11, London, England.

The conference will offer a varied program, addressing current problems and opportunities that arise when providing information to business, industry, government, and academic institutions. Contact Organising Secretary, Online Review, Learned Information, (Europe) Ltd., Besselsleigh Rd., Abingdon, Oxford OX13 6EF, England.

Computer Networking Symposium, December 10-11, Gaithersburg, Maryland.

The symposium highlights computer networking and covers protocol applications, distributed data bases, and local networks. Contact Harry Hayman, IEEE, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

JANUARY

Winter Conference of the Optical Character Recognition (OCR) Users Association, January 11-14, Atlanta.

The conference features sessions on OCR applications in health care, remittance processing, government, retail, general data entry management, etc. Contact OCR Users Assn., 10 Banta Pl., Hackensack, NJ 07601, (201) 343-4935.

HISSG Winter Seminar, January 20-23, Long Beach, California.

The theme for the Hospital Information Systems Sharing Groups seminar is "Cost Containment—The Legislative and Voluntary Aspects and Their Effect on Hospital Information Systems." Contact W.V. Rosqvist, Hospital Information Systems Sharing Group, 2415 South 2300 West, Salt Lake City, UT 84119, (801) 972-6099.

Telecommunications/China '81, January 17-25, Beijing, Peking.

The second of its kind, this exhibition is limited entirely to U.S. companies; it introduces American products in China and explains the products' uses. Contact Expoconsul, a Division of Clapp & Poliak, Inc., Princeton-Windsor Office Park, P.O. Box 277, Princeton Junction, NJ 08550, (609) 448-3200.

FEBRUARY

NEPCON West '81, February 24-26, Anaheim, California.

The conference is directed toward all persons involved in the manufacture and test of printed circuits, multilayers, microelectronic circuitry, semiconductors, and other devices. Contact Industrial & Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

International Solid State Circuit Conference, February 18-20, New York City.

The ISSCC is sponsored by the IEEE and is currently running in its 28th year. Contact Lewis Winner, 201 Almeria Ave., Box 343788, Coral Gables, FL 33134, (305) 446-8193-4.

COMPCON Spring '81, February 23-26, San Francisco.

The theme for the spring conference is VSLI and its future effects on design systems. Contact Harry Hayman, IEEE, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

CSC '81, February 23-26, St. Louis.

The ACM sponsors this computer science conference. Contact John W. Hamblen, University of Missouri-Rolla, Computer Science Dept., Rolla, MO 65401, (314) 341-4491.

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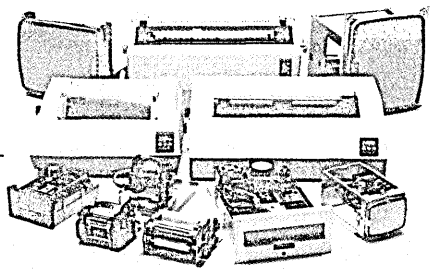

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CIRCLE 15 ON READER CARD

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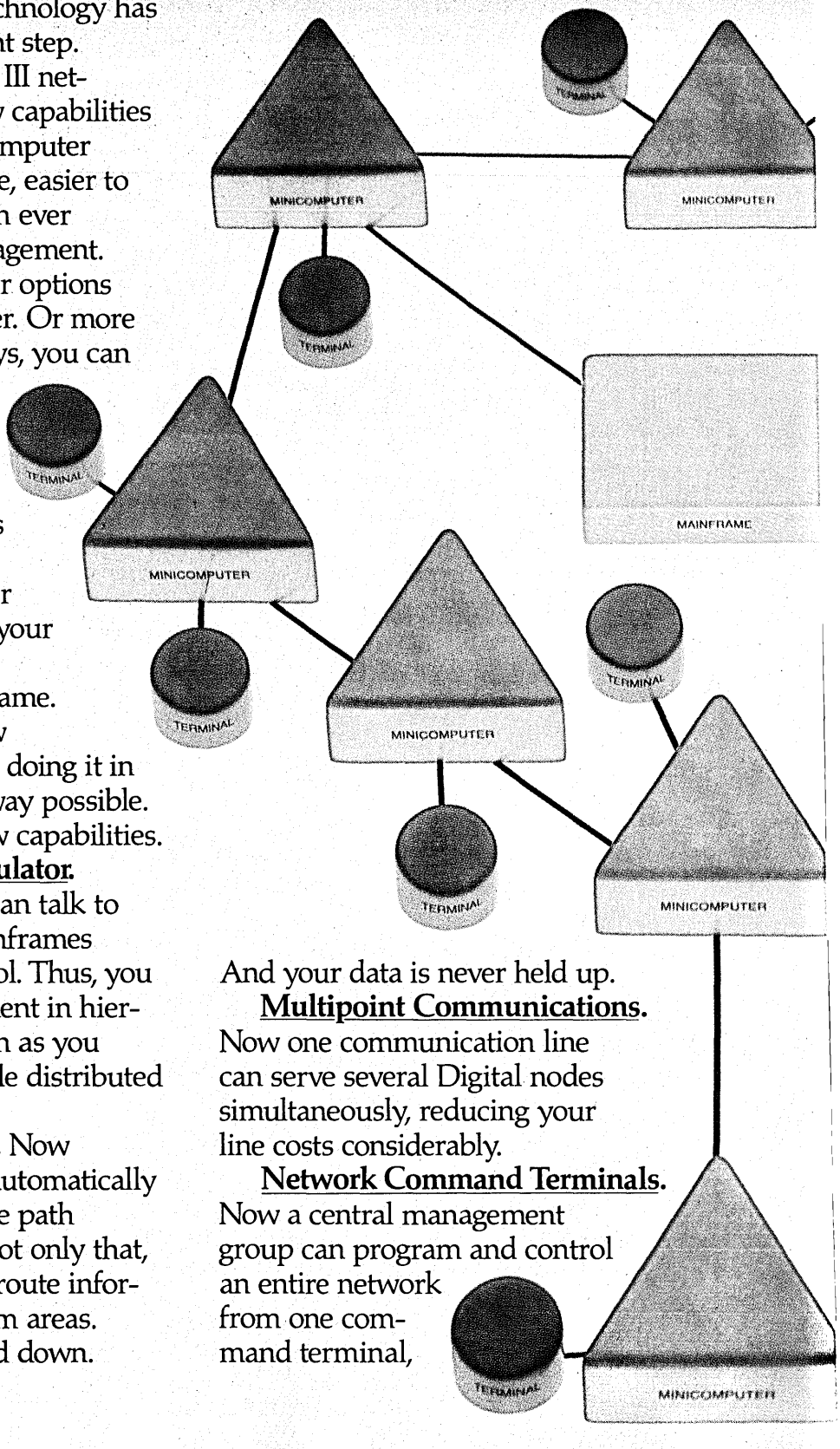

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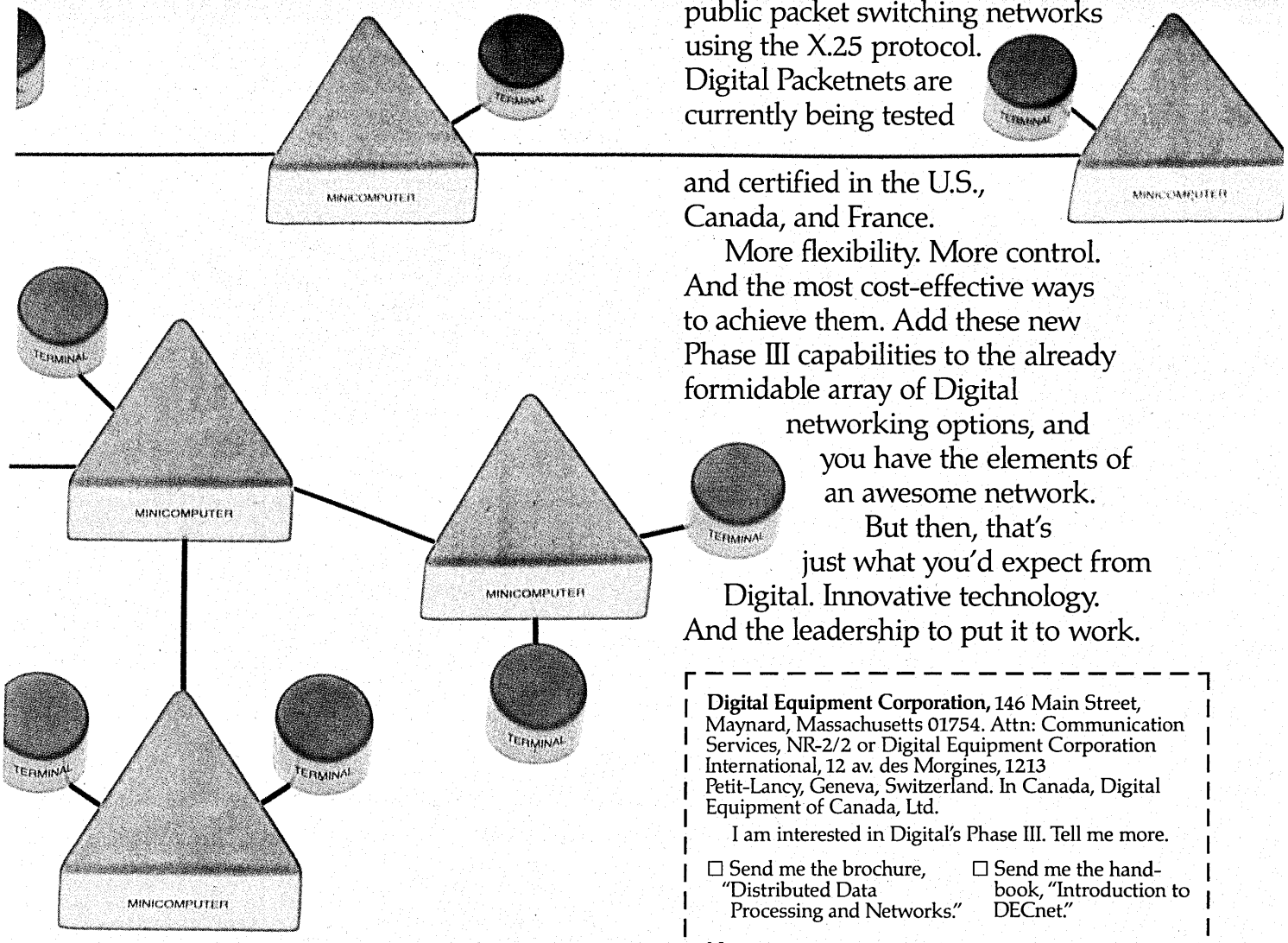

public packet switching networks using the X.25 protocol. Digital Packetnets are currently being tested and certified in the U.S., Canada, and France.

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thus cutting the cost of programming individual nodes in widely dispersed locations.

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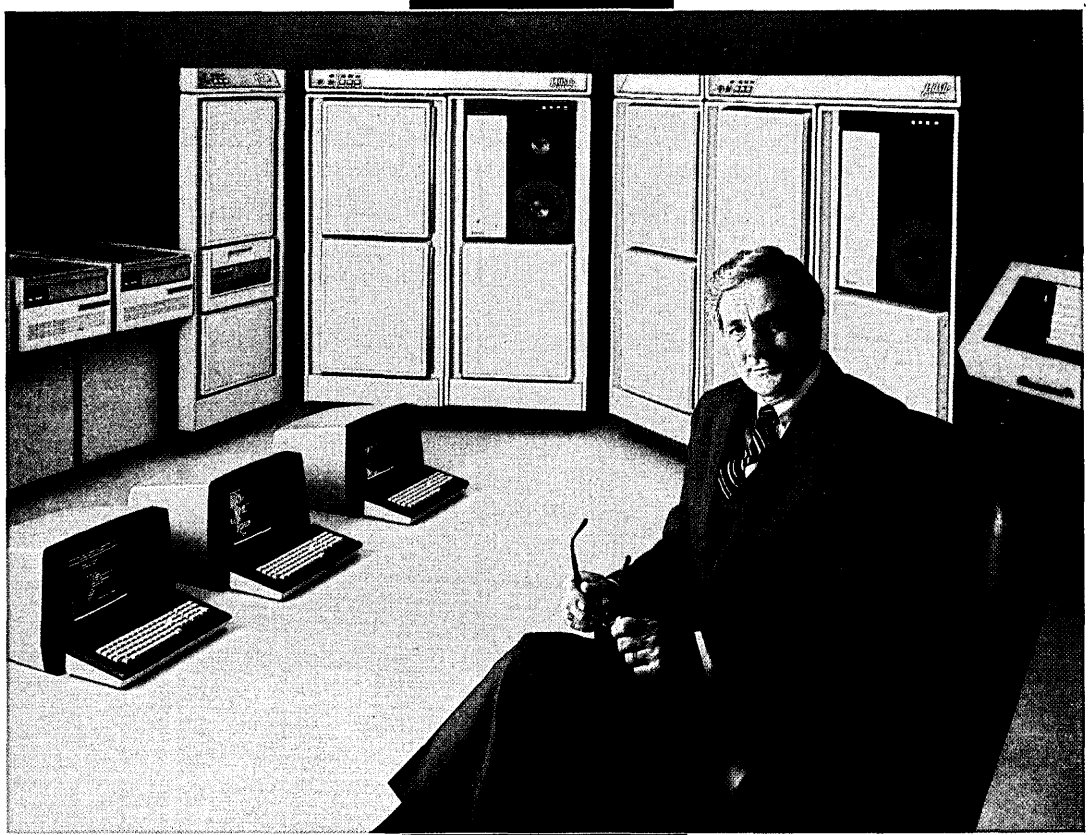

CIRCLE 17 ON READER CARD

LETTERS

UMBRAGE

Re: "A New Set of Ground Rules" (Aug., p. 92) and "After the FCC's Decision" (Aug., p. 99), without arguing the pros and cons, I take exception to the manner in which the Communications Act of 1980 will come into being.

When HR 6121, the Communications Act of 1980, came out of Subcommittee to the full House Committee on Commerce, it did so without proper consideration. Representative Lionel Van Deerlin [D.-Calif.] strong-armed the bill through the committee, making derogatory comments to people in our industry trying to understand and comment on the legislation, even to the extent of claiming that lack of passage would favor foreign competition, which is patently ridiculous. The earlier version, HR 3333, failed in committee, after supposedly 22 days of discussion of which no living human being can produce a transcript.

The Administration pushed the bill with the populist appeal of "deregulation," citing lower costs in the airline industry. As an economist by training, and as a businessman, I can tell you that it is not at all analogous to compare deregulation of a highly competitive industry with a monopoly. I know of no other case where a monopoly has been deregulated and the economics are not at all clear. There are many irregularities in the bill, including language on seniority and job security, which are unusual in that a legislative body is concerning itself with union contracts.

The bottom line is that regardless of merits, this represents political railroading in an election year. We've lived with the Communications Act of 1934 for the past 46 years, so there is absolutely no timing urgency except for the fact of an election year. That does not justify not giving the industry adequate time to scrutinize and comment on this legislation that we may have to live with for another 46 years.

LESTER M. GOTTLIEB
President
Data Dimensions, Inc.
Norwalk, Connecticut

FOOTNOTE TO HISTORY

Re: "A Master of Understatement" (May, p. 84), the author, Linda Runyan, claimed that Dr. Atanasoff was the true inventor of the electronic computer, and tried to support her claim by quoting from the findings of the court for the Honeywell-Sperry Univac trial (1971-73).

History is not necessarily recorded accurately in the court record, as I can show from documents that were not entered into the trial. *By presenting excerpts from three letters written by Dr. Mauchly it should become more evident that he developed the electronic computer concept by himself, without the aid of Dr. Atanasoff, during the 1930s*. Dr. Mauchly had always contended that he experimented and successfully built base five and base two counters during the 1930s (while he was at Ursinus College); and these letters verify that he had successfully built a high speed electronic computing circuit before he visited Dr. Atanasoff in Iowa for three days.

Before ever meeting Dr. Atanasoff, Dr. Mauchly had built a "digital computer," without vacuum tubes, to perform cryptographic encryption. He built this machine by using "matrices of nonlinear devices—neon diodes." (The quotes reflect Dr. Mauchly's own language.) Although this was presented during the trial, the judge chose to ignore it.

The article gives the erroneous impression that the judge found Dr. Atanasoff to be the true inventor of the computer. On the contrary, he rejected that argument and supported Dr. Eckert and Dr. Mauchly as the inventors of the electronic computer.

The court's decision was that Dr. Mauchly and Dr. Eckert were the only inventors of the ENIAC, but that the patent was invalid because the patent was applied for by Dr. Mauchly and Dr. Eckert more than a year after the judge considered the ENIAC to be in public use.

"How could they dump me, Martha? I've always been a loyal party man!"

CARTOON BY FRANK COTHAM

LETTERS

The judge, in ruling that Dr. Mauchly and Dr. Eckert were the inventors of the electronic computer ENIAC, expressed his skepticism of Dr. Atanasoff's position in phrase 4.3.28 of the court's findings: "The failure of an alleged inventor or co-inventor to make a claim of inventorship at the time Eckert and Mauchly were being publicized as the inventors is evidence permitting the inference that the alleged inventors or co-inventors' assertions are not sustainable."

The judge's decision to invalidate the ENIAC patent should be looked at cautiously since the ENIAC patent had been declared valid by two prior courts.

Honeywell took Sperry Univac to court in an attempt to have the ENIAC patent invalidated so that it could avoid paying royalties to Sperry Univac for the ENIAC patent. Neither Dr. Mauchly nor Dr. Eckert was one of the principals in the court case; they had assigned their patent rights on the ENIAC to Sperry Univac during the 1950s.

Honeywell, in its attempt to have the ENIAC patent declared invalid, argued that "Dr. Mauchly derived his ideas on electronic computing from Dr. Atanasoff." My assumption is that the judge accepted Honeywell's argument because he did not understand the difference between an electronic computer and a electromechanical computer.

Even if he lacked the technical expertise needed to differentiate between these types of computers, the judge's decision would have been different had he been able to read the letters presented here. These letters are from Dr. Mauchly's private collection to which I, as his son-in-law, have access. The letters are dated 15 Nov. 1940, 4 Dec. 1940, and 7 June 1941.

The first two letters were written before Dr. Mauchly ever knew Dr. Atanasoff. He had met Dr. Atanasoff in late December of 1940 during a meeting in Philadelphia. Dr. Atanasoff had introduced himself to Dr. Mauchly after Dr. Mauchly's talk on weather analysis and the harmonic analyzer he had built to speed up the computation of 27-day Fourier coefficients that he encountered as part of his weather research. Remember that these three letters were not submitted as evidence in the Honeywell-Sperry Univac trial. Neither Sperry Univac nor Honeywell performed an exhaustive search of Dr. Mauchly's private collection, and, subsequently, neither party found these letters.

These letters should prove that Dr. Mauchly planned an electronic computer well before he ever knew Dr. Atanasoff.

An excerpt from Dr. Mauchly's letter to Mr. H. Helm Clayton, dated the 15 Nov. 1940, reads:

"In a week or two my academic work will not be quite so heavy, and I shall begin to give some thought to the construction of computing devices. We have further simplified the design of our proposed 27-ordinate analyzer. In addition, we are now considering the construction of an electrical computing machine to obtain sums of squares and cross-products as rapidly as the numbers can be punched into the machine. The machine would perform its operations in about 1/200 second, using vacuum tube relays, and yielding mathematically exact, not approximate, results. That is, its accuracy would not be limited to the accuracy with which one can read a meter scale, but could be carried to any number of places if one cared to construct the machine with that many parts; with conventional tubes, it would be rather bulky, but tubes could be designed to make it very compact."

The second letter, dated the 4 Dec. 1940, was written to Mr. John Dewire. An excerpt from this letter reads:

"For your own private information, I expect to have, in a year or so, when I get the stuff and put it together, an electronic computing machine, which will have the answer as fast as the buttons can be depressed. The secret lies in 'scaling circuits,' of course. Keep this dark, since I haven't the equipment this year to carry it out and I would like to be the first."

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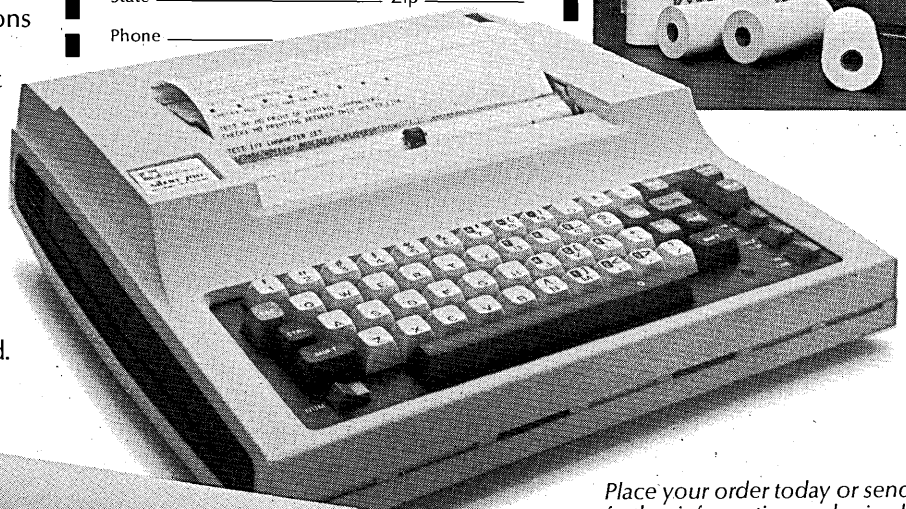

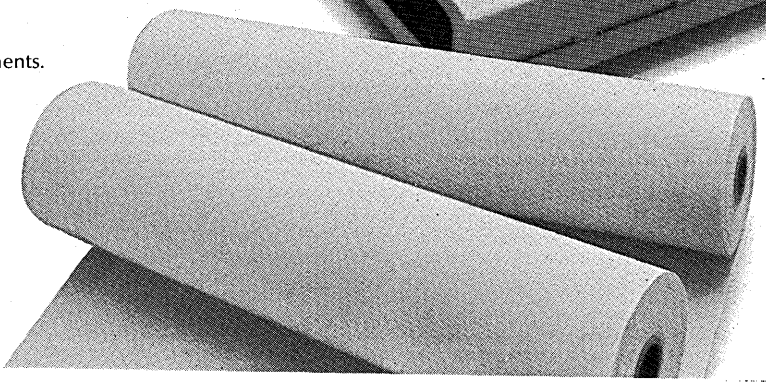

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CIRCLE 19 ON READER CARD

LETTERS

The third letter, dated the 7 June 1941, was written to Mr. George W. Bailey (chairman of the Radio Section of the Office of Scientific Personnel of the National Research Council). Mr. Bailey had written to many colleges in an attempt to recruit young men for the Signal Corps and Dr. Mauchly was responding to one such letter. This letter was written several days before Dr. Mauchly left on his trip to Iowa to visit Dr. Atnaasoff. An excerpt from this letter reads:

"If it is not out of place, I should like to raise the question as to whether there is any place in which my own varied training would fit. I have already filled out the Specialization Personnel check list in Physics, Statistics, and Meteorology; in each of these I indicated my interest in electrical computing devices, and electronic devices particularly. Perhaps I did not place sufficient emphasis on that aspect of my activities. I don't think I qualify as an "expert" in radio engineering, but my deep interest in electronic computing and control devices is accompanied by practical laboratory work, leading now to the construction of a high speed electronic computing circuit. Incidentally, during the next week I am going to Ames, Iowa, to visit Dr. Atanasoff of the Iowa State Physics Dept. and to discuss with Dr. Atanasoff the pros and cons of his electronic computer versus mine."

What was extraordinary about Dr. John Mauchly was his genius for finding new solutions to pressing problems; he did not just come up with solutions that were refinements of an existing technology.

JAMES MCNULTY
Ambler, Pennsylvania

CORRECTIONS

Re: "The Top 50 Datacomm" (June, p. 112), you did not include one of the Top 50. Us. Multi-Tech is a manufacturer of data modems. In the fiscal year ending Dec. 31, 1979 we had sales over $2.3 million, which would have placed us no. 48 in your chart.

THOMAS E. HEIMERMAN
Director of Sales/Marketing
Multi-Tech Systems, Inc.
New Brighton, Minnesota

Re: "Computer Graphics" (Aug., p. 43), while I greatly appreciate the excellent description of the Domestic Information Display System (DIDS), I must point out a minor error. The exemplary work done by Harvard's "software wizards" in developing the Odyssey system certainly served as a model for some DIDS features. However, Harvard did not directly contribute to the DIDS software development. DIDS was developed by NASA/Goddard Space Flight Center and the Bureau of the Census to demonstrate the potential of a satellite image analysis system for the rapid display of federal statistics. The capability of this system to rapidly manipulate high volume satellite imagery led to the highly interactive capabilities of DIDS.

JOHN T. DALTON
Interactive Systems Development Branch
Goddard Space Flight Center
Greenbelt, Maryland

Re: "The Datamation 100" (July, p. 140), there are some errors about our products.

FORETAX is a corporate tax compliance and planning system, not a corporate planning system. Our financial analysis, planning, and modeling system is called FORESIGHT.

Our traditional accounting systems are the INFONATIONAL accounting systems. We offer general ledger, accounts payable, purchase order, accounts receivable, sales analysis, and fixed assets systems. You stated that we had a single accounting system called "Informational."

JAYNIA LYNN GRACE
Marketing Service Manager
United Computing Systems, Inc.
Kansas City, Missouri

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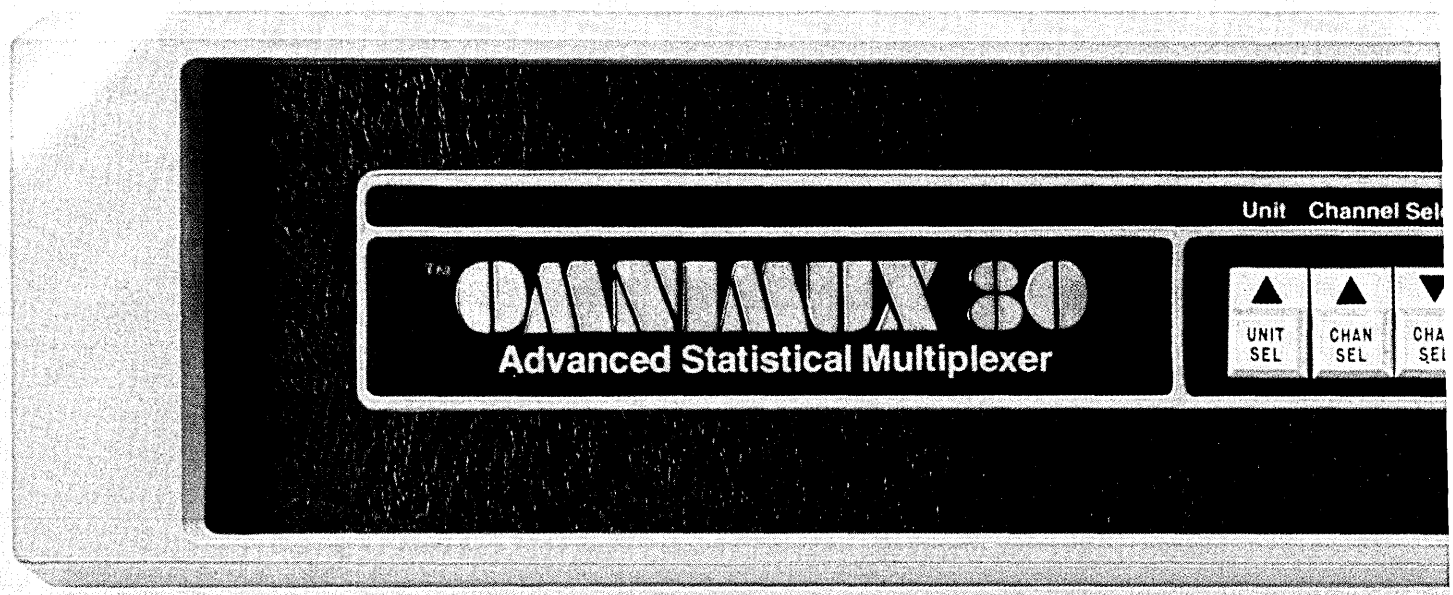
CIRCLE 21 ON READER CARD



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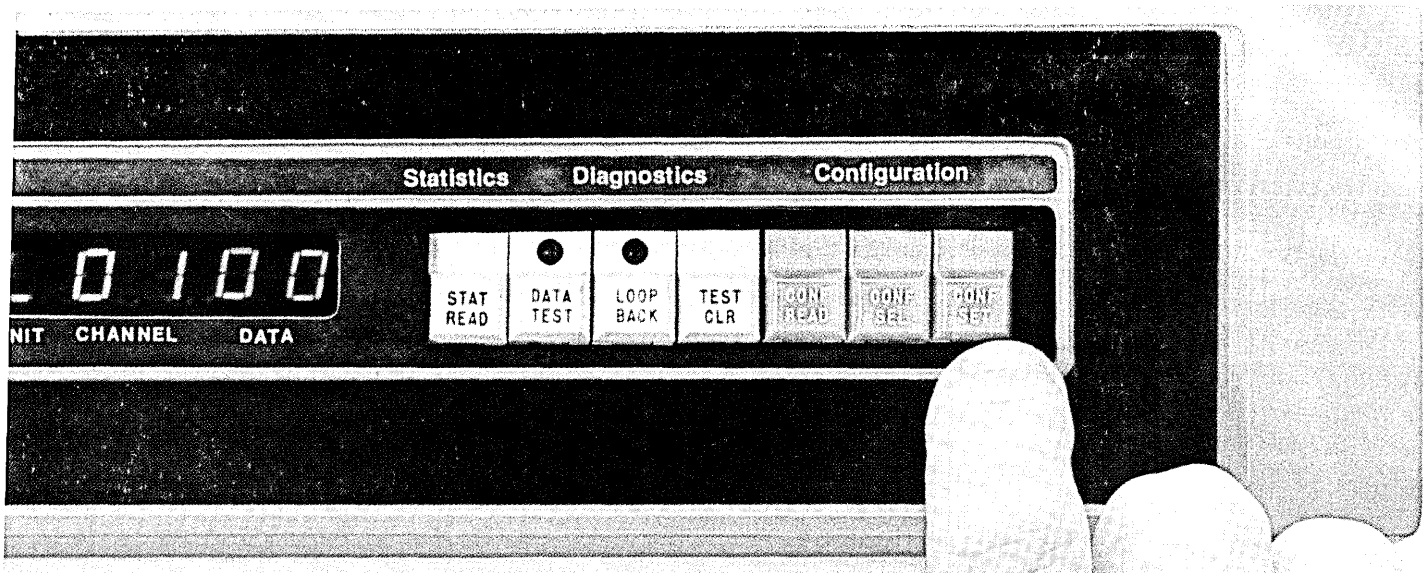

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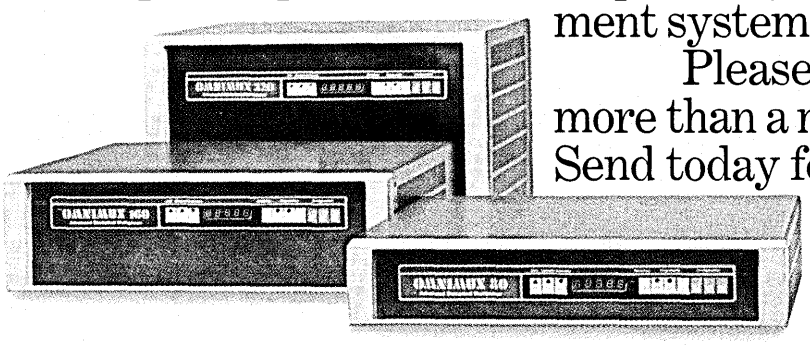
Omnimux has a wide range of management oriented features. Extensive monitoring and test capabilities, local and remote control, convenient front panel operation and compatibility with network management systems are just some of them.

Please let us show you how much more than a multiplexer Omnimux can be. Send today for our illustrated brochure.



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CIRCLE 24 ON READER CARD

SCIENCE/SCOPE

Water levels in cooling systems of nuclear reactors may be monitored more reliably, especially during an emergency core shutdown, by an innovative metal-coated optical fiber developed by Hughes. The thin glass thread, some 1000 of which would be placed around a reactor's core, is tipped with a sapphire retro-reflector. Unlike plastic-coated fibers, it can withstand the harsh reactor environment of temperatures as high as 350°C and pressures up to 1800 pounds per square inch. Compared to resistive level sensors now in use, the fiber is a model of simplicity. The sapphire tip, when dry, reflects light transmitted through the fiber; when wet, it reflects no light. Prototype sensors were developed under Nuclear Regulatory Commission sponsorship.

Nearly 25 orbit-years of flawless service have been accumulated by radiative coolers built for weather satellites in synchronous orbit. These devices are used to passively cool infrared detector arrays to less than 75K. They are far more reliable than mechanical refrigerators because they have no moving parts. They also require no power for operation. Radiative coolers built by the Santa Barbara Research Center, a Hughes subsidiary, have suffered no degradation in performance due to contamination. Since pioneering development of staged radiative coolers in 1966, SBRC has won six separate contracts to provide these devices. Designs qualified for space flight include a unit for an interplanetary mission to Jupiter and another for an earth resources satellite.

Military field technicians can test digital circuit cards containing large-scale integrated circuits with a new portable semi-automatic system. The Hughes HMC-193 Microcat, a microcomputer-aided tester, uses troubleshooting data stored on magnetic program tapes to guide a technician quickly to defective components. It uses universal adapters to route test signals and power, thus eliminating the need for unique adapters. Microcat can be taken anywhere in its shockmounted case and operated in just about any environment.

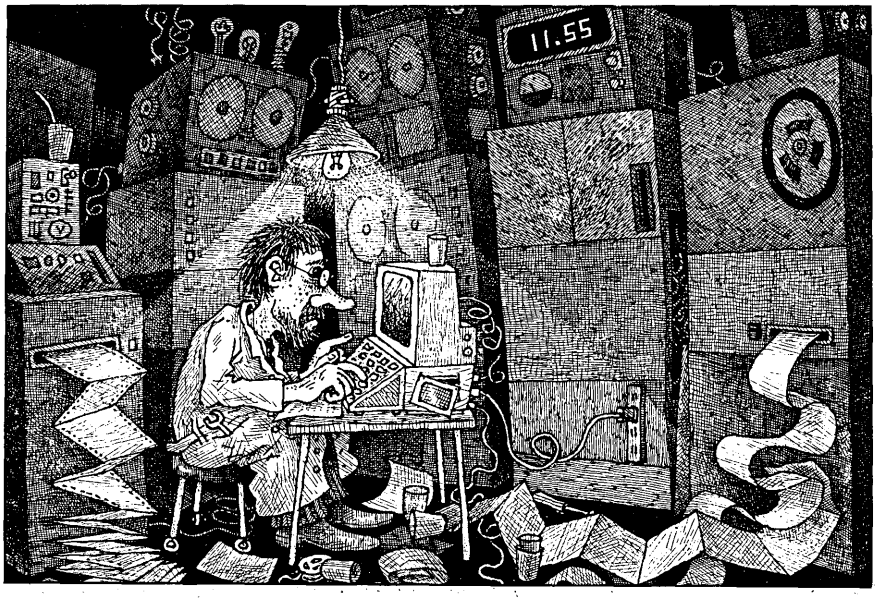
Are you a graduate EE, ME, or physicist with experience in project or systems engineering, optics, product design, reliability and test? Can you fit in with a very bright scientific team working on: lasers, electro-optics, automatic test systems, digital and analog computers, airborne space sensors, electronic/electromechanical components and devices, and other far-sighted systems? If so, and if you seek challenge and just reward, contact Hughes Aircraft Company, Professional Employment, Dept. SE, Electro-Optical & Data Systems Group, 11940 W. Jefferson Blvd., Culver City, CA 90230. Equal opportunity employer.

Special uses of fiber-optics are growing with the development of a highly reliable connector that doubles the efficiency of earlier links. The device precisely aligns the ends of two laser-light-carrying fibers while maintaining a gap of only one-thousandth of an inch. (Ideally the fibers should be butted, except scratches caused by shock or vibration would reduce transmission efficiency.) The result is a coupling that is better than 70 percent efficient. The new Hughes connector also has a special seal to prevent contaminants and moisture from leaking in and impairing fiber performance.

John L. Kirkley, Editor

EDITOR'S READOUT

LOVE'S LABORS LOST



This is the story of two loves.

Both of them could get us into big trouble.

The first love is our love of machines. As children of the Industrial Revolution we are still enamored of our technology. Despite plaintive cries from the humanists, we still believe, deep in our hearts, that given enough time, money, and engineering know-how, we'll find the answers.

Our second great passion is for immediacy. We pride ourselves on our ability to take quick, decisive action . . . we're a results-oriented, pragmatic people.

In the computer industry, our love affair with technology has produced amazing changes, the kind of changes and incredible numbers that are grist for platform speakers and editors. Not too long ago we were privileged to chair a session at which Dr. John McCredie, president of Educom, began his talk with just such wondrous numbers.

Hardware costs, he predicted, will decline, as they have over the past 25 years, at a compound annual rate of 20% to 30%. Prices will plummet: today's $100,000 system will cost $16,000 in 1985; at the same time, speed will continue to increase by a factor of 10 every 10 years. And in five years we'll see a 32-bit microprocessor with 128K of memory on a single chip.

But McCredie, like others, points to problems that are becoming more insistent and, seemingly, insoluble. Many of these problems result directly from our romance with machines and our need for immediacy.

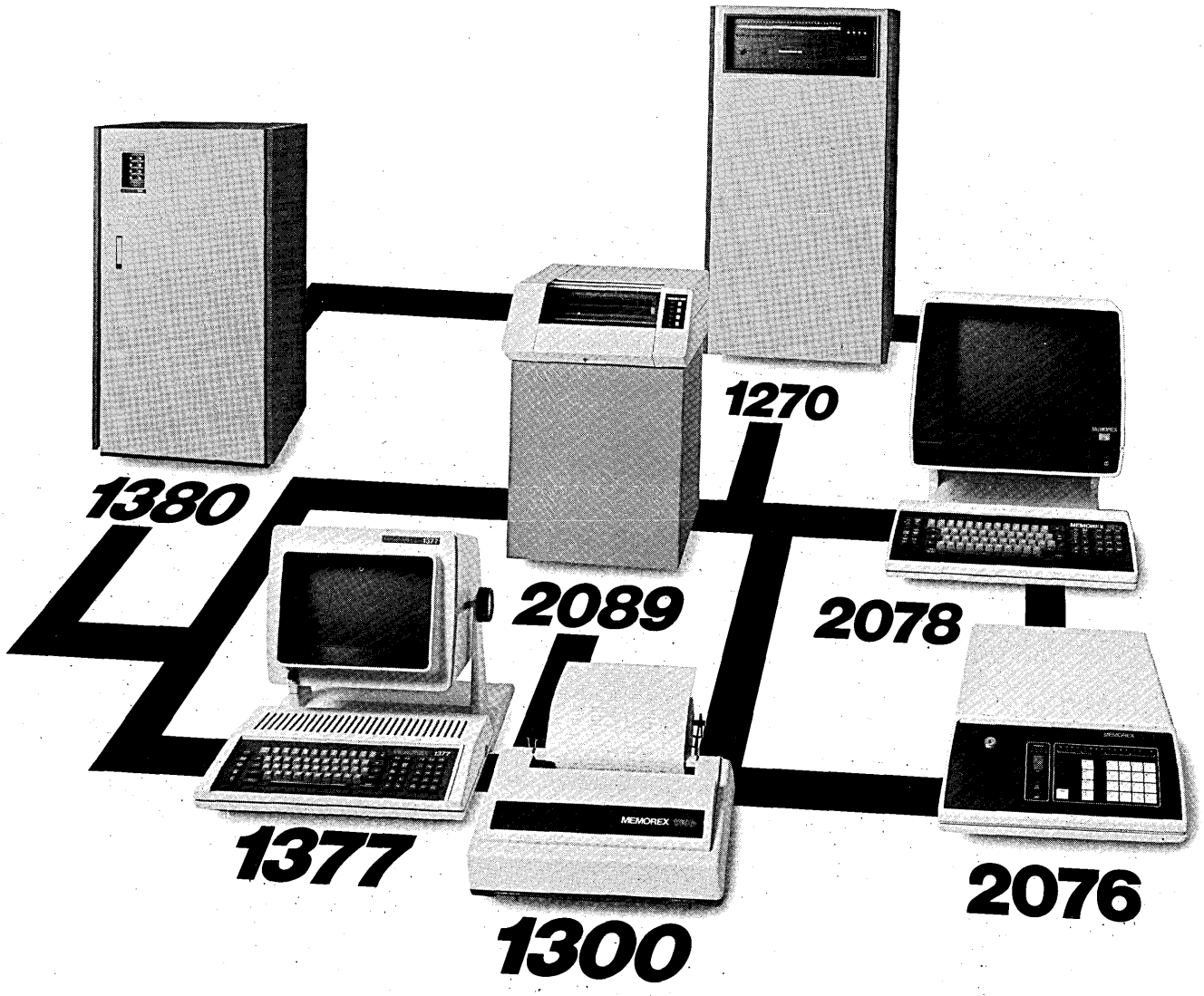
For example, we lack programmers. The shortage is assuming crisis proportions.

Considering root causes, we cast our thoughts back to the Ramo Wooldridge Corp. in the early '60s. We had a computer design setup typical of the era. The EE hardware type was king. He had the best office, worked in a splendid glassed-in computer room, and even had a name parking place. Somewhere in the back of the building, in a windowless room littered with coffee cups and printouts, were a few bearded, red-eyed programmers. After the hardware priests had designed and built the machine, the programmers' job was to make it work. We didn't know it at the time, but the tail was wagging the dog.

Can research and development lead us out of this dilemma? Possibly, but we have a problem here as well, one having to do with our desire for quick results. In order to show immediate returns to stockholders, U.S. business is lagging behind our two primary competitors, Japan and Germany, in plowback R&D funding. We're running a very bad third. The Japanese government targets promising technological areas for developmental subsidies, accelerated depreciation, and tax credits. The Germans have much the same program: low interest loans, tax-free cash grants for R&D investments in facilities, and special depreciation rates for those facilities. We do not.

One final example—again illustrating our insistence on immediate gratification. On p. 88 of this issue, you'll find an excellent and alarming story by Merrill Cherlin. It has to do with the disappearance of a special breed of individual essential to the future health of our industry—the experimental computer researcher. The PhD computer science researchers are being lured into industry and away from the academic laboratories where the future of computing, in its broadest terms, is shaped. The government is aware of the problem, but as Dr. Jerome Feldman, chairman of the computer science department at the University of Rochester, notes in the article, "History is full of societies that didn't solve critical resource allocation problems . . . it's certainly possible that this country will fall behind scientifically and technologically—why not?"

One can only hope that we will come to value people more than hardware and that we will look to the long-term solutions rather than the quick fix. Then, perhaps, this story will have a happy ending.*



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You can schedule well ahead–knowing every member of our family is available. And you can expect cost-effective product solutions without sacrificing field-proven quality and reliability.

Now, when you're considering the purchase of communications equipment, you no longer have to be locked into the "usual" source. Because now–you have the entire Memorex family of controllers, display stations and printers to choose from.

And remember: when Memorex raises a product family, we combine our years of experience with expertise targeted on the technology of tomorrow. To find out all of the specifics on each member of the Memorex family, call Laurie McNeil at (408) 996-9000. Or write: Memorex Communications, 18922 Forge Drive, Cupertino, CA 95014.

MEMOREX

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CIRCLE 26 ON READER CARD

IN FOCUS

TURKEYS IN DP

IN THE BEGINNING ...

In 1952, a Univac I computer was used to project election results from a sampling of voters. The results were tabulated and released at 8:30 p.m. The computer had projected an Eisenhower landslide: Ike with 43 states and 438 electoral votes, Stevenson with five states and 93 electoral votes. Officials on the scene, unaccustomed to a Republican victory of those proportions and totally skeptical, skewed the data, keeping the election odds at that hour to 8-7, instead of the 100-1 odds the Univac I had projected. By the dawn's early light, the actual vote had Eisenhower with 442, Stevenson with 89.

THE BIGGEST PLANS

Frank Marchuk had a company, Laser Computer Corp., and a paper tiger, the CG-100 laser computer. It was a 10 trillion bit, 20 nsec system priced at $1.6 million. In mid-May 1971, Marchuk claimed to have sold 178 machines, and had scheduled delivery for the first 45 units (to Boeing Computer Services). As reported in DATAMATION (July 1, 1971), "A spokesman for Boeing declined to comment on the order." By 1975, Laser Computer's phone was disconnected, and Marchuk was in Orange County (Calif.) Superior Court, suing two companies for repossessing the property and "stealing the plans" of Laser Computer. He later withdrew his complaint in exchange for not paying court costs. Boeing still has no comment.

MACHINES THAT WENT BUMP IN THE NIGHT

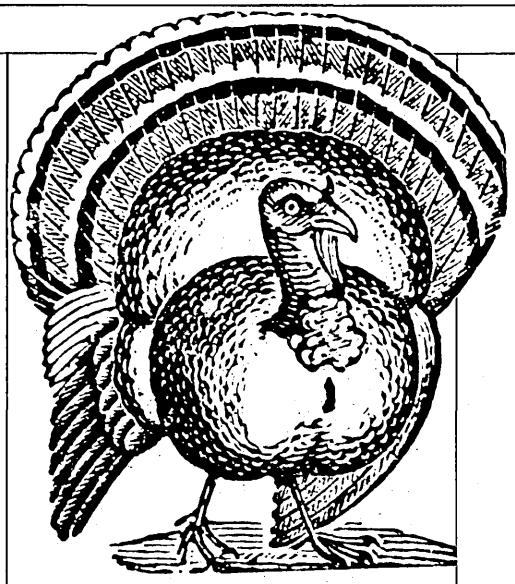
There was once a numerical control machine, carefully designed and installed. In operation, one of its mechanical arms methodically reached back and bashed a hole in the wall behind it.

*

Consultant Bob Patrick remembers the water-cooled Honeywell D-100 in Los Angeles that was set up wrong, and the tape drives, whirling like sprinklers, irrigated the entire installation.

*

And RAND's Johnniac was afraid of the dark; because of photosensitive diodes, it shut down completely if the lights were turned out. Think-tank ingenuity solved the problem by installing fluorescent lights inside the machine.



... BUT WHAT A WAY TO GO

In early 1970, Viatron Computer Systems was in registration; it had just sold $25 million of convertible debentures to the public; it had 50,000 letters of intent for its System 21; there were over $70 million worth of contracts for the semiconductor industry. By the summer of '70, only seven firm orders were in evidence, and the semiconductor industry was holding several million dollars of Viatron accounts receivable. Viatron's stock had gone from a high of $62 to $2.

Dr. Edward M. Bennett, former Viatron president and "guiding light" of the company, was quoted in DATAMATION as saying, "You can start small and you can stay small, and you can die small. Or you can start big, and you can grow bigger, and you can die a little bigger than you would have otherwise."

The System 21 consisted of a keyboard, two tape recorders, a microprocessor, a video display, and a parallel data channel. So what else was new? The $39 a month rental tag Viatron was touting. (It later switched to "sales only.")

Announcing that the low price could be achieved by using MOS devices, an excited semiconductor industry, anxious to please, rushed into costly R&D commitments to provide the custom devices for Viatron. Estimates vary, but the expense to the semicon makers was probably around $15 million.

Wall Street and prominent management consulting firms were loathe to admit the emperor had no clothes, so Viatron, which offered its employees free popcorn, coffee, soft drinks, potato chips, a one-month vacation, and liberal stock options, got rave reviews. "The personnel of Viatron, from secretaries to the president, exude vitality, excitement," said one brokerage newsletter.

When the company was late in producing a cassette-tape-to-computer-tape device (the main element in most of the configurations of the ordered System 21s), outsiders began having their doubts about the company. In W. David Gardner's incisive two-part article, "The Rise and Fall of Viatron" (DATAMATION, May 15, 1971 and July 1, 1971), he quotes a detractor as saying, "It's like giving $40 million to the Marx brothers."

In the end, after Viatron had logged more than $40 million in losses against little more than $3 million in sales, and after it had held off a brace of companies with claims of more than $500,000, a petition was filed in bankruptcy court against the company in February 1971. The claims totaled only $3,901. It was, after all, a small death.

*

No mention of high-fliers would be complete without an obituary for Itel. As reported in *Computer & Communications Buyer* (Sept. 1980), "Financial information by Itel Corp. in August shows that the company has lost its shirt. Itel has also managed to lose the shirts of its bankers and investors along with a few tattered garments on the backs of lessees. In 1979, the company lost more than $430 million—a nasty problem because Itel entered the year worth $240 million. 1980 is still up in the air (or down in the hole), but Itel's being in the red to the tune of another $30 million or so is not at all out of the question."

GREAT MOMENTS IN THE HISTORY OF COMPUTING

Ramo Wooldridge developed a military computer that loaded programs via punched paper tape. When the acceptance test phase arrived, RW flew its honchos, the system, and the taped programs back to Washington, D.C. for the final demonstration before the Pentagon brass. The tapes were loaded, the system came up—and suddenly, the processing stopped. All the sprockets had been ripped out, and the program was destroyed: the senior Air Force colonel was standing on the end of the tape.

*

In the early stages of facilities management, air-conditioning systems were designed to balance the load with the computer, but the a/c systems put out much cooler air if the systems were down. At one installation, the staff didn't trust the computer to run alone, and so turned it off before they left for lunch. When they returned, the windows were covered with frost.

*

Mort Bernstein of System Development Corp. tells a few on himself: "Something was wrong with the circuitry of the IBM 701 . . . the first time I ran a program on it, I managed to destroy half of the Williams tube memory. And then there was the IBM 704. At first the machine would take a card only after a full cycle; then IBM cut it to half a cycle, finally, to a quarter-cycle. Somehow, I wrote a program that didn't quite fit—it was a fifth off the cycle.

Three-quarters of the way into a 3,000-card program, I noticed something was wrong. What was wrong was that the cards were breaking every fifth tooth on the gears; the bottom of the machine was littered with broken teeth. The customer engineer who showed up to help later won an award at IBM—for suggesting the company manufacture stronger gears."

*

One user tells about the time he ordered a memory upgrade, and received a bushel basket full of parts from the vendor: everything you've always needed for an upgrade—cables, power lines, brackets. But no memory.

*

Then there was the Interdata 832, billed as an IBM-compatible machine . . . until one major user discovered it couldn't run IBM programs. Interdata found the error in the microcode and corrected it. The interesting point was that 49 other machines had been installed for some time . . . and no one had noticed the error.

*

There was a comma missing in a FORTRAN program for the Apollo rocket. It was compiled anyway. It crashed. It cost $15 million.

*

Around 1969, Chrysler Corp. profits were down 40%. Part of the explanation was that due to computer error, production managers ordered 500 Imperials without power steering or power brakes and sent them to dealers who had not ordered them.

*

In 1951, at the Point Mugu Naval Air Station in California, programmers plotting missile trajectories were tracking the range in miles. "No, no," said the military, "you have to use nautical miles." The program was changed to measure the altitude in negative fathoms.

*

THE POSTMAN-ALWAYS-RINGS-TWICE BUT-MA-BELL-DOESN'T AWARD: to ACS.

WE CAN'T SAY WE WEREN'T WARNED . . .

The same old management that put SDS out of business now runs Xerox Data Systems.

Take a brand new company with very limited resources. Enter it in a field dominated by the giants of American industry. Give it a product that takes years to develop and years to sell: digital computers. And make a profit while nine out of ten others are counting their losses.

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Scientific Data Systems was founded in September, 1961. By 1963 it was in the black. And has reported increasing profits every year since.

Back in 1961 SDS management made a basic decision. Instead of following the leader they concentrated on a neglected segment of the market: the scientific-technical community.

Now they've made another decision: to expand their scope and go after the business in the general business community. And because in business the Xerox name is a recognizable asset, they changed the name of the company. Nothing else has changed.

So, if you're wondering about their chances in this new venture, don't worry. They'll manage.

XDS
Xerox Data Systems
El Segundo California

PHANTOM MACHINES

Announced with a royal fanfare, but mysteriously never making a public appearance:

Burroughs B8500

IBM 360/60

Honeywell 66/85

IBM 7030 STRETCH—it never met the specs; IBM took a bath, and had to give rebates . . .

IBM 7095—announced in the winter of '63 and overshadowed in the spring of '64 by the birth of the 360. FORTRAN manuals exist for the 7095; it's probably still lurking in the Armonk attic . . .

Univac 1110—the memory on the processor was too slow, so users hooked up the faster 1108 memory . . . and the machine became known as the 1109. You figure it out.

Announcing a $15-million investment in application packages for IDMS Database Users.

Cullinane Corporation recently raised $15,000,000 to invest in application packages for IDMS users; the first such effort in the history of the software business. It is the intent of the Cullinane Corporation to provide a comprehensive library of application packages to its IDMS user base. We feel this is the ultimate productivity tool whereby the application is already built for the IDMS user. In addition, these will be integrated applications which "speak to each other" and take advantage of the various IDMS tools, such as OnLine English, to make the application data available to the end user. The first available application is the Customer Information System (CIS), for banks. The CIS is a proven, high-performance system, capable of supporting multiple banks.

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John Cullinane, President

Cullinane Corporation

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Tailored to management, these seminars introduce the new application packages, as well as the complete family of software systems from Cullinane.

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20 Washington, DC	9 Buffalo, NY	16 Boston, MA
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CIRCLE 27 ON READER CARD

IN FOCUS

HYPE-THETICAL

Not everyone may recall, but IMSAI—known primarily as one of the successful companies in the early (mid-'70s) days of personal computing—started out announcing futuristic microprocessor-based devices for the conventional dp market. Its most ambitious project was the "hypercube," an array of 8080 microprocessors logically interconnected in four dimensions. That fourth dimension must have sent the project into Hyper-Hype—the machine was announced, but never built.

THE INDUSTRY CONS ITSELF

Remember CRAM—card random access memory files? It worked for NCR . . . for a while . . . and so all the other vendors jumped on the bandwagon. But the wagon, wasn't hitched to a star, and they all withdrew, quietly, in favor of disks.

THE SELL, SELL, SELL AWARD

There have been many attempts, but no company has ever been able to match the timeless tackiness of the Recognition Equipment ads of the late '60s . . . photos of women standing around water coolers, black-gloved women in black cocktail dresses, and, finally, a woman in the sixth month of pregnancy: all with the caption "Our optical reader can do anything your keypunch operators do. (Well almost.)"

—Wendy Reid Crisp and Deborah Sojka

A PARABLE

In 1965 Congress passed legislation to encourage states and private nonprofit institutions to establish adequate student loan insurance programs for eligible educational institutions. To deal with the changing legislation an Office of Education task force was established in 1966 to develop adequate systems to support the Guaranteed Student Loan Program. The administration of the program had to design procedures to establish the eligibility of schools and of students to receive interest subsidies paid by the government. The staff could not catch up on the backlog and had to send interest subsidies relying only on lenders' statements.

An interim computer system was designed with the help of an outside contractor. Most of the personnel in the loan agency were new to the program and claimed that rigorous systems specifications could not be developed. The computerized system used optical scanning and did not work satisfactorily. One problem was that the codes for schools had not been completed. Without the school coding, the guaranteed loan staff could not prepare a list of students to verify enrollment. Without the verification, interest payments could not be made automatically and had to be processed manually.

To overcome these difficulties, a contract to develop a system for the Guaranteed Student Loan Agency was awarded in 1967. The new system was supposed to streamline the loan history file and cover federal requirements. When this new system was introduced, it is believed that a number of tapes containing essential data were lost in the conversion. The 10-reel master files had to be reconstructed many times. The system was run for the Office of Education, but the computer being used belonged to the Department of HEW, which did not give the Guaranteed Student Loan System high priority.

In late 1969 a contract to develop a successor system was awarded. A new system was also needed because of several legislative changes enacted by Congress. A major accounting firm began to develop the second version of the system. The contractor claimed that the

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INTERTEC'S NEW $2500 MULTI-USER SMALL BUSINESS COMPUTER

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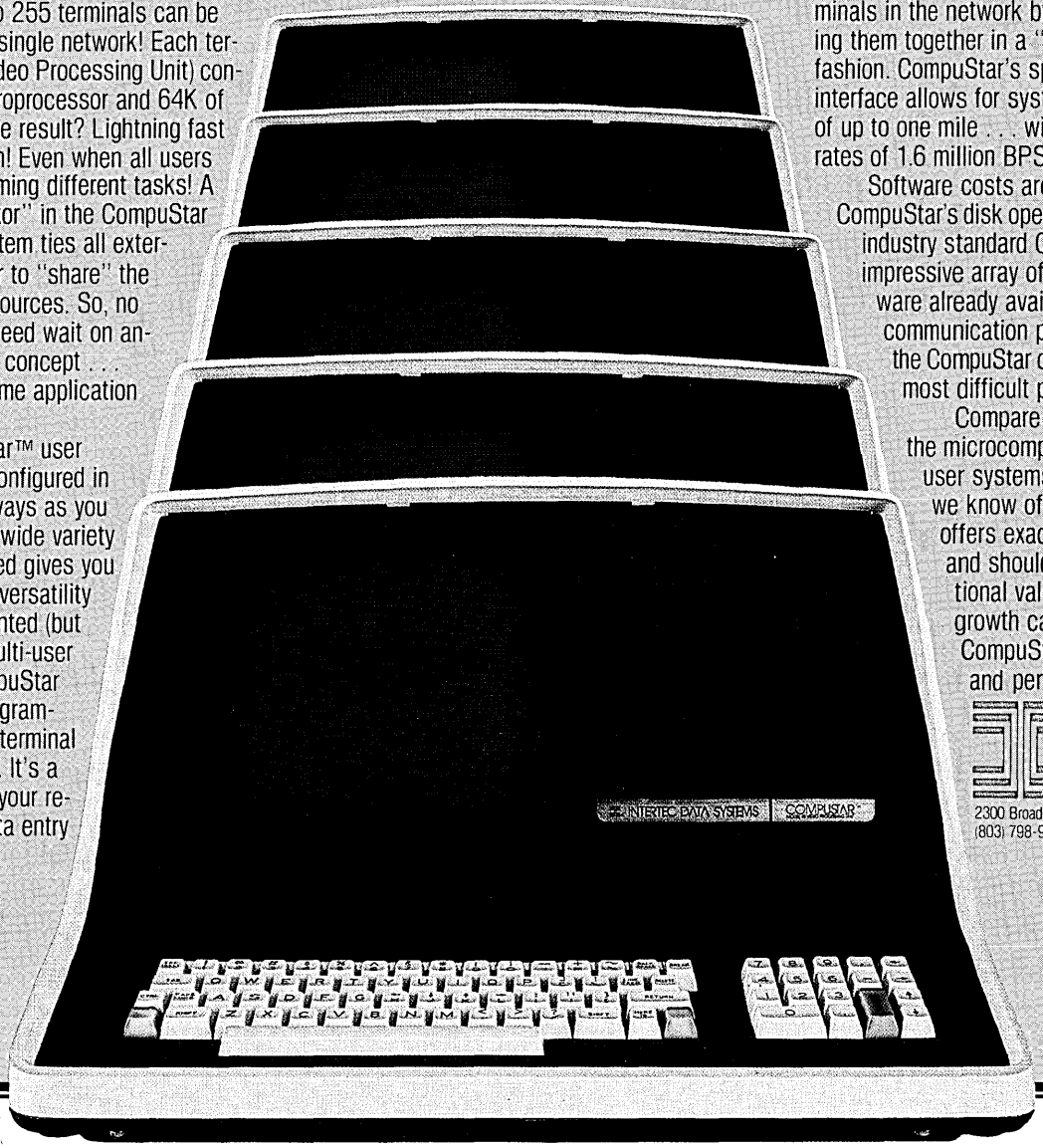
Unlike any other system, our new CompuStar offers what we believe to be the most practical approach to almost any multi-user application. Data entry. Distributed processing. Small business. Scientific. Whatever! And never before has such powerful performance been available at such modest cost. Here's how we did it . . .

The system architecture of the CompuStar is based on four types of video display terminals, each of which can be connected into an auxiliary hard disk storage system. Up to 255 terminals can be connected into a single network! Each terminal (called a Video Processing Unit) contains its own microprocessor and 64K of dynamic RAM. The result? Lightning fast program execution! Even when all users are on-line performing different tasks! A special "multiplexor" in the CompuStar Disk Storage System ties all external users together to "share" the system's disk resources. So, no single user ever need wait on another. An exciting concept . . . with some awesome application possibilities!

CompuStar™ user stations can be configured in almost as many ways as you can imagine. The wide variety of terminals offered gives you the flexibility and versatility you've always wanted (but never had) in a multi-user system. The CompuStar Model 10 is a programmable, intelligent terminal with 64K of RAM. It's a real workhorse if your requirement is a data entry or inquiry/response application. And if your terminal needs are more sophisticated, select either the CompuStar Model 20, 30 or 40. Each can be used as either a stand-alone workstation or tied into a multi-user network. The Model 20 incorporates all of the features of the Model 10 with the addition of two, double-density mini-floppies built right in. And it boasts over 350,000 bytes of local, off-line user storage. The Model 30 also features a dual drive system but offers over 700,000 bytes of disk storage. And, the Model 40 boasts nearly 1½ million bytes of dual disk storage. But no matter which model you select, you'll enjoy unparalleled versatility in configuring your multi-user network.



Add as many terminals as you like - at prices starting at less than $2500. Now that's truly incredible!

No matter what your application, the CompuStar can handle it! Three disk storage options are available. A tabletop 10 megabyte 8" winchester-type drive complete with power supply and our special controller and multiplexor costs just $3995. Or, if your disk storage needs are more demanding, select either a 32 or 96 megabyte Control Data CMD drive with a 16 megabyte removable, top loading cartridge. Plus, there's no fuss in getting a CompuStar system up and running. Just plug in a Video Processing Unit and you're ready to go . . . with up to 254 more terminals in the network by simply connecting them together in a "daisy-chain" fashion. CompuStar's special parallel interface allows for system cable lengths of up to one mile . . . with data transfer rates of 1.6 million BPS!

Software costs are low, too. CompuStar's disk operating system is the industry standard CP/M*. With an impressive array of application software already available and several communication packages offered, the CompuStar can tackle even your most difficult programming tasks.

Compare for yourself. Of all the microcomputer-based multi-user systems available today, we know of only one which offers exactly what you need and should expect. Exceptional value and upward growth capability. The CompuStar™. A true price and performance leader!

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CIRCLE 29 ON READER CARD

IN FOCUS

"Louie, I'd like something that will carry me through the question-and-answer period of the stockholders' meeting."

Guaranteed Student Loan Program staff was unclear in its requirements for the system; there were at least seven major amendments to the contract during implementation. Financial accounting requirements were not clearly specified. The staff in the Office of Education had assigned only two persons to work with the contractor, and major decisions took four to six weeks to be made.

The contractor also underestimated the job. The slippage in implementation of the system created backlogs and contributed to an incomplete set of documentation for the system. Finally, the specifications were frozen and the contractor was allowed to cancel the remaining part of the job before removing all the errors in the system. The maintenance of this new system was awarded to yet another contractor, and as might be expected, the conversion was a rerun of 1967.

The General Accounting Office conducted a thorough study of the program in 1973 and identified a number of significant problems, including difficulties in processing procedures, collection procedures for insurance premiums, commitments, and disbursements. The conclusion was that the system was poorly designed, poorly documented, and inadequately controlled.

—Hank Lucas

CARTOON BY HENRY MARTIN

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DM20 Editing, buffered transmission, extended formatting capabilities, block and character transmission, buffered auxiliary port, extended function keys.

DM10 Status line, baud rates up to 19,200, addressable cursor, 14 key numeric pad, line drawing capability, self test, time-of-day clock, read terminal status, line lock.

DM1A Function keys, memory lock facility, split screen operation, half intensity, independent auxiliary I/O port, single key cursor control, visual attribute control.

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CIRCLE 31 ON READER CARD

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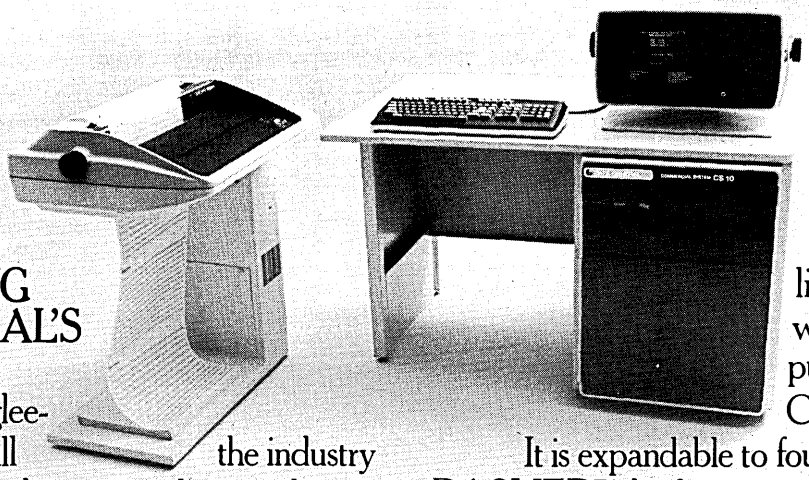

INTRODUCING DATA GENERAL'S NEW CS/10.

It has been gleefully estimated by all the industry pundits that during the next twelve months somewhere in the neighborhood of 500,000 small businessmen will purchase their very first computer.

Isn't it ironic that, until now, there was no computer perfectly suited to this emerging market? In fact, the choice narrowed down to computers that were either too much, or too little, or weren't capable of expanding to accommodate any but the most stagnant of businesses.

Which is precisely why we at Data General engineered the new CS/10. While the CS/10 is eminently affordable (actually it's the lowest priced—$10,950 list—serious multi-terminal computer in America and features one of the most aggressive discount policies for industry suppliers and volume purchasers), it is designed to provide a surprisingly wide range of sophisticated functions with enormous possibilities for expansion.

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It is expandable to four interactive DASHER™ display terminals. Such innovative software tools as the Proxi™ program generator can be added to help you customize programming for practically peanuts and there's even an optional remote unit that enables you to diagnose problems from your desk or wherever you happen to be.

And perhaps the most significant competitive aspect of the CS/10 is that it isn't just one lonely machine. It is part of an entire family (CS/10 through 70) of program and data-compatible systems, which of course means that one modest CS/10 installation can easily burgeon into a 17-terminal CS/70 system (with an impressive number of peripherals).

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LOOK AHEAD

(Continued from page 14)

Dallas. The services provide a method for potential subscribers to evaluate voice mail without having to install a full in-house system. About 800 individual users representing 25 companies are using the voice mail service in both cities, with some calling in for messages from as far away as Canada. By using Touch-Tone telephones, a user can leave messages in the system and pick up his own messages in much the same way as he would with an electronic mail system. A VMX system costs about $500,000 and can handle up to 1,500 users within a corporation.

ECS seems to have the voice mail market pretty much to itself for now, but in the future it expects major competition from IBM and AT&T. IBM has an experimental Speech Filing System operating at its Yorktown Heights Research Center using dual 370/168s. A commercial version of this system reportedly would cost about $3 million. AT&T has proposed a residential voice storage service in the Philadelphia area which would allow users to collect phoned in messages from special recording equipment installed in phone company central offices. But the Bell offering is stalled due to regulatory delays.

ECS feels the potential for voice mail lies in in-house systems. It will soon install its next major VMX system at Hercules Corp. in Wilmington, Del.

DOES "H" STAND FOR HOT?

One reason for IBM's delays with H development, according to a former IBM researcher, is that IBM had heat transfer problems with its multi-chip carriers. To cool the chips, IBM had planned to use liquid Freon, which is theoretically inert and should not damage the chips upon direct contact. In fact, however, the Freon over time picked up chemical contaminants which corroded the chips. IBM reportedly solved the problem with a new two-stage cooling system using helium to pick up heat from the chips and a liquid Freon element to cool the helium. The Freon problem reportedly came as a belated surprise for H developers (IBM had been researching Freon cooling for a decade) and caused costly redesign.

RUMORS AND RAW RANDOM DATA

We hear that Network Systems Corp. will go public before year-end...Rumors persist that Jared Anderson may leave the presidency of Two Pi...It's no secret that Burroughs is in big trouble on several fronts. One company insider talks of "major shake-ups" in management, while one financial analyst predicts that "half the company will be fired" by year-end.

NEWS IN PERSPECTIVE

START-UPS

APOLLO IS LAUNCHED

With a formidable management team and an expressed dedication to service and support, Apollo Computer is ready to take off.

In 1972, J.W. Poduska's basement in the suburbs of Boston was the nursery for newborn Prime Computer, which grew up to become a minicomputer success story. Poduska was vp in charge of both research and product development at Prime, a central figure in the firm's success. Late last year, he went back to his basement and in February announced the formation of a new company, Apollo Computer, Inc.

Apollo has just moved into a new plant in North Billerica, Mass. The firm now has an executive roster that looks like an association of former general managers from the minicomputer industry, and boasts a small staff of technical hotshots that already has a local industry reputation. And John William Poduska, the 42-year-old ceo, says with a cherubic smile, "I think we were all just born into the right industry at the right time. This can be just *incredibly* exciting!"

Apollo is about to announce the first of its product line, a high-performance, local-loop network of highly interactive dedicated microcomputers: 16-bit micros that can operate in a virtual machine environment with large-machine functionality. These are personal computers for the computing professional, with an integral bit-map raster scan display, a workstation node with plenty of extras, and a machine-independent PASCAL operating system.

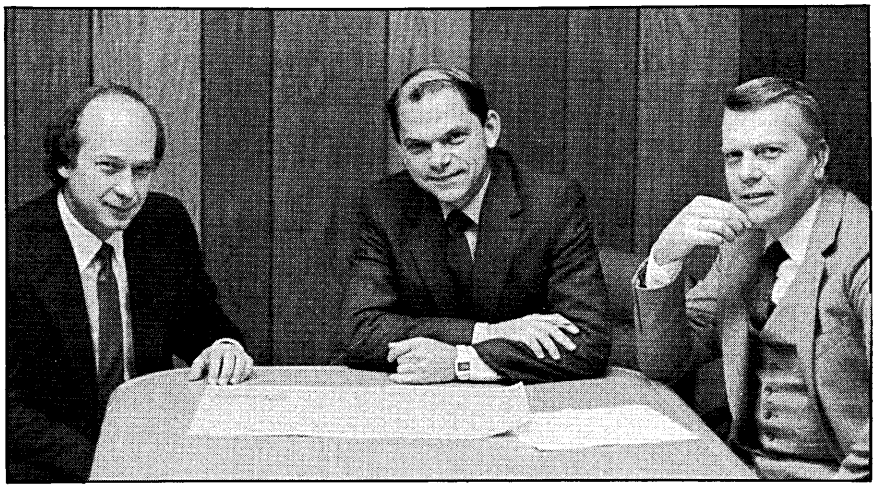
The machine-independent OS will permit a system vendor to keep up with the advances in VLSI technology, treating the latest cpu chips almost like any other system component, adapting the system to it as they would a new disk drive.

"It's not really plug-compatible," explained Apollo's vp for system development, David Nelson. "We'd have to rewrite some code for a new chip. But we've taken all the instruction set-dependent aspects of the operating system and encapsulated them in two areas—the code generator for the high-level language and the very low-level run-time support for the OS kernel —and both of these machine-dependent areas can be rewritten without significant modifications to the operating system."

In the past, said Nelson, the "West Coast people who make chips" watched the "East Coast people who sold systems" snatch up new components as quickly as they were made available. "As high density logic devices came out, they were rapidly assimilated." But that ended, recalled Nelson, when the semiconductor manufacturers began offering the entire cpu on a chip. The vendors, the system manufacturers, simply had too much invested in their own operating system software; they couldn't afford to switch to a new cpu architecture. Apollo, however, will be able to take advantage of VLSI technology from any of several manufacturers, he said. The system is now based upon the Motorola 68000, but the company will be testing alternative chips, added Poduska, and will probably move to a full 32-bit chip in the future.

The Apollo designers claim their system represents a "new concept" in computing made possible by recent advances in VLSI technology, operating systems software, video display technology, distributed communications, and magnetic storage.

Poduska echoed the thoughts of many academic analysts when he declared that the plunging price of hardware has removed the economic justification for tradi-



GERALD STANLEY, DAVID NELSON, BILL PODUSKA: They're hoping for revenues between $50 million and $100 million within the next five years.

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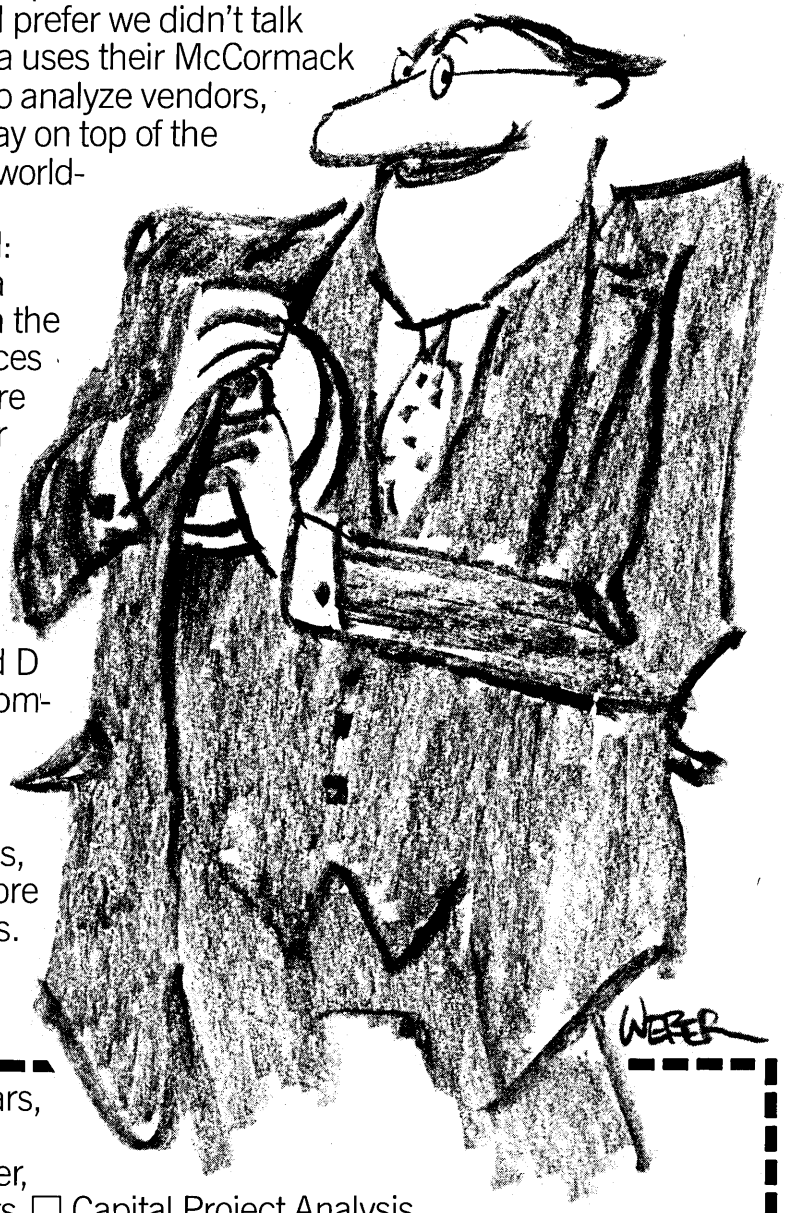

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CIRCLE 34 ON READER CARD

tional time-sharing. A micro-based Apollo network offers the user a dedicated cpu (and an always-available highly interactive wideband interface), yet retains the advantages of time-sharing: shared peripherals, data bases, and communication facilities.

"What makes all this change interesting and exciting is that we can now take advantage of so many parallel advances in related areas," explained Poduska. "And not just in the hardware world; in systems and software too." Poduska noted the reliable cpu chip supply; 64K RAM; cheap storage in Winchester disks; high performance graphics available with a dedicated cpu; and high-performance local-area networks.

The Apollo system will use the 24-bit virtual address space on the MC68000, 16 megabytes, for virtual memory. "The concept of Apollo is built upon this large virtual address space for both programs and data files," said Poduska. "It's not unique in the sense that it hasn't appeared before and worked, but it is certainly unique on a microcomputer."

The virtual address space and the large-machine (FORTRAN 77) functionality of the OS will distinguish the Apollo dedicated system from competing microcomputer systems, he said. The VM implementation was difficult and expensive, "but the end result is that our machines can support very large programs—many megabytes of programs—just as a Prime, or a VAX, or a 370 machine would."

A typical Apollo configuration would be a $35,000 standalone module for an entry or development purchase, which includes the cpu, the 1024 × 768 bit-map display, one-quarter megabyte of memory, 33 megabyte Winchester disk, a 1 MB floppy disk, and a network controller. The peripherals module, priced at $55,000 and usually shared by all other modules, also includes a 300 lpm printer and a 45 ips magtape. The simple terminal module, with keyboard/display, cpu, network controller, and one-quarter MB of memory, is priced at $25,000.

"There is a reasonable analogy between what the micros will do to the minicomputer business and what the minicomputers did to the mainframe business."

"The micros will offer a monumental challenge to the industry," Poduska predicted. "We're talking about billions of dollars in sales within a very short time." Apollo itself, structured and financed for rapid growth, hopes for revenues between $50 million and $100 million within the next five years, declared Poduska. The company may try to go public perhaps within two or three years.

"There is a reasonable analogy between what the micros will do to the minicomputer business and what the minicomputers did to the mainframe business," said Poduska. "I just think it will happen a little faster, will get a little more intense, and I think the magnitude of the numbers involved is going to be more important to the general economy."

Apollo's nine founders include Poduska; Nelson, the former director of research at Prime and once manager of architecture research at Digital Equipment; Charles Spector, Apollo's executive vp and chief operating officer, a 12-year DEC veteran, most recently general manager for DEC's manufacturing, distribution, and control products group; and Robert Antonuccio, former general manager of Data General's Southboro, Mass., plants, now Apollo vp for manufacturing.

The others are John Greata, former head of Prime's software and advanced system development group, who will be Apollo vp for engineering; David Lubrano, former treasurer of National Medical Care, Inc., now treasurer and Apollo vp; and finally, Gerald Stanley, former group marketing manager for Digital's medical systems group, now Apollo vp for marketing.

—Vin McLellan

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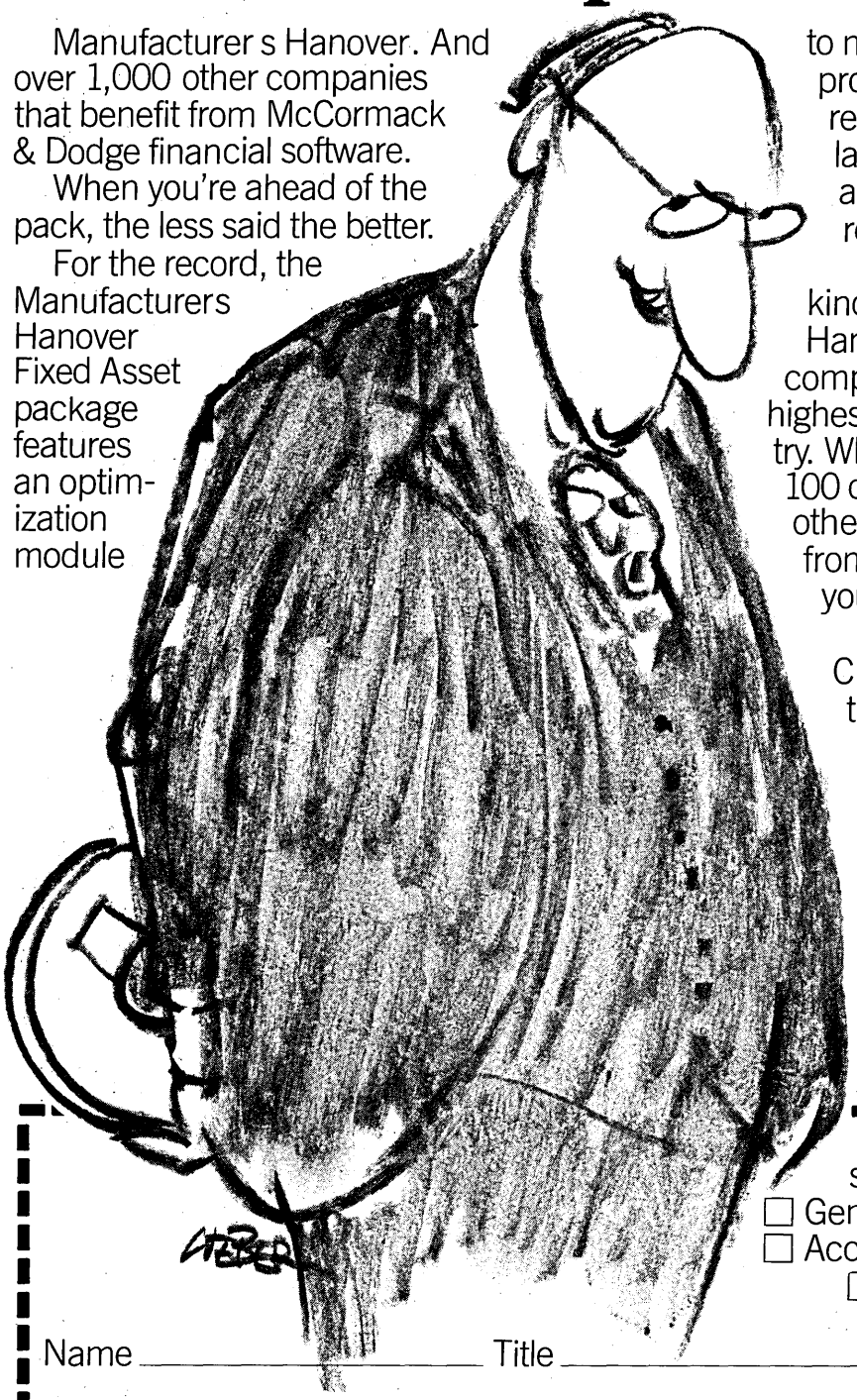

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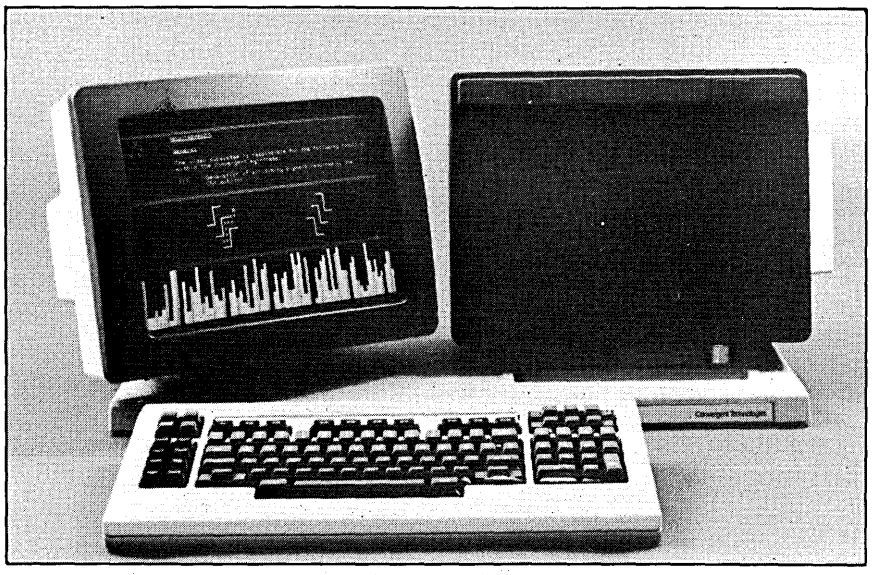
POWER TO THE PEOPLE

Convergent Technologies' concept is to put mainframe power on the desktop.



THE INTEGRATED WORKSTATION is Convergent Technologies' first product, which the company began shipping last month.

The trend to decentralized data processing, given a nudge by recent interest in distributed processing, is getting added impetus this month. A new company with plans to produce multifunction workstations that can be clustered in a local area network is promoting the idea that remote processors may provide users with local site processing, but that's not enough. What's really needed and what can now be supplied at reasonable cost, it is being argued, is processing power for each user, on office desktops and laboratory workbenches.

"Computing resources will continue to become more intimately tied to individuals, as opposed to locations or departments," says Allen Michels, president of one-year-old Convergent Technologies. In the past, he adds, it's been questioned how much processing capability or hardware intelligence should be provided to users. But with the low cost of LSI circuits and microprocessors, that no longer is the issue. The semiconductor portion of the hardware is coming down in price, while costs of things like wire, plastics, and sheet metal are going up. So the equipment maker might just as well pack that intelligence in there, he says. "By doing so, you bring capability to the party at a decreasing cost. That's what we're doing."

Convergent Technologies, of Santa Clara, Calif., last month began shipping its first product, the workstation based on the Intel 16-bit microprocessor. The user-pro-

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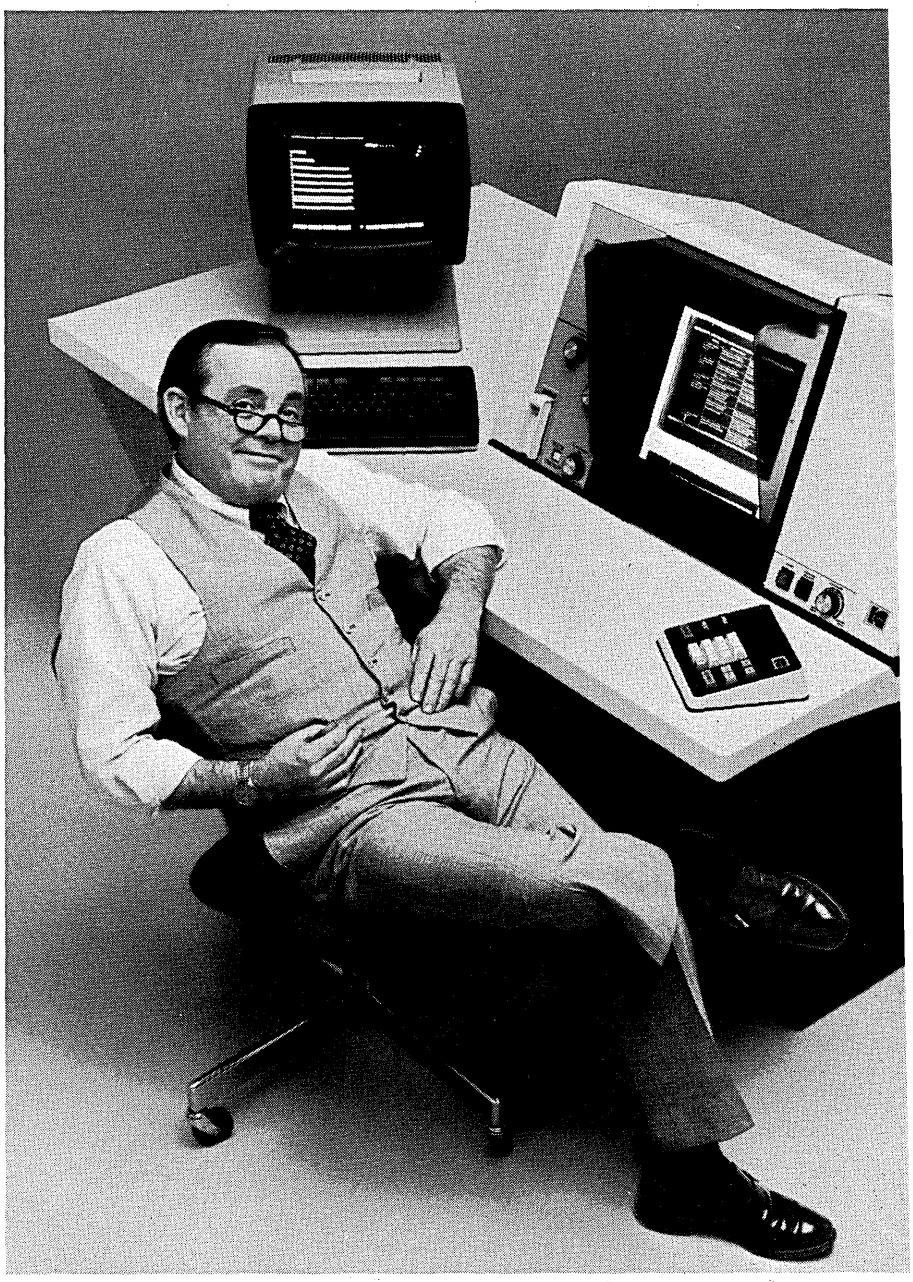

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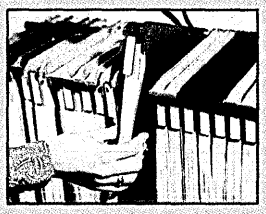

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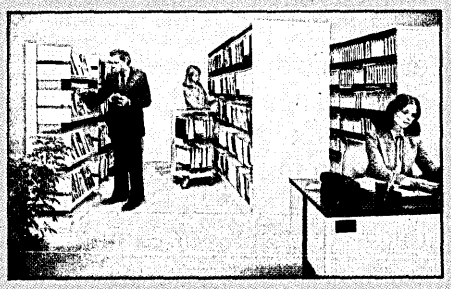

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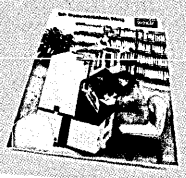

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grammable station, which runs its own operating system, comes with a keyboard and 15-inch crt, processor with 128K or 256K bytes of user memory, and communications capability. The next upgrade to these desktop workstations will be the ability to configure them as a local cluster. Each station can have its own mass storage and printer or share such resources with other workstations in the cluster, the availability of these devices being managed by a shared resource processor (SRP). At that time, the user will have multilingual access to a common data base.

Michels thinks the trend will continue and that "the next level to decentralization is to people."

Michels contrasts this setup with a distributed system in which, say, an IBM 8100 communicates with a large mainframe and supports a number of local dumb terminals. If the communications lines or the mainframe were to go down, so also does the 8100, he explains. But if a CT shared resource processor were to lose access to that mainframe, it would continue to run. And even if the SRP were also to go down, each workstation could continue to do its own thing. Further, among the workstations in a cluster there can be any mix of applications, any mix of languages running concurrently.

The IBM system with the 8100 "is a reimplementation of mainframe computing at a local level," Michels explains. "It's still centralist and there's still the dependency everywhere upon the availability and performance of the central device."

In word processing, of course, those systems that feature a processor supporting a number of terminals are called shared-logic systems. Michels calls Convergent Technologies' approach distributed intelligence, for he's packing LSI intelligence into the machine and distributing this to local users. He notes, too, that a number of vendors have what they call a shared resource system, where the resource being shared might be a printer. But he says when CT uses this term, "we're talking about the ability to access a data base using multiple languages concurrently and a common set of files in that data base being available to all comers, irrespective of the nature of the local processing that's going on." So he's using the term to mean the availability of information resources to users.

"From our point of view," he adds, "the roots of our business lie in the acceptance of distributed processing and the growth of the distributed information processing concept in the office, factory, or laboratory." He thinks the trend toward decentralization will continue and that "the next level to decentralization is to people."

Michels, however, sees not only the growing justification for distributing intelligence to local users, citing the lower costs that make this feasible and the higher productivity that results from it, but also sees a concurrent movement in the office. Automating clerical functions, he observes, has produced typewriter-like, crt-based, dedicated-function machines called word processors. As these devices evolve, he says, one can see the need for more functions, more power, greater ease of use—in short, additional intelligence. The result is a convergence of the word processor, coming up from the office world, and the multifunction workstation, coming down from the world of distributed processing.

To the end-user organization, the CT device is a product that performs like a mini, looks like a terminal, but functions as a workstation.

"And I think the two are going to merge," he says. "The evolution of ddp, in terms of its decentralization, and the evolution of the clerical terminal, in terms of its upward evolution, converge on a common type of product." That product is said to be

one that people are familiar with, consisting of such elements as the keyboard and display, but one that can be used to do different things at different times.

From the viewpoint of the end-user organization, then, the user-programmable device being produced by CT is a product that performs like a minicomputer, looks like a terminal, but functions as a workstation. The vendor does not provide applications programs, leaving that up to the buyer —whether a user or oem. Available, however, is software to aid in applications development, including an extended version of BASIC, PASCAL extensions, FORTRAN, and COBOL coming up early next year. The basic workstation with 64K RAM is priced at $4,000.

Michels most recently was general manager of the microcomputer development systems operation at Intel Corp. Previous to that he spent 10 years at Digital Equipment Corp. His cofounders at Convergent, Robert Garrow and Kal Huber, both worked for Michels at Intel.

Their business plan calls for the shipment of some 100 systems to as many customers this year, with hopes for 4,000 more next year. Says Michels, "We're committed to being the major supplier of systems that represent the presence of mainframe power on the desktop."

—Edward K. Yasaki

MANAGEMENT

TAKING THE REINS

Early indications are that Blumenthal will introduce a new management style at Burroughs.

When W. Michael Blumenthal became ceo at Burroughs Corp. recently, he gave evidence that a new management era might be dawning at the firm. The former U.S. Secretary of the Treasury had been slated to assume the Burroughs post at the start of 1981, but the date was suddenly moved up by the company's board of directors. His predecessor, Paul S. Mirabito, retains the title of board chairman until January, when Blumenthal will hold both top slots.

Blumenthal joined Burroughs early this year with the job of vice chairman and reportedly had been "learning the computer business" in preparation for taking the reins.

In an interview only days after being named to head Burroughs, Blumenthal showed that he had been doing his homework. He characterized the computer industry as different from other industries because "it is marked by rapid technological changes and rapid changes in the market brought about by the lowering of production costs. Thus, the market is growing upward and outward all the time with opportunities for new users. At the same time there are new areas in which existing users have to be served," he explained.

Where dp previously revolved around the cpu, Blumenthal said, now other factors such as systems support are taking on added importance. Despite the recession, the industry as a whole is experiencing rapid growth and this is creating a requirement for critical skills which are vital but in short supply, he suggested.

Strategic planning is particularly critical, and Blumenthal said Burroughs will emphasize this area. He said it is essential that the company "present a reliable supplier position" to users so that service and support have a high level of follow-through with customers.

Asked about the impact of the recession, Blumenthal said, "We would be in much worse shape if we were not in such a dynamic, growing industry." Commenting on Burroughs' second quarter financial re-

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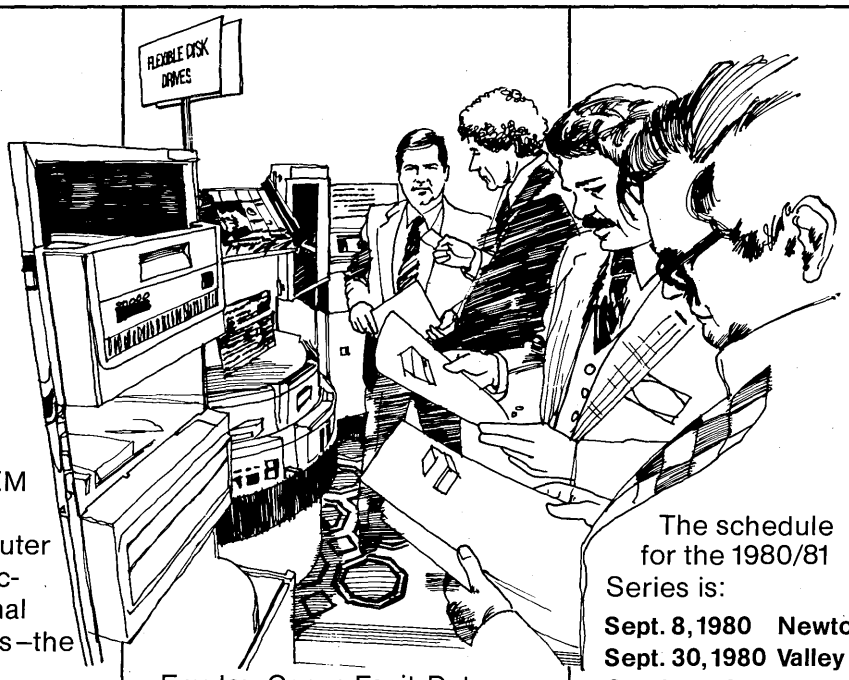

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W. MICHAEL BLUMENTHAL: "Being honest about our successes and failures is the best policy."

port, which showed that the company had an earnings decline for the first time in 17 years, he said, "To some extent this was due to economic conditions," but also to particular problems within Burroughs which he described as "not fundamental" but "correctable in the short term." Without elaborating on the internal problems, he vowed to correct them by 1981.

Regarding the pending acquisition by Burroughs of System Development Corp., Blumenthal said it "presents a very neat fit where our strengths and their strengths match." SDC is very strong in the military systems area, he added, and while Burroughs has the necessary hardware and a strong organization in Paoli, Pa., SDC's government business "will be very helpful to us." The Santa Monica, Calif., firm is also very strong in software support and Burroughs is "rather weak" in this area, Blumenthal stated, so the acquisition would help Burroughs build up this important segment of the market. SDC has an office automation software product called the Data Vault, which Blumenthal said has good potential and will complement the hardware capability at Burroughs to provide an integrated office automation system.

Calling the SDC affiliation a "match made in heaven," Blumenthal said he expects it to be finalized, but he cautioned against interpreting the move as the start of an intensive acquisition campaign. While he did not rule out such a possibility, the Burroughs chief said it would depend on the five and 10 year strategic plans now being developed and the potential weaknesses in the company that these plans uncover.

In this regard, the new emphasis on planning led to the appointment of Jerome Jacobson to the position of vice chairman for the company. Jacobson had served with Blumenthal on the management team at Bendix Corp. and will now be in charge of business development planning at Burroughs.

Acknowledging that there have been successes and failures in acquisitions at Burroughs, Blumenthal said the Redactron purchase some years ago had been "a very mixed picture, but we have learned from that, and the SDC acquisition will be handled quite differently."

The image of Burroughs as a company that is "hard to get to" is only partially justified, Blumenthal said, "but being honest about our successes and failures is the best policy." He predicted that the company would become more open about its activities in the future.

Contacts with Burroughs customers have often centered on the perception that the firm had good hardware and a good software operating system, but that it's not always supported and serviced as it should be, he mentioned. "This is something we are going to address ourselves to very vigorously," he said, adding that he had heard the same complaint "wherever I have gone."

Although the corporation has some temporary problems that need to be fixed, Blumenthal commented, the opportunities for growth are at the same time very good.

—Ronald A. Frank

COMPANIES

GEARED FOR GROWTH

Digital Scientific Corp. is refining and expanding its markets.

The big thing for Digital Scientific Corp. for the past 10 years has been emulation.

More than 250 of its Meta 4 computer systems are out and doing their thing for users of IBM 1130 and 1800 systems and Control Data 160As. And, says San Diego-based Digital Scientific, they're doing it better and faster.

In fact, it was the company's emulation efforts that first brought it to the attention of then Itel president, Peter Redfield, in 1973. In that year, Digital Scientific determined that the mid-range IBM 370 series presented an opportunity for improved price/performance ratios. With that market in mind, it began development of a more powerful processor than the Meta 4.

Digital Scientific's aim was emulating the 370/145. Itel became interested and talked the company into changing to the

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370/158. But little Digital found it lacked the resources to continue the program, and Itel talked National Semiconductor into purchasing the development rights to what was to become the Advanced Systems family first marketed by Itel and subsequently totally transferred to National (Nov. 1979, p. 54).

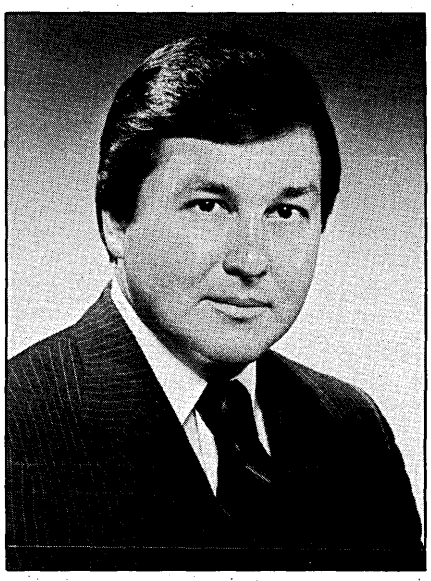
Redfield must have liked what he saw in his early talks with Digital Scientific,

Future growth will be in the small business systems area.

for in May of this year, along with La Jolla, Calif., investor Nicholas Wallner, he acquired the San Diego firm.

"When they acquired the company," Digital Scientific's new president, Charles Hart, says of Redfield and Wallner, "they felt strongly that microprocessors were the big thing in the computer industry today." They talked to a number of companies producing microprocessor-based systems and, last August, acquired Computer Office Systems, Inc., producer of a business and word processing system called the Memory Master. COS' 25 employees were moved into Digital Scientific's San Diego plant and the combined operation is geared for growth.

The growth, says Hart, will be in the



CHARLES J. HART: He says DSC is looking at other buy-out candidates.

small business systems area. He sees the company's Meta 4 business as "stable."

Hart describes the Memory Master as a microprocessor-based system that combines word processing and data processing. Three-year-old COS did less than $1 million in business last year, and Hart is projecting $2 million for this year. He sees the operation propelling total Digital Scientific sales to $30 to $40 million in three years' time.

Fred Brown, president and founder of COS and now a Digital Scientific vice president, feels mobility and low price will be the keys to his systems' success. The Memory Master prices range from $9,950 to $14,900. The unit is on casters and the company wheels it from a van to a customer site for demonstrations. The company is

"We talk solutions. We sell benefits, not features."

currently shipping units at the rate of 15 per month and expects to up that to 50 by next June.

COS manufactures its own hardware and develops all software except the operating system. That is CPM. The company doesn't customize software, but Brown said the software has a self-customizing feature that asks a user questions about his business and then tailors the applications to his needs.

The company plans to open sales offices for COS at the rate of one per month and expects to have 100 offices within three years.

"Our Memory Master system was designed for use by office people, not computer experts, and this helped create a de-

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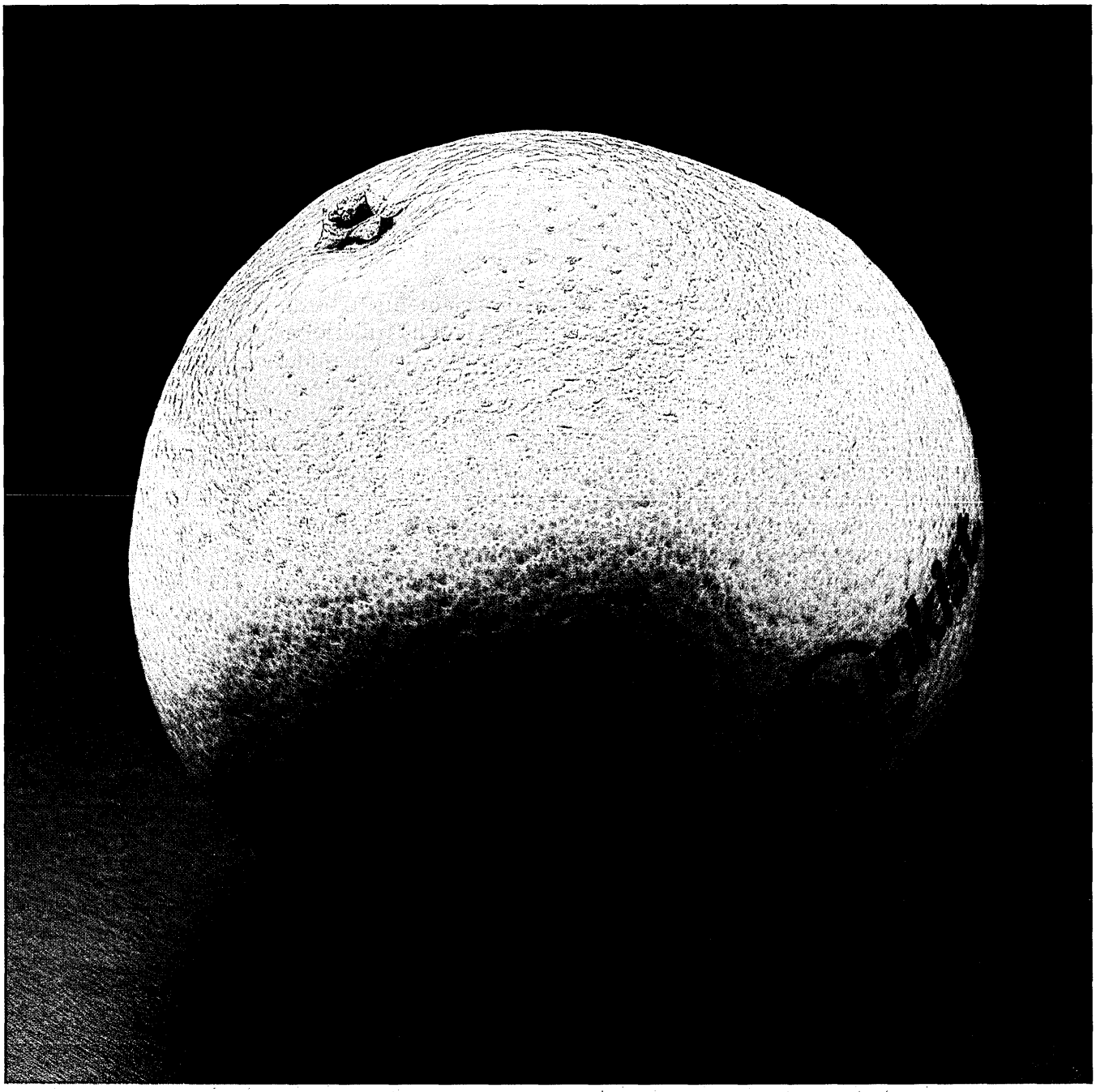

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mand that was outstripping our ability to supply the machine," Brown says. "As part of DSC, we can meet that demand and grow faster than we would have imagined just six months ago."

"We have no middlemen," he explains, "which keeps our cost of sales low. We talk solutions. We sell benefits, not features."

The COS system can communicate as a terminal and can be used as a front-end for the Meta 4 system. "We're just beginning to look at the big company market," says Brown.

COS is operating as a division of Digital Scientific with its own marketing, assembly, and service staff but sharing administration, personnel, and engineering. As part of Digital Scientific, it already is readying a new version of the Memory Master for introduction late this month. It will have the ability to communicate without an acoustic coupler and will feature a data key for security. The current model uses codes for access protection. With the keys, Brown explained, each user will have his access limitations programmed into a chip embedded into the key. The chip can accommodate up to 1,400 bits of information.

Hart, whose assumption of the company's presidency coincided with the acquisition of COS, sees the sales philosophy of COS as compatible with his own. "I'm customer-oriented as a result of my service bureau background." He spent 13 years with Control Data's service bureau operations.

Hart joined DSC following a year as president of Tasco, Inc., a San Francisco-based Hewlett-Packard oem. There he learned the retail business, and he's applying that knowledge at Digital Scientific. The company is negotiating a joint venture arrangement with DNA of Saginaw, Mich., a company which, in the early '70s, developed a Retail Information Management System (RIMS) on a Meta 4. "We're taking that after the retail market," says Hart. He said this is Digital's first vertical market thrust, and "if that succeeds, we'll look at other application areas."

The Meta 4 caught on quickly by becoming the first widely used commercial computer that performed faster than the machine it was emulating.

The company also is negotiating a joint venture arrangement with the University of California at San Diego to develop UCSD PASCAL on the Meta 4. The company purchased the development rights to UCSD PASCAL from Softech Microsystems of San Diego. They expect to work with university personnel in bringing the language up on the Meta 4.

DSC first introduced the Meta 4 at a Fall Joint Computer Conference in 1969 in Las Vegas. It was considered revolutionary at the time, being based on a patented high speed (35 nsec) read-only memory that, in conjunction with a proprietary and versatile bus structure, enabled the processor to emulate other systems.

Most of the early orders for the new system came from universities and other sophisticated users who were interested in experimenting with its extensive microprogramming and emulation features.

Before long, though, it became apparent that a large population could benefit from the Meta 4's capabilities. Many users of the CDC 160A and the IBM 1130 and 1800s faced forfeiting substantial investments in technical support personnel and applications programs because their ven-

The company also is negotiating a with the University of California at San Diego to develop UCSD PASCAL on the Meta 4.

dors were not offering them technically advanced, software-compatible follow-on products. The Meta 4 caught on quickly by becoming the first widely used commercial computer that performed faster than the machine it was emulating.

The system's microprogramming features and its inherent speed made it versatile enough to satisfy most of DSC product needs through the early and middle 1970s. New and enhanced memory, and peripheral and communications interfaces were developed to keep pace with the state of those arts. In 1977 and 1978, further steps were taken to broaden the market appeal of Meta 4-based products, including the addition of a time-sharing operating system, high performance fixed-head and large disk storage subsystems, and multiline asynchronous communications.

Hart believes the company will continue to replace 1130s and 1800s for many years. "It's kind of like the 1600 bpi tape drive with the coming of the larger disks," he says.

The DSC president is projecting $10 million in sales for this year for the company, and indications are that there will be more acquisitions. He, Redfield, and Wallner have said they're looking at other buy-out candidates to further diversify DSC and expand its markets.

—Edith Myers

NTSC GETTING IN SHAPE

The strategy at Northern Telecom Systems is to build for the future.

Northern Telecom Systems Corp. is in the running to become "a major force in the electronic office products" area, according to Marcelo Gumucio, NTSC president.

That goal seems very real at NTSC these days, but the road to get there is proving to be rocky. In mid-1980, Northern Telecom Ltd. reported more than a 90% drop in net profits, much of which was attributed to NTSC operations.

The product line that Gumucio inherited when he joined the company early this year was based on systems from Data 100 and Sycor, the two companies that Northern Telecom acquired several years ago. In a recent interview, the NTSC chief described the terminals as the base from which the division intends to expand into the office automation field. "We have intelligent terminals and distributed dp," and these devices are associated with electronic office systems, he explained.

Acknowledging that considerable restructuring has taken place at NTSC, Gumucio said the Data 100 and Sycor systems had been merged into a single product line with one sales and service organization. To achieve this, support operations have undergone a "process of rationalization and centralization" while marketing has been decentralized into seven regions, with each region having its own sales, service, and administrative support close to the customer. In the manufacturing area, operations have been streamlined and research & development has seen NTSC efforts merged with Bell Northern Research, another arm of Northern Telecom.

While these changes may seem like major upheavals, Gumucio points out that "all these moves have been carefully thought out and I think they are going to bring many benefits down the line."

In the process, the number of NTSC sites has been reduced, bringing people closer together "so they can work more effectively. I think there was a mismatch between the size of the organization . . . and what the business required. We took out basically two levels of management . . . which means I am closer to the customer. It allows me to run the business more effec-

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NEWS IN PERSPECTIVE

tively," he pointed out.

When Gumucio took over NTSC, senior management was spread over four locations. He has concentrated operations in Minneapolis and claims that having the entire management team under one roof is paying off.

Although busy with corporate restructuring moves, NTSC has not neglected development of new products. "We are in the process of improving the performance of our current product line through enhancements, additional software, applications packages, and so forth. The strategy is very simple—our current customer base continues to grow with the first products they ever had, and it will be easy for them to move to the next products." NTSC now has about 5,000 customers, although some of these are divisions and subsidiaries of the same corporation, he explained.

The number of NTSC sites has been reduced, bringing people closer together "so they can work more effectively."

As part of the evolution into office automation, the Northern Telecom SL-1 PBX already can operate with certain Data 100 and Sycor terminals. Future products will be compatible with existing installed equipment, but Gumucio admits that this strategy is not widely known. "We have been very tame in terms of what we say to the outside."

One of the first product enhancements being developed is word processing. Software to implement this feature will be introduced soon. Experiments are also under way with electronic mail for existing products.

Gumucio demonstrated an experimental device in his office that uses an SL-1 together with a customized crt screen and keyboard. The device had the ability to display electronic mail messages, had built-in storage for a "note pad" and calendar items, and also interfaced with conventional phone facilities. "We're doing some high-level research in terms of how this [type of device] might be received and who might want it. Right now we have a number of customers that are very interested in being a test case [for the product]," he revealed. Versions of the experimental terminal/telephone, which has no model number or name at present, could begin to be tested at customer sites "within 18 months, depending on [which] product you are talking about," he confided.

Gumucio said he expects word processing within three to four months, some other hardware/software enhancements within six months, and other products to follow "depending on how our market tests go."

New product emphasis will be on distributed dp, remote batch, 3270-type IBM emulation products, and introductions "that take us closer to voice." The NTSC chief said some customers are already prepared for both voice and data capabilities in the same system. He said this expectation was high among top managers with whom he had talked, but "the order entry keypunch operator may not be quite as ready because there is a whole system that needs to exist including the data base and training that is not yet in place."

Characterizing IBM as a major NTSC competitor, Gumucio said his company was moving "very aggressively" in the direction of SNA compatibility. "We are looking very carefully at X.25," he revealed, adding that "it's controversial." Many NTSC customers are already using both private and public data network combinations and "it is our intention that the network be transparent to the device," he said.

Comparing NTSC to a runner preparing to get physically fit, Gumucio said, "We want to do it gradually, looking at the present, making our commitments, and building for the future. You have to get your system in shape before you head for the big race."

—Ronald A. Frank

BANKING

RACE MAY BE TO SWIFT

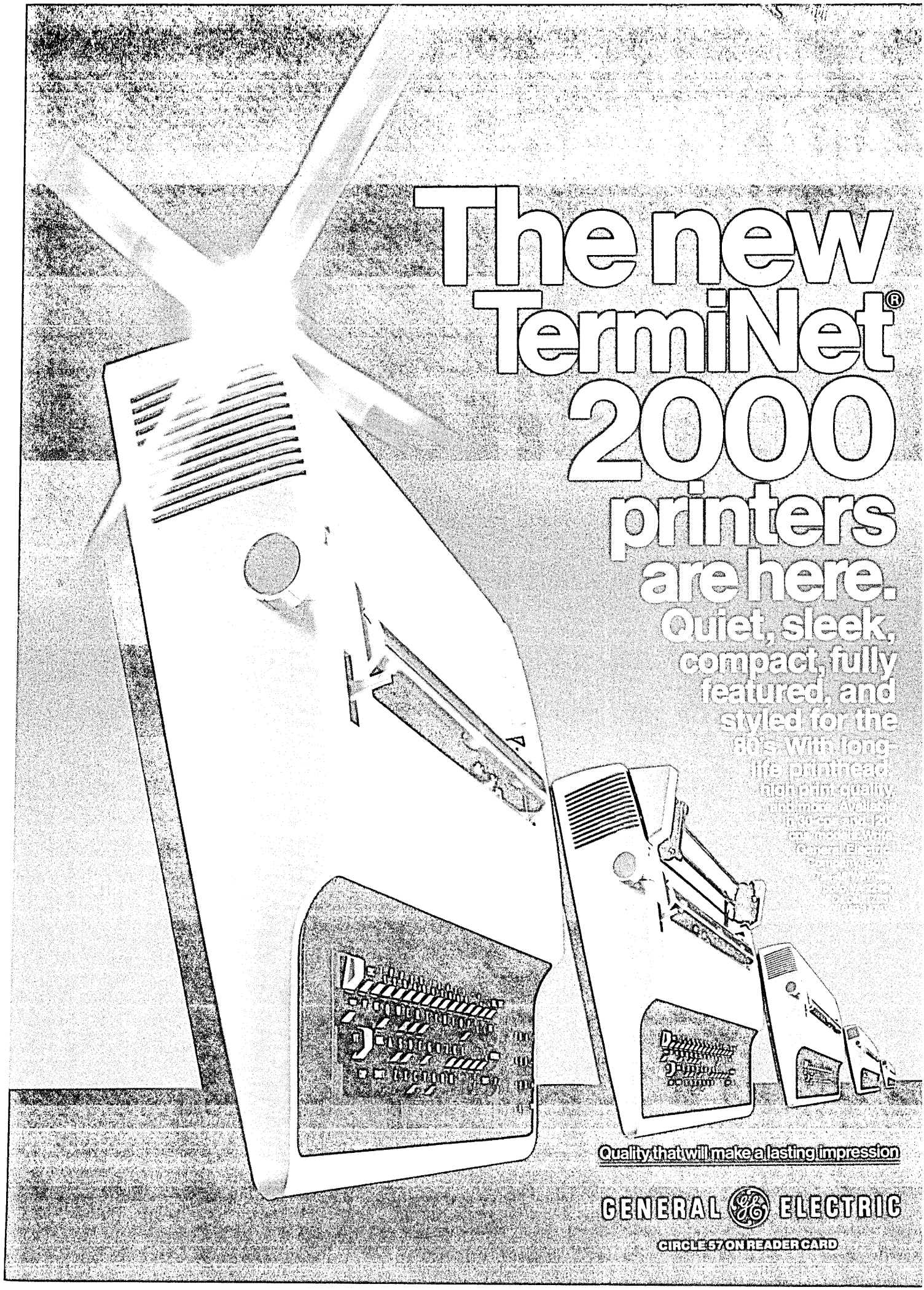
The feud between the PTTs and the electronic banking network may be nearing its end.

An end to the four-year "monopoly abuse" battle between the SWIFT electronic banking network and the all-powerful European Post Offices (PTTs) is in sight.

With its conclusion, we could be witnessing the first loosening of the regulatory straitjacket that has closed around the private computer network user in Europe.

Informed sources say that PTTs are preparing big cuts in the EFT networks tariffs—the first of these, a 20% cut in intercontinental charges, will be announced to banks next month. In addition, sources claim that SWIFT will be allowed to embrace certain classes of international money transfer (for example, those that involve bank-to-bank transfer within one country) that have so far been denied it.

The result, experts say, could be a big growth spurt for the 700-plus bank network, which is already set to receive its first Japanese and Latin American members next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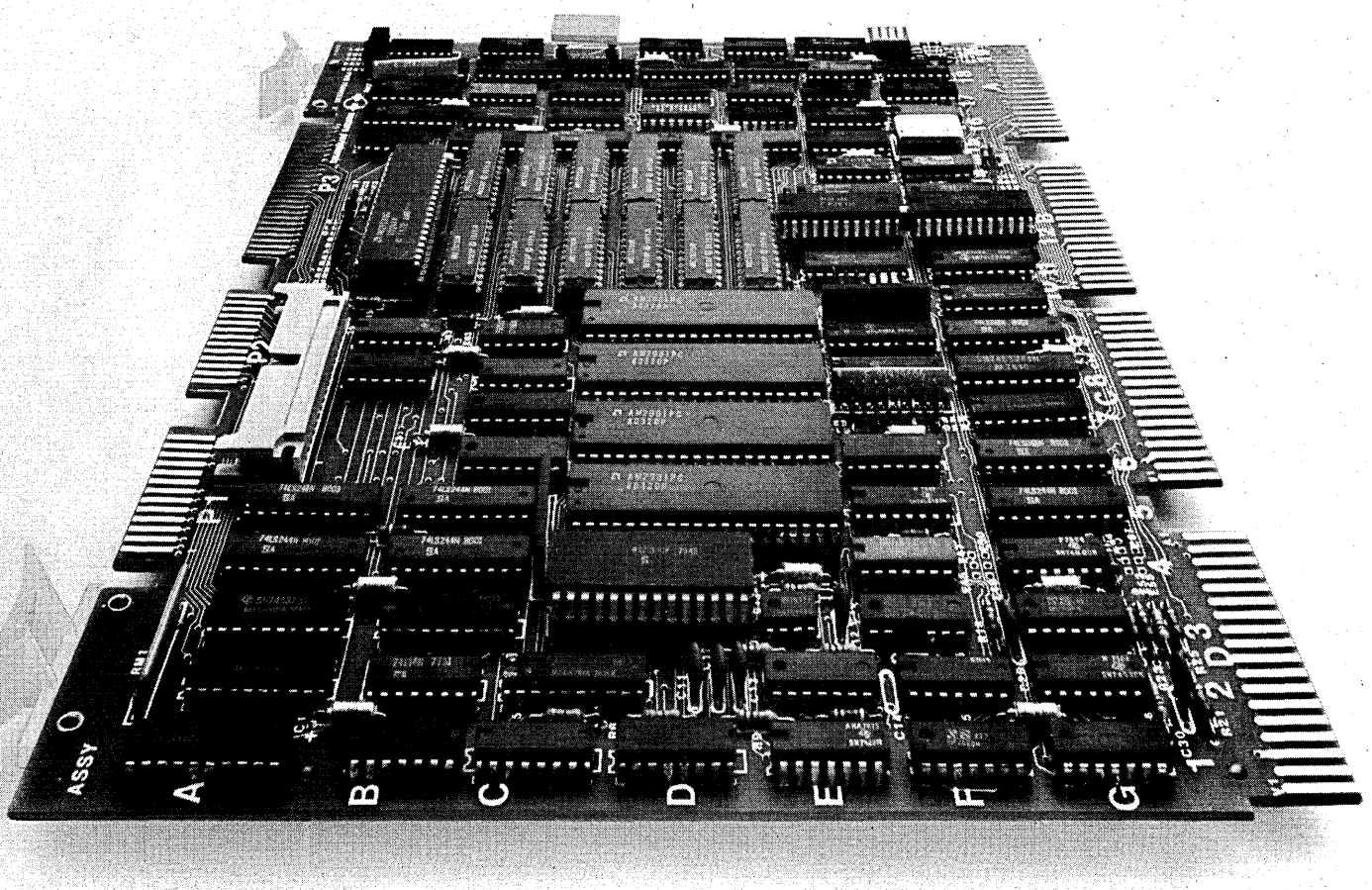

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year, and Eastern Bloc equivalents in 1982.

Observers point out that the PTT tariff reductions follow a 50% cut in intercontinental and 30% cut in inter-European tariffs only 18 months ago.

"The PTTs are as good as admitting that they overreacted to the network when it went live in 1977," said one U.S. banker. "They figured that with SWIFT the banks would quickly kill off their telex investment and severely erode PTT revenues." Experts point out that for West Germany—believed to have the world's biggest investment in telex—and other PTT militants such as France and Italy, this would have been a bitter blow. "So they pressed the panic button," explained one observer, "and brought out the tariff weapon."

SWIFT's finance director Bessel Kok explained that new volume-sensitive tariffs were brought in that had the effect of raising its normal fixed line charge (known as coefficient, or K1) as much as 600% in some high volume countries.

SWIFT officials see the softening on the PTT's part as vindication of their decision to take a stand on behalf of the private network user. A complaints dossier lodged with the European Community's Competitions Directorate, DG4, in 1977 led to an investigation that is still continuing.

The upshot of all this is that the banks and the PTTs were pushed into a dialogue to air their grievances. "We don't have everything we want yet," said SWIFT's Kok, "but these round tables should encourage the private sector."

If all this smacks of a victory for private networks, there are signs that, for SWIFT at least, the sound could have a hollow ring. Rumors in New York banking circles point to SWIFT being unable to take advantage of its good fortune because of problems in getting enough capacity and support from its mainframe supplier, Burroughs.

Some U.S. bankers believe that SWIFT is straining to cope with its current 200,000 transactions a day across its three computer centers. Each center runs around

Cuts in EFT network tariffs could mean a big spurt for the 700-plus bank network.

a Burroughs 4800. Kok confirmed that SWIFT hopes to go to 300,000 to 400,000 transactions a day within 15 months, "but we won't need a new center or a new supplier to cope with this."

Kok said that the plan was to triple the three centers and add some processing power. He said that in this way Burroughs could offer a "temporary" increase to handle new demands. "We see this purely as a bridge to a second generation of computers we would hope to install around 1984."

Rather than guaranteeing Burroughs the order, SWIFT will go to the marketplace with an open tender. Kok explained that the design profile for the new generation was already well into development.

Despite tough new measures by Burroughs to counter ongoing delivery and

There are rumors that SWIFT may be unable to take advantage of its good fortune.

support problems in Europe, the company now faces the real prospect of losing its most prestigious European customer.

Capacity isn't the only consideration put forward in U.S. banking circles as an obstacle to SWIFT growth. Many of the smaller U.S. banks have claimed that it is currently too expensive to join the network. As well as investment in its own hardware, a smaller bank could face costs of $60,000 for a SWIFT interface device (known as a SID) and a $7,800 one-time entry charge.

"This can seem like an awful lot of money when you only want to send 10 messages a day," said one New York banker.

Kok replied that from now on these banks can stop worrying. Following an agreement with Texas Instruments, a new reliable and cheap SID, using software designed by SWIFT itself, will be made available. Its total cost: $14,100.

SWIFT manager Eric O'Brien said the device would suit any smaller bank handling up to 150 transactions a day, and would cater to all his communications needs.

Network executives claim that over 100 banks had requested the device over the past few weeks, and this number was expected to climb sharply.

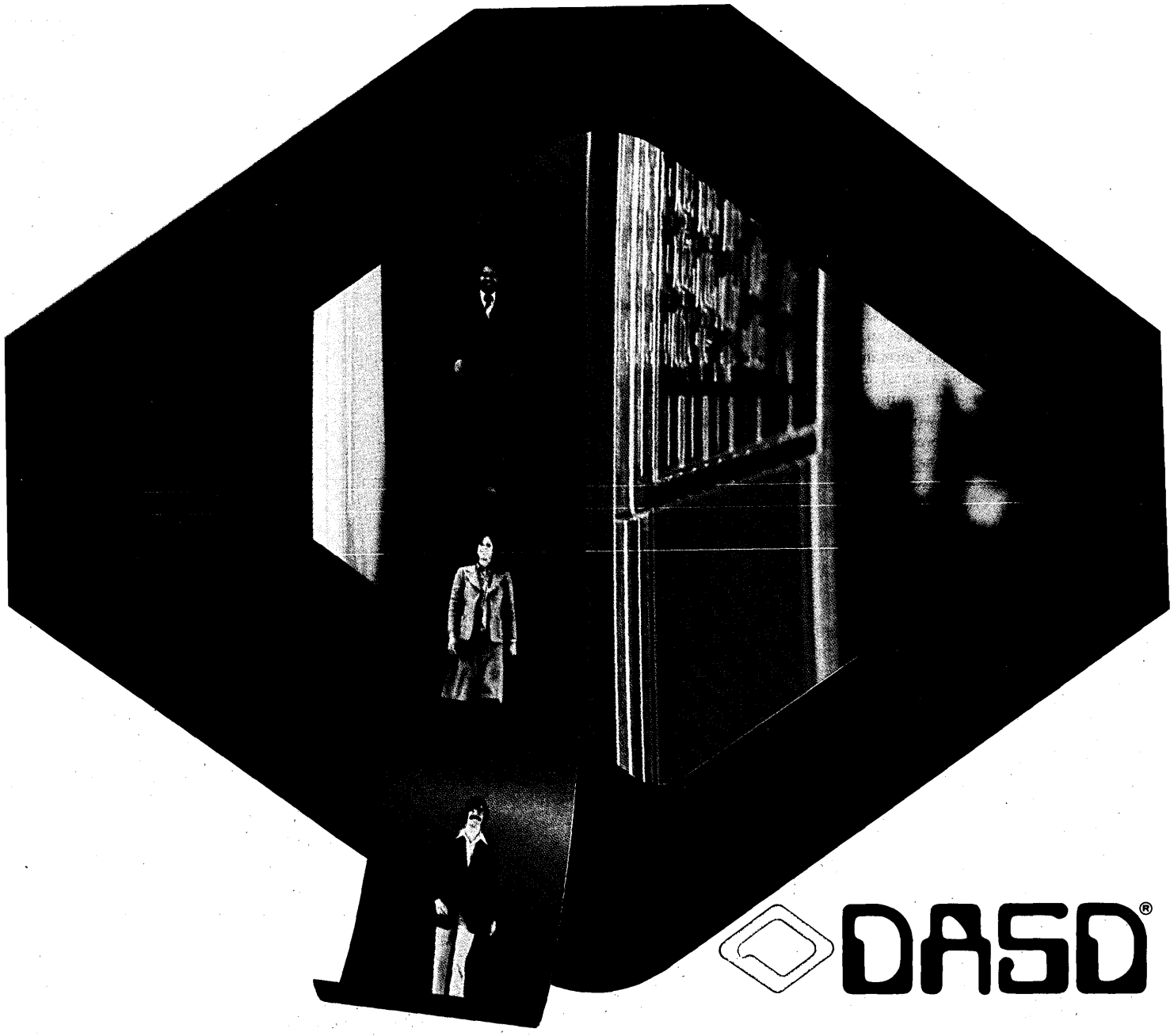
It now remains to be seen whether Burroughs can come up with the fabric to support all these developments, or whether it turns out to be the fly in the ointment. The feeling in some quarters of the U.S. Federal Reserve Bank is that the network's supplier problems will remain. "It may make more sense to extend the Fedwire system to perform SWIFT's function throughout the U.S. and promote an alternative standard," one of the Fed's executives explained. "But in any event, many of the leading U.S. banks

It now remains to be seen whether Burroughs can support all these developments.

will continue to watch for more SWIFT growth before committing themselves," he added.

As in the past, SWIFT has scaled one mountain only to find another to climb.

—Ralph Emmett



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CIRCLE 60 ON READER CARD

GOVERNMENT

TOO MANY COOKS

Show-goers at the Federal Computer Conference were told why there's no accountability in federal adp.

For three days and 36 sessions, attendees and speakers at the third annual Federal Computer Conference discussed the theme of "Applying Computers to Make Government More Efficient and Accountable." The conference, designed to help government adp managers solve their production problems and give them an in-depth knowledge of recent industry advances, attracted over 11,000 people and 135 exhibitors to the nation's capital.

"Accountability in adp is as poor as anything in the government," Rowland Freeman III, administrator of the General Services Administration, confessed to conferees in his opening day keynote speech. Under the proposed Paperwork Reduction Act, which stalled in the last session of Congress but is expected to be reintroduced early in the next, Freeman's agency would be given vastly expanded responsibility in the new federal information policy program.

"The level of our adp efficiency is even lower," Freeman admitted. "We've managed to take a tool that offers the highest hope for efficiency and manage it in the most inefficient way."

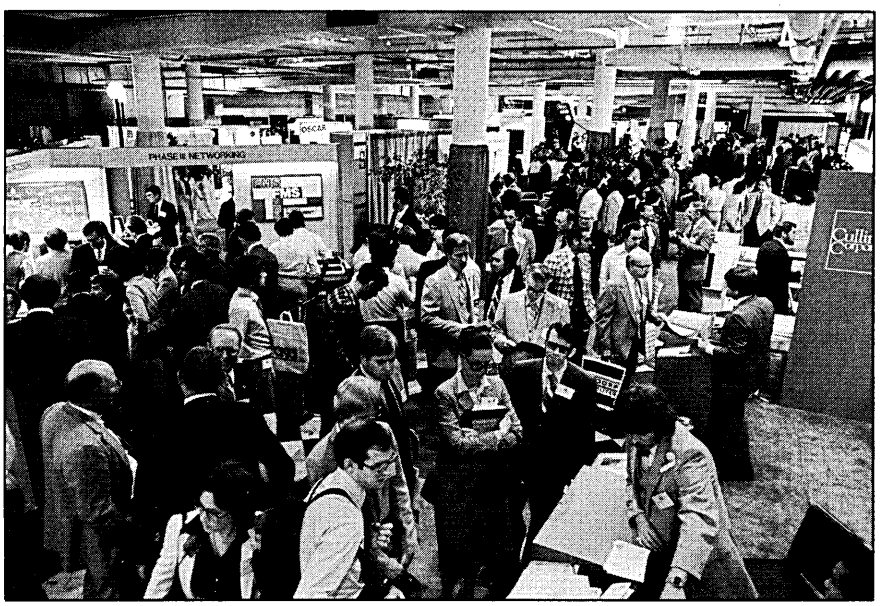
Hardly an optimistic assessment. But compared to what Freeman told his surprised listeners a little later, it was positively glowing.

"To have accountability, you must have a good data base," he said. "In the agency that I try to manage, that data base is not present and what is, is being processed by 1965 technology.

"Accountability is a special management style that includes establishing goals, objectives, and standards and measuring performance. It is the test of a good management system. And the adp acquisition structure is far from that. By the time an adp acquisition goes through the oversight processes of GSA, GAO, OMB, and congressional committees, who do you blame if something is wrong? Chances are excellent that by the time the process is completed the project manager and all the other players have changed. It's clearly a case of too many cooks spoiling the broth."

So, in the best bureaucratic tradition, you blame everyone and no one. Meanwhile, the government's hardware gets softer and the software harder. According to Freeman, half the government's computers are over seven years old, which by itself contributes to inefficiency. Worse, those doddering ancients fail to attract decent help, which leads to badly designed software.

"I won't even bother to tell you," he said when describing GSA's payroll, which makes a round trip between Kansas City and Washington before one of his employees sees a check, "what happens when the com-



THE FEDERAL COMPUTER CONFERENCE attracted over 11,000 people and 135 exhibitors to the nation's capital.

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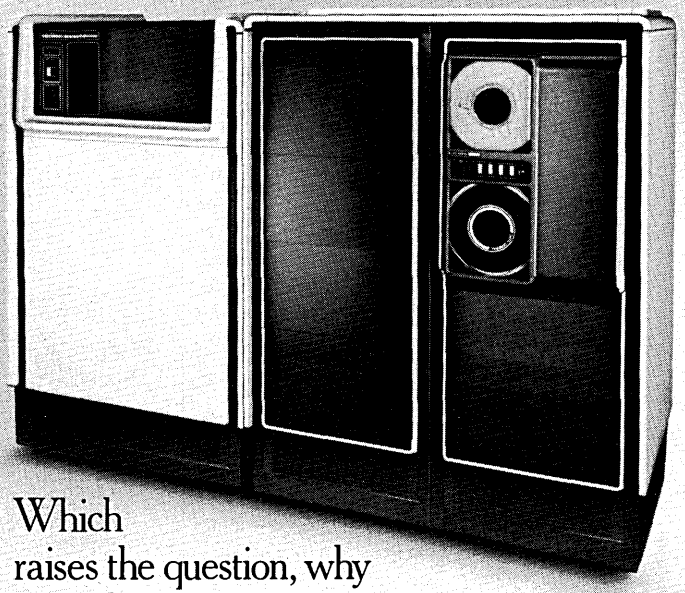

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CIRCLE 62 ON READER CARD

puter, running in batch mode, detects an error. The reason I won't is I can't stand to see grown men and women cry."

There wasn't a big run on handkerchiefs, although it would have been justified. Besides, Freeman eventually offered some solace. The adp procurement and property management regulations have been rewritten to resemble the English language and will be further modernized and simplified. And data management software will be extensively used in GSA's new system development activities.

"If we work together we can bring about a revolution in accountability and efficiency in government," Freeman urged, "simply by maximizing use of computers. That's the challenge. Let's do it."

The remaining two days were devoted to learning how to carry out Freeman's suggestion. Subjects ranged from computers in defense systems and mini/micro technology to the Brooks Act and distributed processing.

The message of "Information Processing in the '80s" was delivered by Jack Oplinger of the Gartner Group. "Users will buy hardware and move people into new systems rather than try to make current systems efficient," he forecast. "There will be less desire for tinkering to get efficiency. Maintenance will be minimized whenever possible. Hardware will be substituted for human resources."

Oplinger bolstered that prediction by saying that hardware costs would decline 15% to 22% per year, staggering in these recessionary times but still less of a decrease than was experienced during the previous three years. He also said that installed computer power will grow at about 48% per year; cpu unit growth will shift toward the low end; and installed DASD capacity will leap 40% to 50% per year.

Information resources will be focused on office information systems, at an increase of 40% per year. According to Oplinger, General Electric estimates it will have 25 to 30 terabytes of information available by 1990, with 2.25 terabytes required for office information systems.

Information resources in the '80s will be focused on office information systems, at an increase of 40% per year.

"That's about three-quarters of an acre of IBM 3033 disks," Oplinger said. Speaking of that organization, he predicted IBM will maintain its position in the world market, despite Japan's increasingly competitive and aggressive policies. Vendor offerings worldwide will be faster, larger, cheaper, and compatible, with software assuming an increasing portion of the cost but offset by decreases in hardware costs.

The state of the art in hardware was graphically demonstrated in the exhibits. "Our booth's so busy I haven't been able to leave it," Theresa Cole of IBM said. "There are very qualified people here and their questions show high interest in specific equipment."

"The intent is to be seen and make contact," Garry Daniels of Honeywell explained. "You've got to let them know you're out there. If you make a sale, that's great. But that's not really the purpose. We've seen a tremendous amount of people and taken a lot of names. It's been a real good show for us."

Ditto for the organizers, although they may not hear about it for a while.

"There's no way to tell if this show actually has impact because everybody scatters and does his thing," program chairman Morris Edwards said. "Hopefully, it has. But we rarely get direct evidence of what might have been accomplished. The only way for us to tell is that they keep coming back, and we've gotten more attendees each year."

"We are now firmly established as the focal point for this community," said conference chairman William Saxton. "Our next goal is to become the NCC for federal government adp."

That task should be a breeze compared to putting federal adp in order.

—Willie Schatz

MEETINGS

INFO ON INFO '80

More than 22,000 attendees and 227 vendors showed up for New York's Info 80.

More than 22,000 people interested in computing, office automation, and related topics converged on the New York Coliseum in early October for the seventh annual INFO show. More than 200 companies exhibited at the show, filling two floors of the Coliseum.

Allen J. Krowe, president of IBM's System Communications Div., delivered the keynote at the start of the four-day exhibition and conference.

IBM is committed to developing an environment that will interconnect office automation and data processing operations within user organizations, according to Krowe.

Krowe said the integrated office and

dp systems of the '80s would be called Enterprise Systems, which would make it easier for nonskilled managers and office workers to improve their productivity.

Today an average of 48 workers share a terminal, but by 1986 there will be 10 persons per terminal. This increase in access to automated systems will come about at least in part because of the enterprise system concept, Krowe implied.

Although much of the strategy to marry dp and office automation had already been outlined earlier by IBM, Krowe discussed some aspects of development on which IBM has not concentrated before. Using the term "establishment communications links" for local data networks, he said, "there is a tendency to oversimplify the solution. A number of vendors are playing on the heartfelt hopes of the user community and are playing a siren song of attaching any device to the establishment communications link."

Many of the concepts that led IBM to develop its Systems Network Architecture (SNA) will be used by IBM to design a local data network approach, Krowe said. He added that existing links of this type had been installed "with narrow objectives in mind," and he implied that a more general solution to the problem was still not available and would probably have to be more complex in nature to fit a variety of operating environments.

ALLEN J. KROWE: "There is a tendency to oversimplify the solution" for a local data network.

Although the enterprise system environment sketched by Krowe remained general, he mentioned "an in-house debut of the concept which includes the 8100 processor, using the Distributed Office Support Facility (DOSF) and the Distributed Office Support System (DISOSS) software.

The 8100 is operating in a network which provides document creation, storage, and retrieval and will include devices such as the 3279 color crt terminal and the 6670 information distributor, he explained. The system is now being implemented within IBM and will ultimately connect terminal users to a 370 mainframe. In addition, the office products Displaywriter and the 5520 system from the General Systems Division may be connected to this network.

As part of the development of enterprise systems, IBM is also stressing further implementation of SNA, and establishment of gateway functions that can integrate voice, data, text, facsimile, and image information. The gateway will tie together multiplexors, PBXs and communications adapters on distributed dp processors, he said.

Eventually, the enterprise system will improve such functions as document processing, document interchange, access to data banks, graphic display of data, interoffice and intercompany communications, and communications among sites in different organizations, Krowe said.

What IBM is up to was viewed differently by other speakers at Info 80: IBM is attempting to impose a computer network standard on the office of tomorrow and lock its user community into it. This was the opinion of the two partners in Ethernet—Xerox and Digital Equipment (DEC).

"The problems of the office," said

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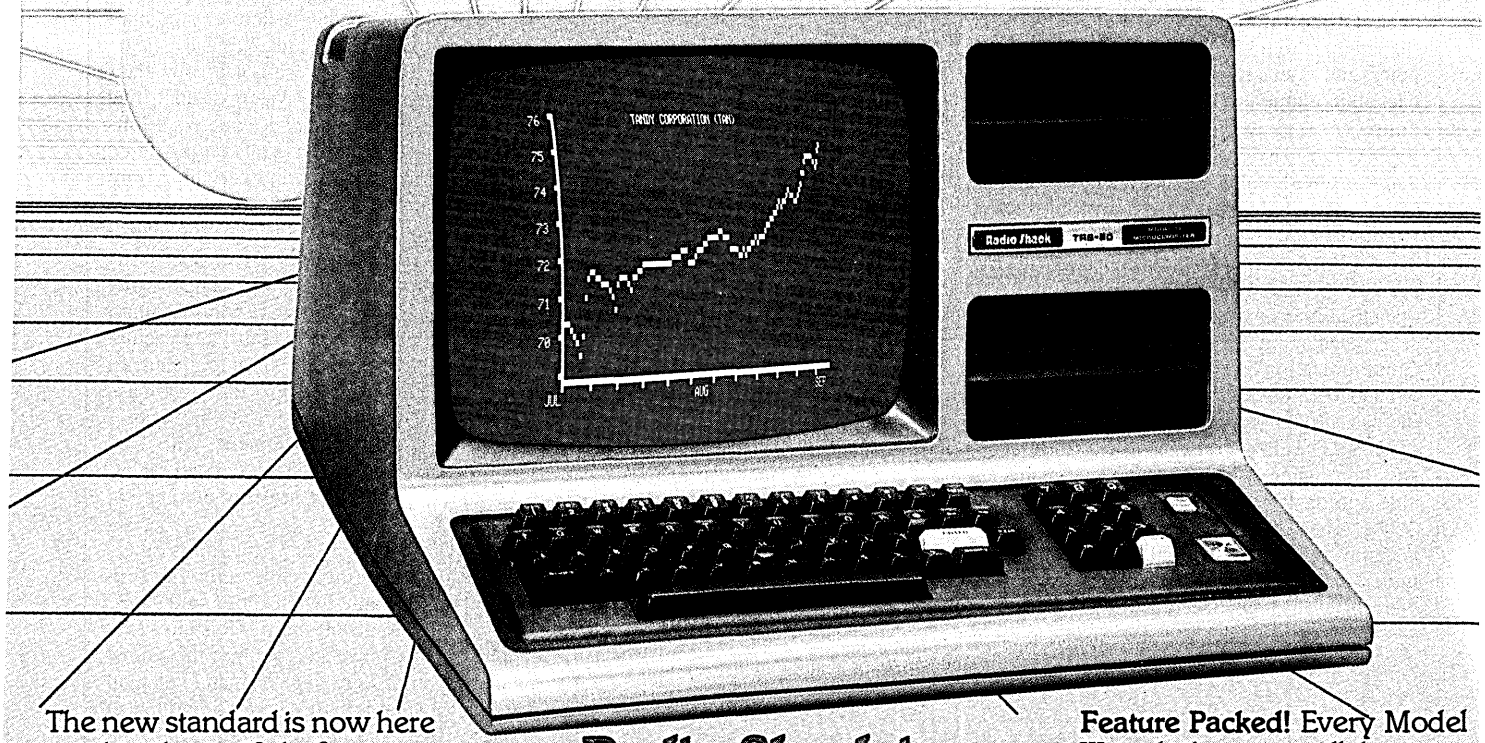

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CIRCLE 66 ON READER CARD

Jack Barry, manager, Information Processing Systems at Xerox's Strategic Business Unit, "call for a general office network solution." Barry said that fully 80% of the information in offices is not kept on mainframes: "So why put it on?" He said that a more flexible approach that carried intelligence out to the user at the workstation "where he needed it" was required.

Jack Gilmore, DEC corporate manager, Office Information Systems, added, "The key is to take the bus [from the computer] and extend it around the office to connect all its elements and individual workstations."

The "two Jacks," as session chairman Amy Wohl called the Ethernet partners, claimed that in this way you could make the whole office a "shared logic system."

Barry stressed that, unlike IBM's approach, "This would keep the network open to as many workstations as possible."

Datapoint vice president, Corporate Communications, Gerry Cullen, had earlier expanded on this theme by warning against the use of data processing structures in the office: "The dp world is a world of great structure, whereas the office is largely variable and unstructured."

The session speakers agreed that dp is mainly something that only programmers understand. Cullen said that if this approach were used in the office, the system would become too complex. "You can't have your best people tied up supporting a product that the user can't use," he said.

IBM's director of business communications systems, Systems Communications Division, Gabe Fusco, countered by calling for more structure. "All of us are attacking the problem in pieces—not combining them." He said that what was needed was a basic architecture to "marry" the bits together into what he called the "compound electronic document."

"The dp world is a world of great structure, whereas the office is largely variable and unstructured."

Describing a six-layer hierarchy, he said that users will be able to come into the IBM system (if necessarily from different geographic locations) using different types of keyboards: "At the center will be our host vehicle and a cohesive package," Fusco said.

He added that starting with simple keyboards for top management, the keyboard would then become more complex as it goes down through the organization. Fusco said that eventually the top executive could probably just use voice input alone to put the whole system together.

Fusco said that such approaches as Ethernet could be offered as simply a loop within its overall Systems Network Architecture (SNA). Answering a question from the floor about users being committed and locked into SNA, Fusco offered a crumb of comfort: "SNA will be made more friendly to any discipline downstream to it."

Apart from the scores of conference sessions, the doors opened on nearly 62,000 square feet of exhibits where 227 companies presented their wares.

Mainframes were notable by their absence, while small systems and office automation equipment dominated. Software houses and hardware makers proffered their program products for everything from micros to mainframes; next year the conference management plans to set up a "Software & Applications Center" for companies wishing to show packages away from the hubbub of hardware horse trading.

IBM's booth held a fairly representative cross-section of the exhibition. General Systems Div. and Office Products Div. showed products ranging from the Series/1 minicomputer to photocopiers, with Displaywriters, talking Selectric typewriters, and other products for the office automation market.

Xerox touted the virtues of its Ethernet local networking architecture. The firm disappointed some by not showing the new 5700 Electronic Printing System, announced two weeks before the show opened, but a Xerox spokesman explained that all available units were committed to sales offices and the development lab.

One of the most eye-catching booths was right inside the door to the first floor exhibits, where Infomart (of Toronto, Canada) demonstrated its videotex system, Telidon.

Basic Four chose Info as its venue for the introduction of its Spectrum 80 Information System, featuring a central File Management Computer and intelligent InfoCenter workstations, a system designed for both word and data processing.

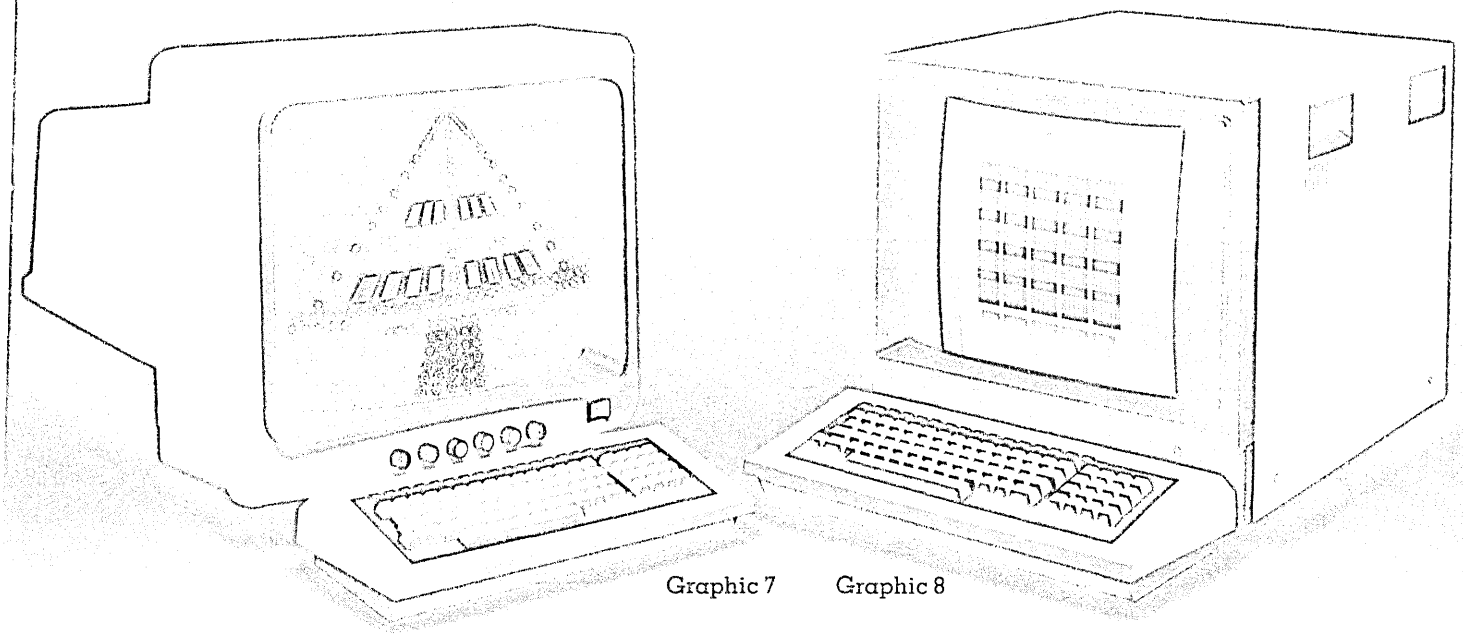
Hewlett-Packard was on hand, showing its recently announced Decision Support Graphics/3000 package, and several small systems. Formation, Inc. brought its F4000 IBM 370 *code* (not *plug*) compatible minicomputer. Yet more minis and systems could be found in the booths of Computer Automation, Sperry Univac Minicomputer Operations, Nixdorf, BTI, Tandem, Point 4, AM Jaquard, and others; Radio Shack and Northstar Computers were among those bringing micros to the show.

Exxon Information Systems, Lanier, A.B. Dick, and CPT were present with word processing products; additionally, it seemed nearly every computer vendor on the floor had wp capabilities on display.

—Bill Musgrave

(Also contributing to this story were Ralph Emmett and Ron Frank)

THE BEST OF BOTH WORLDS: STROKE AND RASTER.



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CIRCLE 67 ON READER CARD

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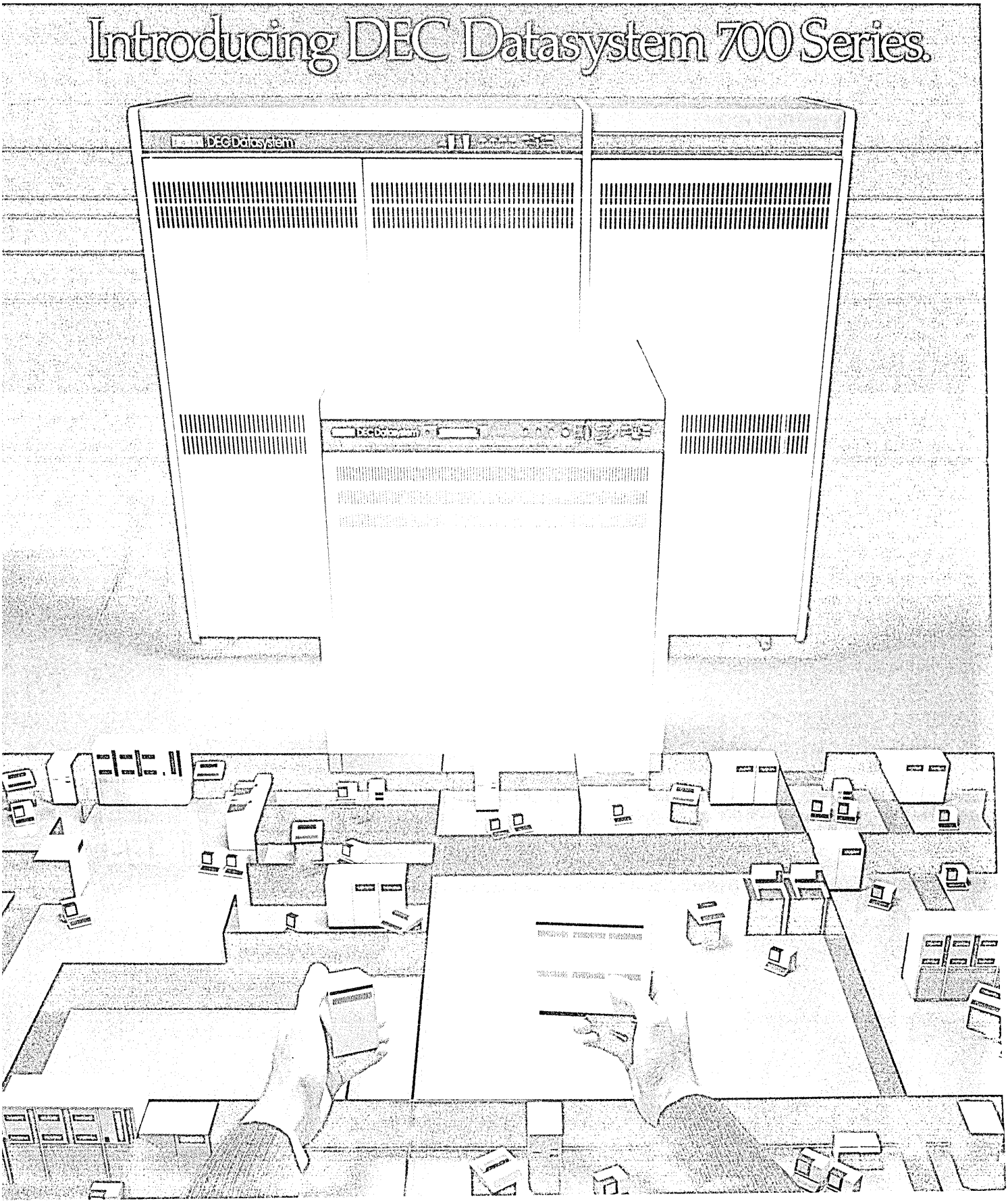

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IBM BY ANY OTHER NAME...

AT&T has a confusing name for its PBX systems strategy—Installed Base Migration, or "IBM"—TCA members are told.

The underlying message evident at the annual conference of the Tele-Communications Association (TCA) was that corporate communications can no longer be taken for granted.

Outgoing chairman Jerry Godwin of Standard Oil of California said corporations are beginning to think of telecommunications as a tool of business rather than just an ancillary service. Informed telecommunications managers can have a substantial impact on the operations and earnings of their companies, he told attendees.

And TCA itself reflects this increasingly important impact. The organization now has more than 1,100 members, making it the largest user group devoted exclusively to telecommunications.

Network management systems were on display by most of the major modem suppliers, with both Intertel and Paradyne showing system upgrades. Paradyne also introduced a modem that operates at 14,400 bit/sec, which was described as the only commercially available device to operate on standard conditioned analog lines at that transmission speed. The data set is priced at $14,400, said to be about 35% less than two comparable 9,600 bit/sec data links. Some modem experts at the show questioned whether the higher speed modem would operate with the same network reliability as existing slower speed data sets. But they acknowledged that if the reliability proved out in the field, the Paradyne 14,400 bit/sec modem would be a breakthrough for users.

GTE Telenet Communications Corp. displayed a credit authorization terminal called the Micro-Fone, putting Telenet into the terminal business even though the unit cannot be used on the firm's public data network in its present form. Developed by GTE's Belgian subsidiary, ATEA, the Micro-Fone will be sold to the Visa bank card network to be supplied to individual credit-granting merchants. The purchase-only terminal is similar to the Bell System Transaction Telephone series and can cost as little as $450 when sold in oem quantities of 5,000 or more. A single Micro-Fone costs about $750, a spokesman said.

Not to be outdone by its network rival, Tymnet officials revealed that they also plan to introduce a credit authorization terminal later this year to be called TCAT. Both network firms said that the credit terminals might mean that in the long term equipment would be available as part of their services if these first products are successful.

The increasing involvement of TCA in Washington regulatory affairs was highlighted by Dan Grove of Motorola, Inc., chairman of the organization's regulatory committee. At a closed members-only meeting, Grove said efforts were under way to postpone the pending AT&T WATS increases, which would significantly raise rates for high volume users.

While 90% of current WATS users will get cost savings from the proposed tariffs, the remaining 10% who are the heaviest users would be subject to substantial increases, he said. The national WATS rate hikes will probably be followed by similar increases in the individual states, he added.

Grove also warned TCA members that AT&T had embarked on a long term strategy to lock users into contracts on its PBX products. Called the Installed Base Migration (IBM) strategy, the plan would raise rates on older Bell System PBX systems, thus forcing users to migrate to the Dimension and Horizon products.

Since AT&T expects competition from IBM, Xerox, Exxon, and others by the mid-1980s, the so-called "IBM" plan would tie up users with longer term contracts. TCA is concerned that the AT&T plan could force users to upgrade their older but adequate PBX equipment. Further, the "IBM" strategy would cause premature write-offs on older PBX lines, thus necessitating as much as a $4 billion depreciation, which would have to be made up by rate hikes in other areas, Grove predicted.

—Ronald A. Frank

COMMUNICATIONS

DATACOM CHOICES MULTIPLY

Attendees at Wescon were treated to an array of datacom alternatives.

An array of data communications alternatives were paraded before attendees of this year's Western Electronic Show and Convention (Wescon) in Anaheim, Calif.

John K. Peters, vice president, Advanced Network Services, GTE Telenet Communications Corp., took a look at offerings of specialized and value-added common carriers.

Summing up the situation in the common carrier industry today Peters said: "The makeup of the players is changing. Major companies are getting into the game —through separate subsidiaries or joint ventures as in the case of AT&T, Xerox, and IBM; and through acquisition as in the case of GTE and Telenet. The players are changing because the stakes are higher. Significant resources are required to compete effectively on a nationwide basis. And most of the players seem to be gathering around the same table, i.e., they are planning to introduce services that promise a total communications solution to the end user. The requirements of the marketplace, advances in technology, and a rapidly changing regulatory picture are all converging to bring this change about."

Peters believes that the existing and emerging specialized and value-added networks will be employing substantially more intelligence. "This intelligence will be used to provide an increasing number of value-added services to the user, such as message store-and-forward, analog/digital conversion, encryption, decryption, compression, improved error detection and correction, user programmability, improved statistical collection and reporting, and improved network maintenance and management, to name just a few."

He sees as a trend that is feeding the development of extended value-added services "the increasing use of all-digital networking technologies. AT&T is expanding (slowly to be sure) their Dataphone Digital Service [DDS] to 96 cities. The new Satellite Business Systems [SBS] network uses all-digital, multimegabit, rooftop antenna technology. Xerox's Xten network is also all-digital, using cellular radio and satellite transmission techniques to provide up to 256 Kbps of bandwidth to a customer. GTE Telenet is now using DDS circuits on all of its backbone links and is developing packet radio techniques to provide high-bandwidth digital access to customer locations."

When it becomes feasible to digitize in the "electronic telephone," he believes a new market opportunity "will explode—the market for high capacity, digital, local networks." These, he said, "will provide the backbone communications network within the office complex."

Peters believes the key to the growth of the local network market "is aggressive development by the semiconductor manufacturers of mass produced, low cost communications components."

Peters feels the '80s "will present enormous growth opportunities to the common carrier industry and to the manufacturers of communications equipment. The market for the delivery of electronic information will grow very rapidly as soon as the cost of implementing new applications can be justified by the end user."

—Edith Myers

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CIRCLE 68 ON READER CARD

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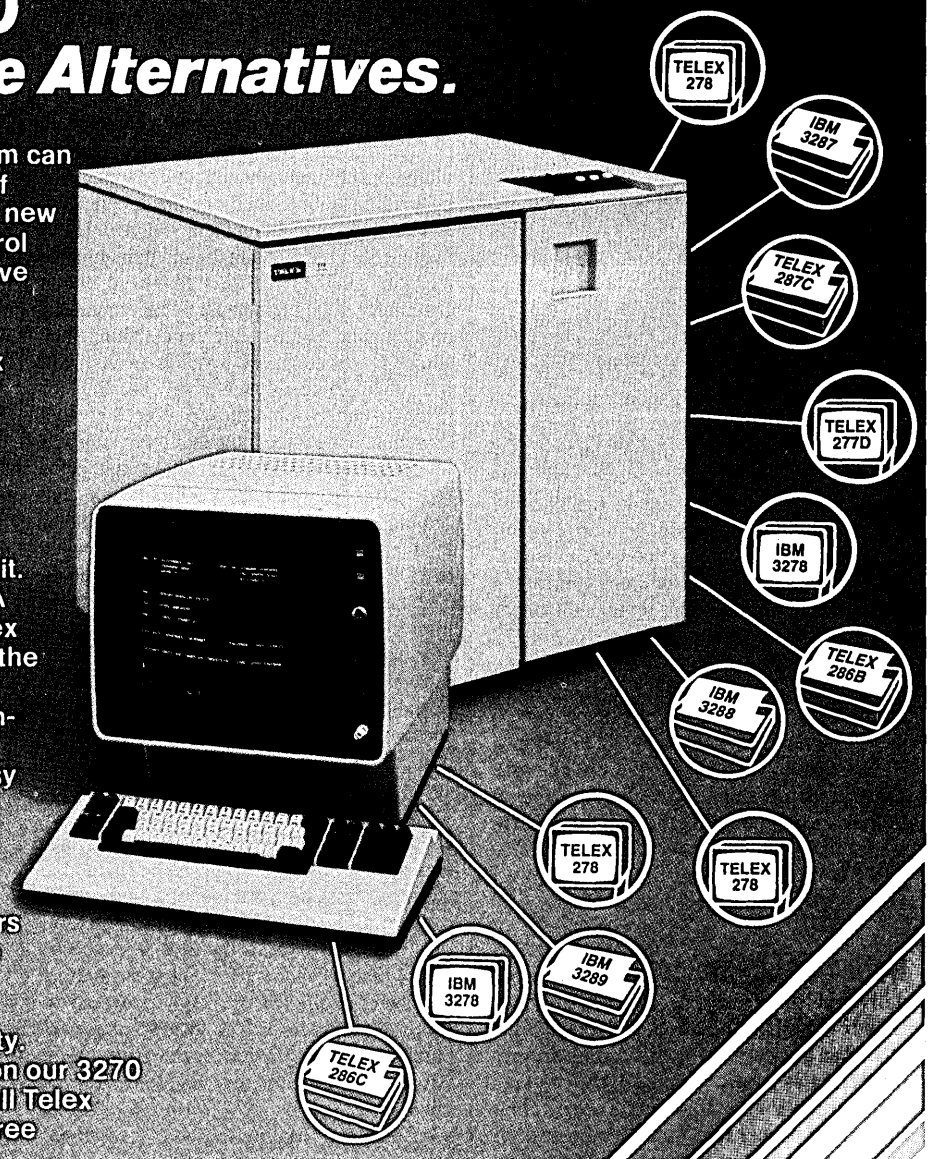

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NEWS IN PERSPECTIVE

BENCHMARKS

BRAILLE WP: Duxbury Systems, Inc. of Maynard, Mass., and Triformation Systems, Inc. of Stuart, Fla. recently announced completion of a microcomputer-based, braille-oriented word processing system designed for use by schools, agencies, and businesses that serve or employ blind persons. The system provides for conventional word processing and automatic translation of the text to braille. The system permits a sighted person with no knowledge of standard English braille to enter and edit material such as letters, memos, class notes, or even full length books. Once the text is entered and processed by the braille translator and the formatter software, formatted braille is obtained. British and Latin American Spanish braille are available, and the system is also designed to be improved for large print (for persons with low vision) and for translation from braille to print (e.g., from cassette braille recorded by a blind person).

AT&T's TELPAK WOES: Effective Dec. 21, AT&T plans to discontinue its interstate private-line bulk-rate offering known as Telpak. This action comes as a result of the FCC's requirement that customers be allowed to share or resell Telpak. AT&T states, "The requirement would dramatically increase use of Telpak and the cost of providing the offering, but without yielding a proportional increase in revenue." AT&T first proposed to discontinue Telpak in 1977 in response to several FCC decisions, in particular the one allowing customers to share or resell these private-line services. Termination of Telpak was delayed, pending a U.S. Court of Appeals review, which was completed last June. Meanwhile, several Telpak users, including the federal government, have gone to court to prevent Telpak's demise. And that action could well extend AT&T's planned cutoff date.

HONEYWELL SPEAKS: In a speech delivered to a meeting of the American Electronics Association, Honeywell's chairman and ceo, Ed Spencer, took an anti-protectionist stance and said that foreign competition is good for the U.S. electronics industry. Spencer said American businesses cannot rely on government intervention to help improve their position in the world marketplace, and cited short-term goals as a primary contributor to the U.S.'s major problems. Spencer continued, "Foreign competition is like a dose of medicine—its long-term benefits far outweigh the bad taste. With the threat of strong foreign competition, the electronics industry can't permit itself to become fat, complacent, and unresponsive to customer demands. We will continue to invest, to develop new products, and to remain competitive because we see great opportunities in front of us and we know that strong competition is hard on our heels." Spencer believes the challenges of the next decade can be met if American business invests in high technology, practices more humanistic management, plans for the long term, and considers the entire world its market.

HERE TO STAY: "Bubble Domain Memories II: A Strategic Analysis," the new study issued by Venture Development Corp. (VDC), reveals that bubble memories will be used in an increasing number of applications, and will also be available at lower prices. This report updates the study done by VDC in 1977 on bubble memory markets. The study notes that problems in producing this technology have ruined plans for the price cuts originally scheduled by leading bubble memory producers, and have stunted the industry's growth. However, the study points out that bubble memories in the field are performing well in commercial applications. The technical problems are confined to production; once shipped, the bubbles work successfully. Many would-be users are only waiting for prices to decline, and the report predicts that this time, spokesmen for leading producers of bubbles will be right about the price reductions forecasted. VDC believes that bubble memory shipments will increase from $18.4 million in 1980 to $226 million in 1985, an average yearly increase of 65%. The first major applications have been in numerical control of machine tools, where dust and chemicals in the atmosphere make moving magnetic media unsuitable, and in portable terminals, where resistance to shock is important. VDC predicts that small computers and word processors will become increasingly important applications.

LOWER COST BUBBLES: Intel Magnetics, Inc. has reduced prices of its bubble memory subsystem components and boards by more than 40%. Effective immediately, the 100-piece price of the BPK72 prototype kit, which contains a 1 megabit bubble memory module and six LSI support chips, drops 42%, from $1,710 to $995. Also included in the reduction is the firm's iSCB 250 board for oem applications; its one-piece price drops 26%, from $4,750 to $3,500. Intel Magnetics now guarantees prices for future production-quantity purchases of the BPK72: $595 each for 5,000-piece orders beginning in August 1981, and $295 each for 25,000-piece purchases starting in August 1982. Said Richmond B. Clover, general manager of Intel Magnetics: "We're first to reduce prices simply because we were first to begin delivering megabit bubbles 15 months ago. We are now shipping 100- to 1,000-piece orders to oems who are currently in production." Intel expects commercial markets for bubble memories to develop in the following sequence: numerically controlled machine tools, industrial control, instrumentation, telecommunications, computer terminals, and business equipment.

BELL & HUGHES WORKING TOGETHER: Hughes Aircraft Co. has been given a $137 million contract by AT&T to construct three communications satellites and the related ground control facilities. Telstar 3, the Bell-owned satellite system, is expected to replace within the next six years the three Comstar satellites now jointly leased by Bell and GTE from Comsat General Corp. Upon approval by the FCC, Bell plans to use the satellites and ground facilities for normal long-distance telephone service and specialized private-line business communications. Work on the contract will be performed by Hughes' Space & Communications Group in El Segundo, Calif. Each satellite will be designed to last about 10 years, compared with the seven-year lifespan of previous spacecraft. Each satellite will also be capable of carrying 21,600 telephone conversations simultaneously, compared with 18,000 conversations carried by previous satellites. The first Telstar 3 satellite is scheduled to be launched in 1983 from a Delta rocket at NASA facilities. The second is scheduled for 1984, and the third for 1985 or 1986.

SCHOOL DAYS FOR CDC: CDC has been awarded a $52 million computer network contract by California State University and College. Over a period of seven years, CDC will build a computer network connecting California University's 19 campuses and its central data center. The campuses will have mainframes installed over a two-year period. The new systems will replace a variety of machines, some purchased and some leased by each of the individual colleges. Yearly, the CDC contract breaks down to $6.6 million of hardware leasing and maintenance, plus another $900,000 for software and maintenance. The new hardware will give half the students enrolled at the colleges direct access to computing. It will also make computers available for curricula other than computing, such as business, social sciences, and agriculture.

A SPECIAL INTEREST: The Digital Equipment Computer Users Society has approved a new special-interest subject for users of the APL computer programming language. This working group will emphasize the practical use of APL specifically on DEC hardware. Members need not have a DEC processor, nor must they be using APL. Membership is free. Inquiries may be sent to DECUS Membership Services, One Iron Way, MR2-3/E55, Marlboro, MA 01752.

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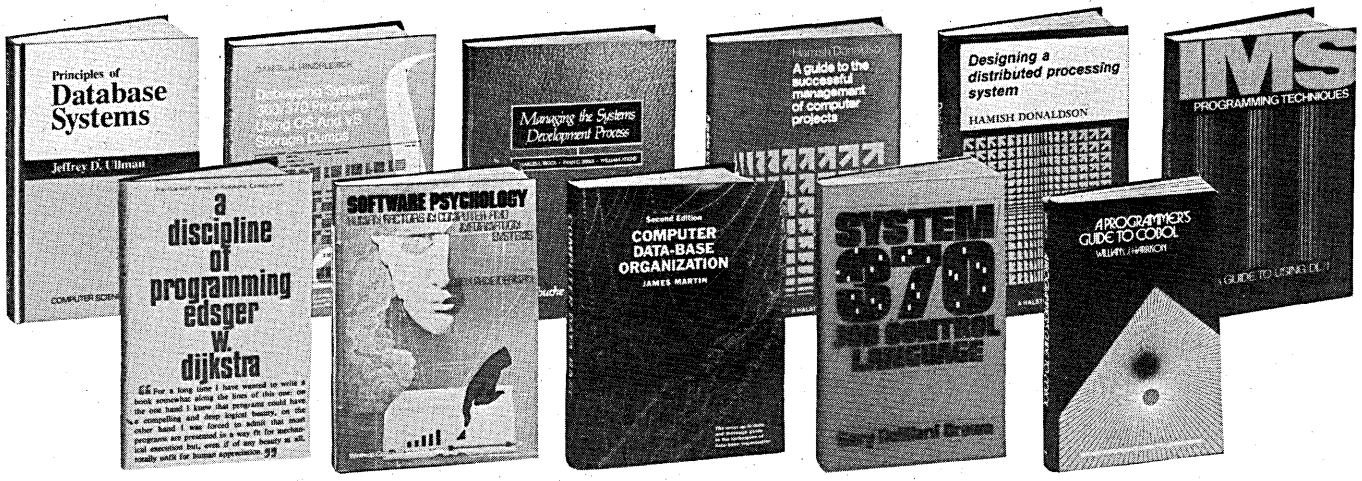

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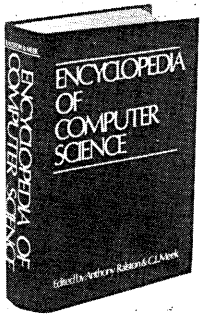

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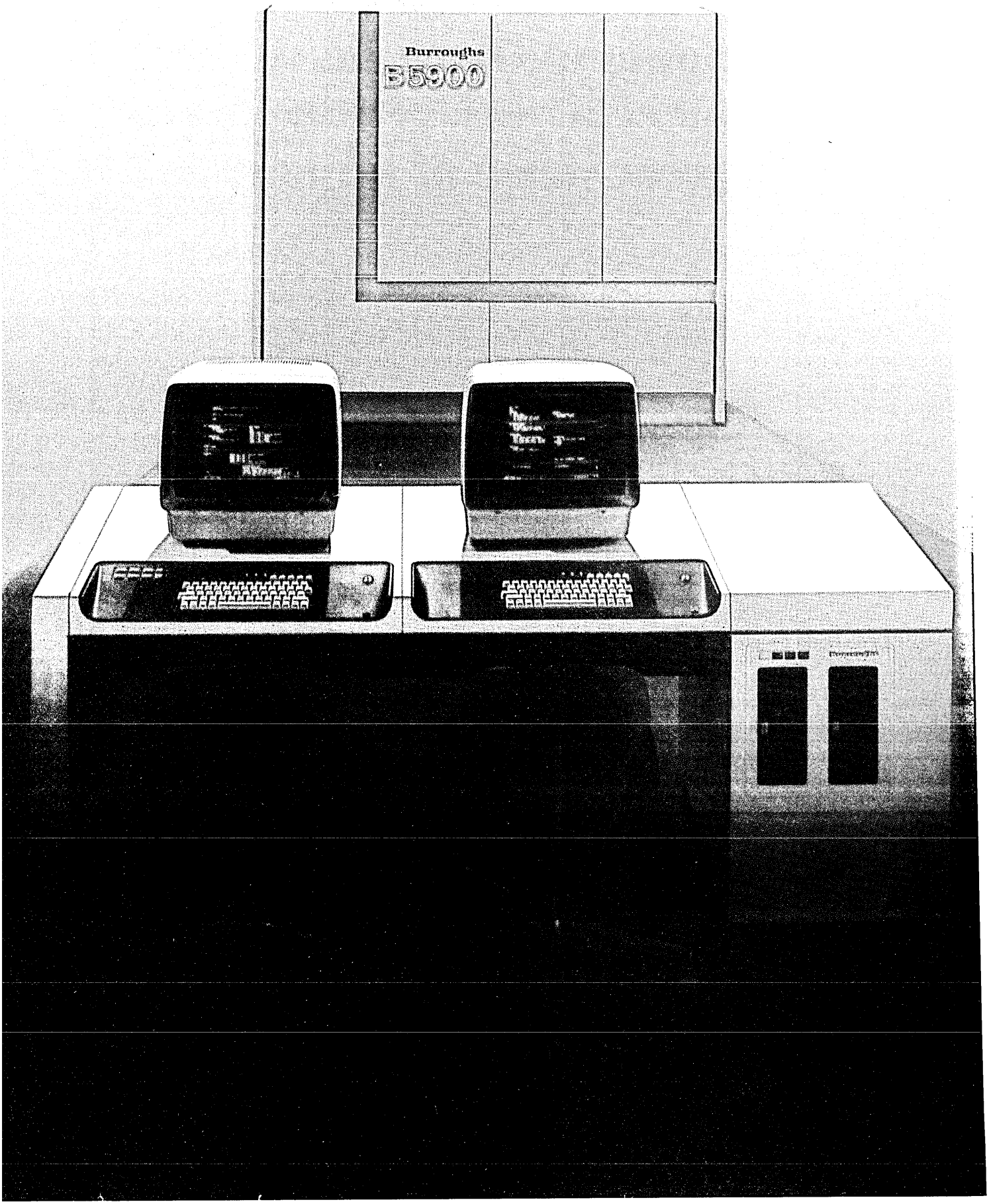
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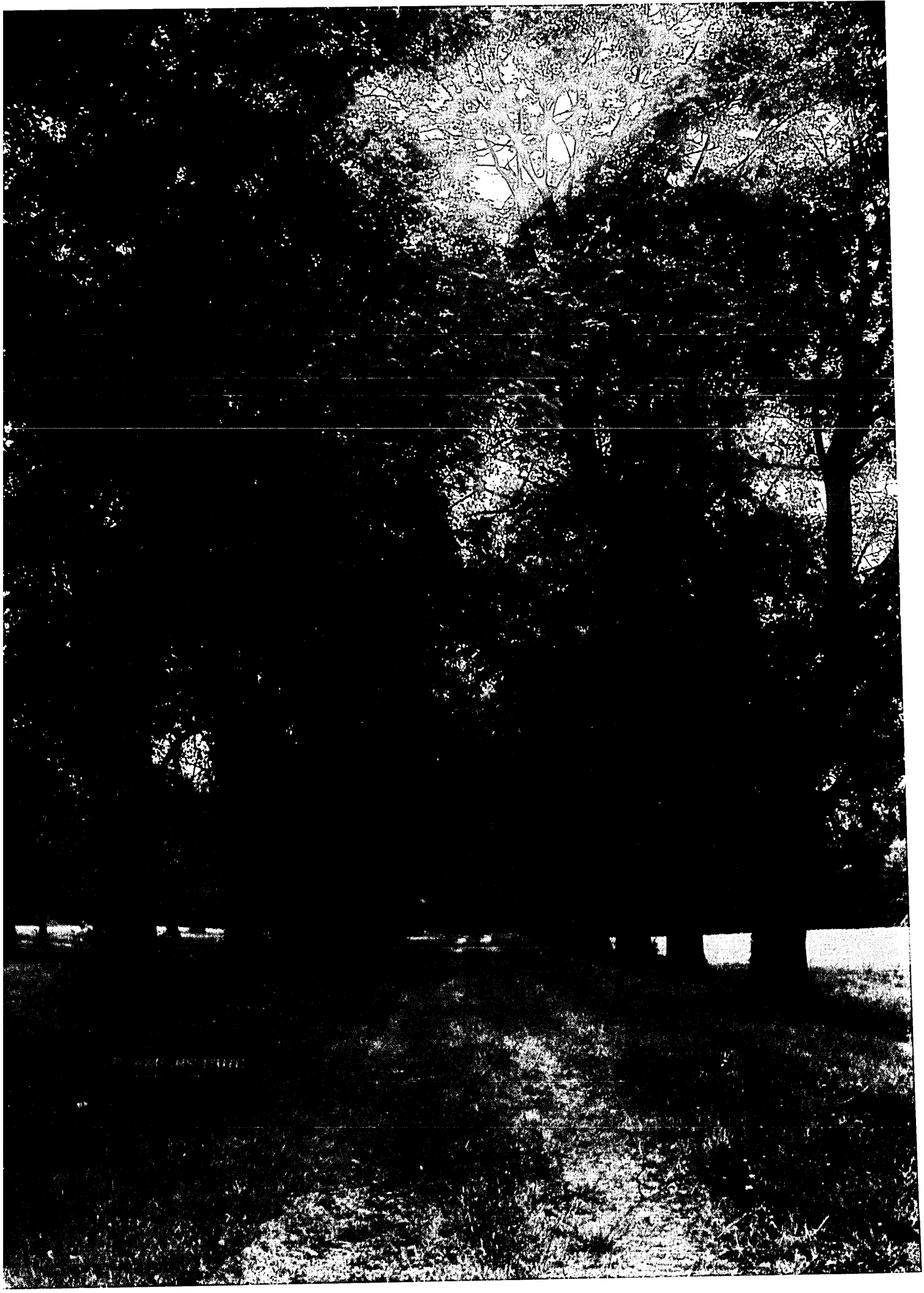


A large part of the meager crop of computer science PhDs is being lured away from experimental research in universities by more attractive industry jobs.

EXPERIMENTALISTS: A DYING BREED

by Merrill Cherlin

There is a crisis brewing in the computer science field, and most people, pecking away at terminals and managing impressive installations, don't even know about it.

There you are, continually worrying about upgrading your equipment and expanding your capacity, unaware that you are working in a fool's paradise. For someday, there may be no new equipment to buy, and no new applications for existing hardware. In short, there may be no tomorrow.

The small group of people whose life work is experimental computer research is a dying breed; there aren't enough newcomers to replace them. These are the folks who have PhDs in computer science and who spend their time inventing. Much of the inventing goes on in the groves of academe; the rest takes place in the various industrial research labs associated with the larger companies.

After four years of college and at least four more years of graduate school, the new PhD is equipped to bring his special brilliance to bear on—possibly unconceived—problems. It is his task to envision the future uses of computing, in its broadest terms.

A government task force looking into the issue of computer personnel shortage claims this shortage may actually impede technological advance in this country. It is predicted that by 1985 over half the total U.S. work force will use computing technology daily—and that we face an imminent defense crisis because we will be unable to attract scarce computer science resources to defense problems.

Why the severe shortage of PhDs? Ironically, because the computer-related job market is so good for bright people at any level. Why should Barbara Brilliant spend four years and lots of money to toil away in a graduate program when numerous companies would be happy to hire her right out of college at a hefty salary?

We spoke to Dr. Jerome Feldman, chairman of the Computer Sciences Dept. at the University of Rochester and senior author of the "Feldman Report." The report, printed in the September 1979 *Communications of the ACM,* summed up the results of a National Science Foundation-sponsored workshop on the problems of experimental computer science. All doctorate-granting university computer science departments in the nation contributed to the workshop.

When asked about the case of the mythical Barbara Brilliant, Feldman said, "There's a widely held view, which I share, that you don't need a PhD in order to do good work. There are plenty of people who do beautiful things without a PhD, but there's a level of training that the best PhD programs provide which is incomparably better than what you get without it. You get breadth and depth, you learn related issues, and it'll continue to be the case that the very best people in research and development will normally have PhDs. An equally smart person who goes to work too early will not get the full scope of things. What normally happens in an industrial environment is that they get thrown into a narrow problem. And they're very smart and they do very well at it but it's hard for them ever to get perspective.

"There's a lot of work being done in industry, places like Xerox's Palo Alto Research Lab, which is probably the best in terms of experimental work. But the problems are that they try to produce proprietary products, and they're locked into the existing product lines. So—if you took all the best computer scientists and gave them to IBM, you would not get the full benefit of their creative energies because of the constraints on what IBM does. Now there's nothing wrong with that from IBM's point of view, but from society's point of view it's a disaster."

A member of Xerox-Palo Alto's Research Lab agrees that each company's research is narrowly defined, saying, "The main research labs are probably IBM, Xerox, and Bell Labs; other places that are growing fast, like Intel, are also setting up major operations. Depending on the company, of course, there will be a different research emphasis.

"As you might expect, if you go to work for Bell Labs you'll be much more involved in communications-related ideas than you would if you go to work for IBM. At IBM there might be a greater stress on systems involving big data bases because they make a lot of money by selling big data base systems."

But many of the meager crop of PhDs go off to those industry-run labs after receiving their graduate education because the alternative—teaching and doing research at a university—is not as appealing. The Xerox staffer, a PhD himself, sheds some light on why. The function of an industrial research lab is testing possible technologies and ideas that may become successful products. That is, in a broad sense, what we do.

"What it means in practice is that we build experimental systems that try out a particular idea—like electronic mail or other aspects of distributed computing, office information systems, that kind of thing. At the research lab we build prototypes that try out various ideas to see if they work. Those ideas that are successful we pass on to the product development organization; they then consider whether they can make a successful product out of it. If they think they can, they will engineer those ideas in a more appropriate way for something you're actually going to sell. So we don't really worry about the cost of producing these prototypes. We just want to try out the experiment and see what it is—we're not going to sell these things.

"There will be some percentage of PhDs who will stay in universities, take faculty positions, and thereby do a lot of teaching. The research they do will tend to be government contracts. That's much more general in scope and is not as involved with the production of these experimental systems. You've got to be able to buy or build experimental computers, and grant money is skimpy. So people there will concentrate more on paper design of systems—proposing ideas for making something easier to program or making it more convenient to use, but without actually buildng a prototype and trying it out. Prototypes do get built, but less often and in a more constrained setting than in a place where you can get all the hardware you want."

PHOTOGRAPH BY MARTY UMANS

Teaching and doing research at a university is not as appealing to many PhDs as working in an industry-run lab.

WHO NEEDS A DEGREE?

Both the university professor and the industry researcher see the other as having too many constraints on his work. But at least if you have a PhD, you can decide which setting you prefer. Without the PhD you won't be able to get the university job; it's a cast-in-stone requirement. But if you're interested in teaching, you may argue that you'll be very happy in industry, thanks, so who needs the advanced degree?

Sadly, that attitude is quite prevalent, and, as Feldman explains, the lack of new professors is probably the single most crucial problem facing the field of experimental computer research. "The critical problem we see at the moment is in faculty members—there's a very, very serious national shortage. There are hundreds of open faculty positions in computer science in addition to the fact that many positions are already filled with marginal people—mathematicians or physicists or other people who are from fields in which there is an oversupply of PhDs. Universities put them to service doing the best they can teaching computer science. What happens is that you get students who aren't as well trained as they could be.

"At the moment roughly 200 computer science PhDs graduate each year. The demand is over eight times that figure. A lot of people who, in fact, go to the universities are doing more and more consulting, so you wind up not losing people but fractions of them, sometimes a large fraction. You know half of their energy is devoted to running their little business, or their consulting, or whatever. So the situation is worse than it looks—a number of people nominally on the faculty are putting much of their energy into hustling.

"The boom in the industry has caused people to raise the incentive to get good people to work for them—people who are now teaching or people who are trying to get PhDs, for example.

"Faculty are not recruited openly. People do not come to the university and walk up and down the halls looking for prospects. On the other hand, recruiting of graduate students takes place openly. The statistics show that often the recruited student takes the job. You can't expect the students to resist these offers. It's not necessarily true that if you're going into an industrial job, especially management, it's good investment in cash terms to get a PhD. The people who stay in school are generally the ones for whom the PhD's independence of action is enough of an incentive. That would be fine except that the whole incentive picture is such that there aren't enough of these students.

"So what we have to do is raise the quality of life if they remain in academics. The only leverage society has on this problem is to raise the attractiveness of being a graduate student and a professor."

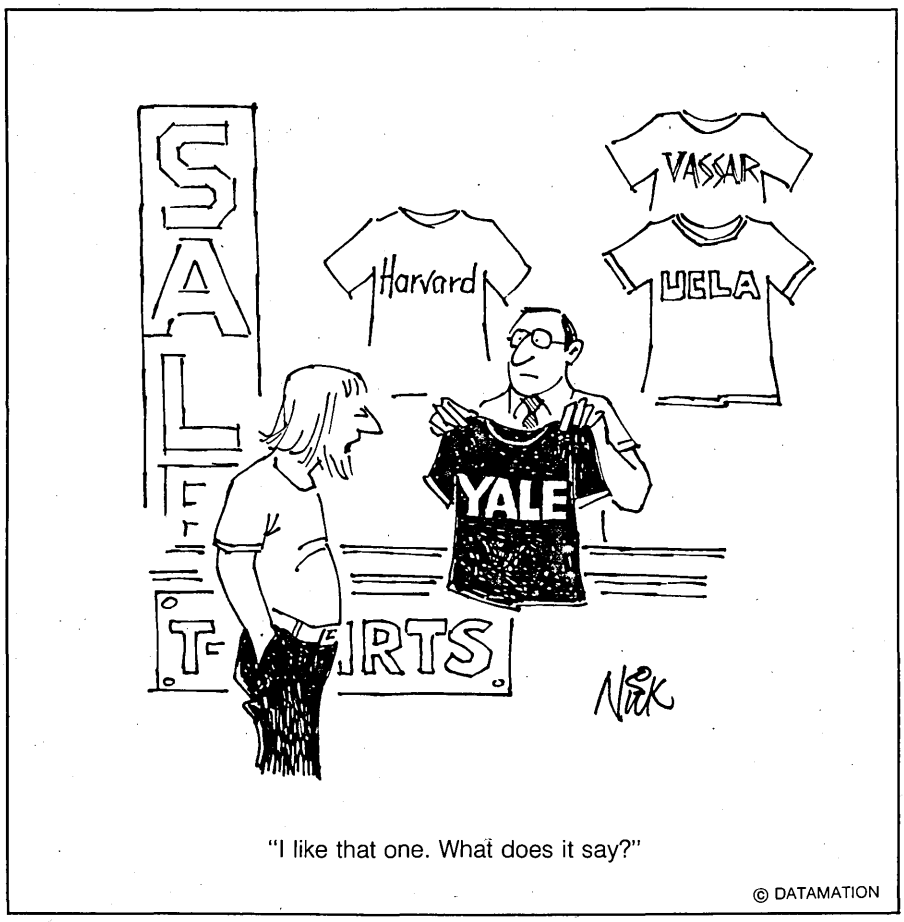
Naturally, with all this fierce competition going on for fledgling computer scientists, loads of savvy high school kids have become interested in majoring in the field as college undergrads, then taking jobs when they get their BS degrees. Feldman continues, "Undergraduate enrollments in computer science are going up a lot. But this shoots back to the faculty problem. They're not being very well trained, on the average. Teachers are terribly overburdened. I was at a number of state universities recently where they'll have 310 majors and five full-time faculty members. This is not an exaggeration. So they try all sorts of things—pulling teachers from industry and from other departments.

"A number of private universities strong in computer science don't offer undergraduate majors at all. We don't. Last I knew, Stanford and Carnegie-Mellon didn't. [Stanford, CMU, and MIT are considered the 'big three' graduate schools of computer science.]And the reason is we'd be flooded by undergraduates who wouldn't be able to continue doing our work as graduate students. So we deliberately head them off. A private university can do this, but a state university cannot. What is happening is that certain state universities are limiting enrollments, but that's tricky too, because it's very political. 'You mean Johnny can't study to be a programmer here at the University of Delaware?' or wherever.

"At Rochester we have about 10 full-time faculty and take about 10 grad students a year. Some of the people applying are as good as anybody ever was, but I think the quality of applicants has gone downhill slightly in the last two years. They're all taking jobs before they get to that point. Once again, some of the smartest people in the world still choose to get PhDs in computer science but I think most people would agree that on average, they're not quite as good."

POORER PAY FOR PROFS

As Feldman mentioned, incentives to study or teach at a university are not the greatest. For one thing, a professor's starting salary is about half the salary the same person with a PhD would receive in industry. If the person in question loves research but isn't interested in teaching, that's another drawback. In industry he could spend all his time doing research, but at a university he would also have to teach and advise students. And with the more poorly trained



"I like that one. What does it say?"

CARTOON BY CHUCK VADUN

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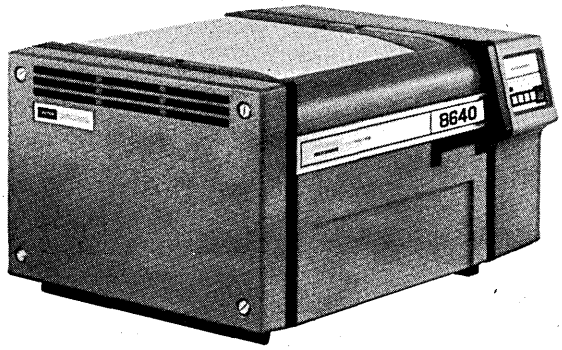

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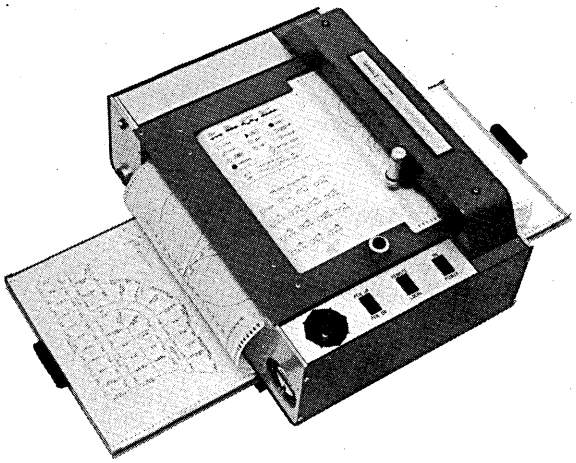

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Many companies now help universities create more attractive environments by donating money or equipment.

students coming through the ranks, that might not be the joy it used to be. Worst of all is the paucity and antiquity of equipment.

Dr. Caroline Wardle, associate dean of the Wang Institute, a new, independent graduate school created to train computer scientists already in industry for master's degrees, says, "You're losing the professors that would be teaching the next generation—it's a serious problem. Not necessarily through any fault of their own, universities have not been able to keep up with the state-of-the-art equipment and facilities, excluding maybe three or four first-rate universities. It's industry that has the state of the art. A scientist is attracted by really modern, up-to-date equipment and it's hard to find that in the universities. And industry can provide an environment that's more pleasant to work in."

In a response to the Feldman Report, Daniel McCracken, ACM president, suggested three ways the government could intercede in the current crisis and perhaps turn it around. First, says McCracken, "A program of traineeships with attractive stipends would serve as a strong inducement to students to stay for doctoral programs."

Second, "The National Science Foundation can take the lead or cooperate with ARPA, EDUCOM, or other agencies in developing a computer network open to all members of the computer science research community. Modern minicomputer technology and common carrier data networks can be combined to permit research groups to connect at modest costs that are well within the reach of an equipment grant program."

Third, McCracken encouraged the National Science Foundations to "support government policies that give incentives to industry to donate equipment and funds to universities."

Dr. Wardle notes, "You're starting to see some collaborative effort between industry and the universities. For instance, IBM has given a grant to Dartmouth to start a two-year master's degree in information systems oriented toward software engineering. It's a small, full-time program. Central Data has given a large grant to the University of Minnesota to set up an engineering program with very new equipment. And the University of Massachusetts is having a big fund-raising drive to try to upgrade its laboratory facilities. It's a question of the universities needing some help. They don't have the financial means to do it all themselves. A lot of companies now understand this and help through corporate donations of money or equipment so the universities can have more attractive environments for students and faculty. The Wang Institute is probably the first of its kind —the president of a large company endowed a separate institution rather than giving a donation to a university to do a program."

Currently, Wang will give master's degrees in software engineering to students who attend class two afternoons a week over a two-year period. While it will provide graduate training to computer scientists in industry, it won't help the critical PhD/faculty shortage. Therefore, it would seem that helping the universities is the way to go.

McCracken made his comments in September 1979 and already, Feldman says, "the response to this problem has been good in the federal government. NSF and other agencies have explicitly recognized the need and devoted more money to it. Programs are starting up in several government agencies more or less along the lines suggested in our report. But that's only one problem.

"Other problems involve, for example, salary structures and the traditional politics of universities. It's a very complex societal problem of resource allocation.

"Societies don't always do what they should. History is full of societies that didn't solve crucial resource allocation problems. There's no reason to assume that it's going to work right. There are other countries working on the same issues; it's certainly possible this country will fall behind scientifically and technologically—why not?

"A lot of people believe in the mythical market forces and that nothing has to be done because by magic the invisible hand is going to solve the problems. That's just not the case."

So we'll just have to pin our hopes on those few souls like the new computer science professor we spoke to recently who couldn't imagine abandoning the ivied halls for the plastic cubicles of industry. He said with genuine pity, "It saddens me to see those really bright people sitting there tinkering with their little brand X computers, hoping to add some dinky improvement to it. We in the academic situation are free, limitless. Anything the mind can imagine is fair game."*

"What do you say we go out after dinner and toss a ball around?"

CARTOON BY CHUCK VADUN

Merrill Cherlin is a freelance writer who lives in Baltimore, Md.

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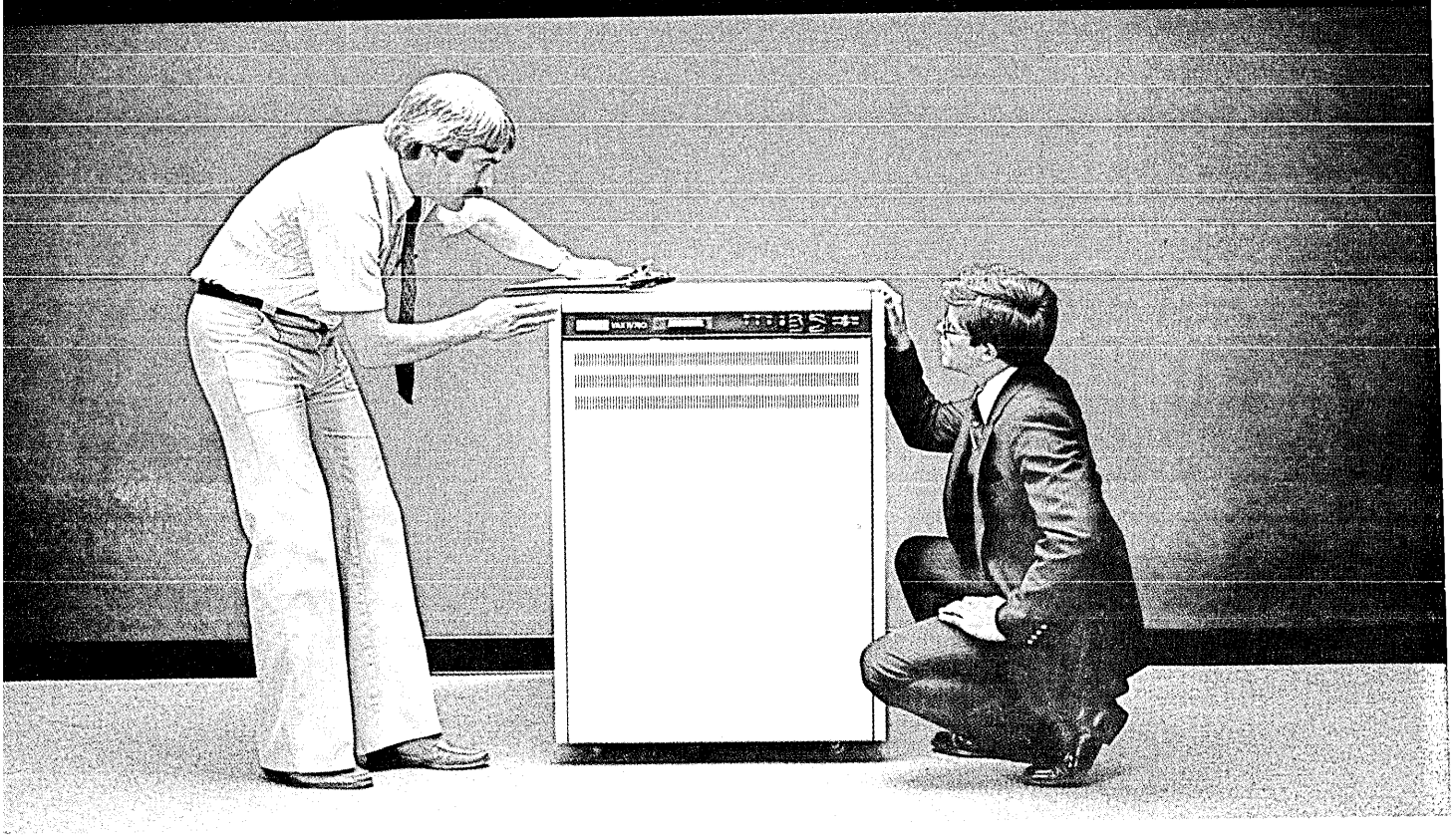

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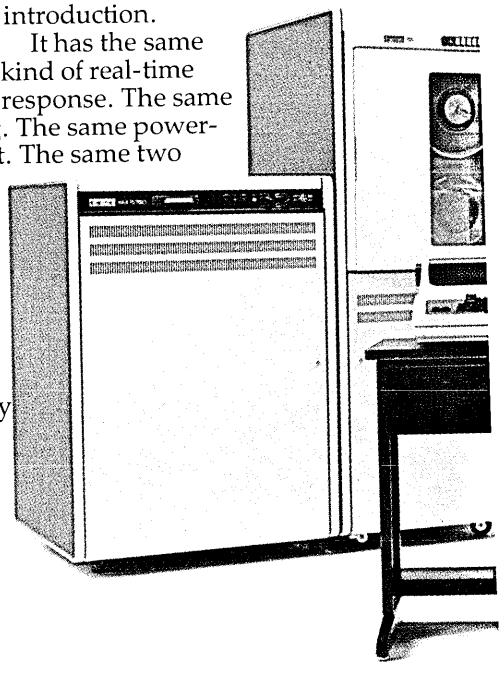

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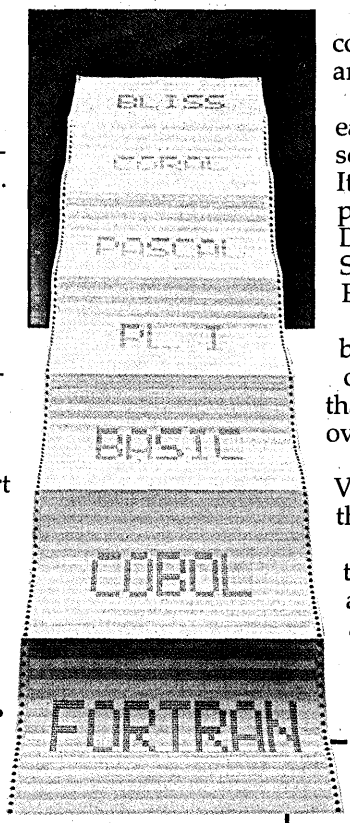

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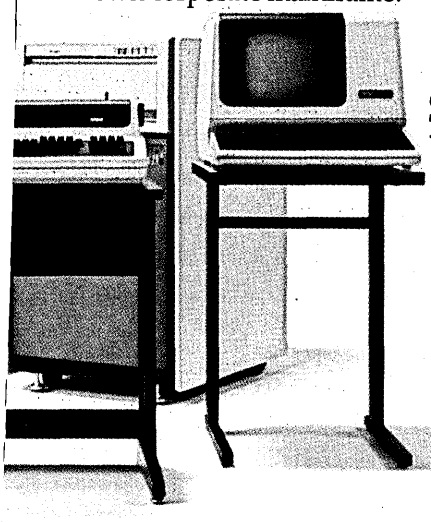

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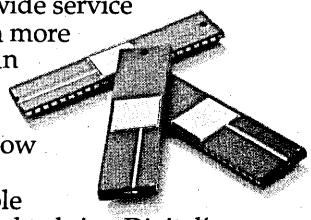

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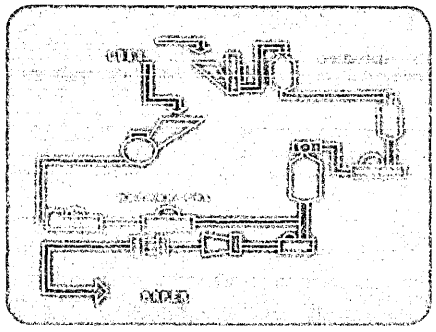
We change the way the world thinks.

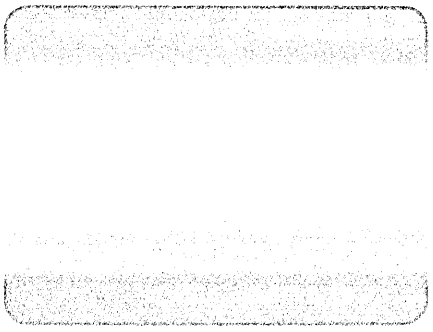
A FEW OF THE FEATURES THAT GIVE TERAK THE EDGE IN PRICE/PERFORMANCE

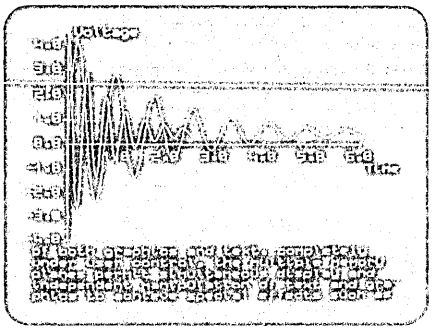
While some of the features of Terak's new 8600 can be found in other computer graphic systems, no other system in the $5K-$20K price class (and even those costing thousands more) provides a comparable combination of features and benefits. Features such as

Low Entry Cost The basic 8600 color system is priced at about $15,000. It can be upgraded to higher resolution and a greater number of colors, but even fully expanded it still comes in at less than $19,000.

Or, you can start with a black and white system for less than $8,500 and upgrade to color at any time by the addition of a color processor and monitor.







Simultaneous Graphic/Text Display

The 8600 offers outstanding control and formatting of both graphics and text. Completely under user control, the multiple memory planes permit simultaneous display and independent manipulation of text and graphics to achieve special effects such as overlays, scrolling and zoning. This capability, in conjunction with Terak's unique flexible character generation, enables the 8600 to present visual displays that are unequalled by any other system of its class.

Broad Spectrum of Color Selection

The number of color maps and the colors in each map is completely under software control. With a 6-plane memory (640 x 480 x 6), up to 64 colors can be displayed on the screen simultaneously. With a 3-plane memory (320 x 240 x 3), up to 8 simultaneous colors can be displayed from any one of eight color maps. The output of the color map produces eight levels each for red, blue and green. The result is the selection of 512 possible levels of intensity, saturation and hue. Switching from map to map is under software control.

Zoning

The 8600 monitor screen can be divided into a maximum of four variable size zones. In a typical application, the upper three zones can display graphics while the lower zone displays text. The text can be scrolled or slow scrolled while the graphics are changing to coincide with the text changes.

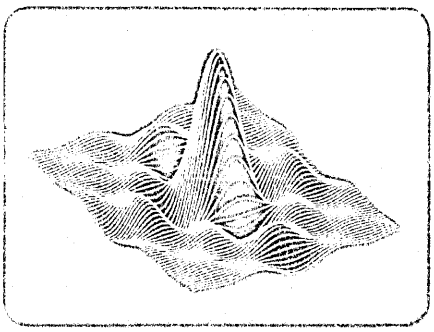
Dual Processors For Speed and Flexibility The two 16-bit processors (each with its own memory) are assigned those tasks which they can accomplish most efficiently and with the fastest throughput. The result is more available user space in memory, faster processing and increased flexibility of operation.

DEC Based Hardware and Software The DEC based hardware and software includes the LSI-11 main processor, RT-11 operating system and Q bus compatibility. As a result, the 8600 will support a variety of software and easily integrates peripheral devices.

USCD Pascal, Too The 8600 also supports the easy to use USCD Pascal operating system for program development, text editing, word processing and interactive applications.

Siggraph Core Standards, 2D1 Level Graphic support is provided for USCD Pascal and RT-11 for Fortran, Basic and Pascal.

The Other Reasons? Add such things as graphics display list processing, a high resolution quadrant, four modes of display blanking, emulation, remote on-line diagnostics, etc. The list goes on and on. But to fully appreciate the system you should see one in action. We'll be happy to set up an appointment. Just contact us.



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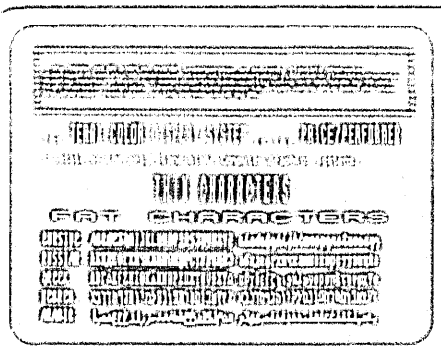
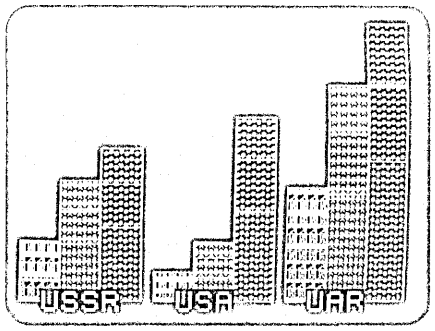




The 8600 also offers several dynamic features that are impossible to illustrate and must be seen to fully appreciate.

Flexible Character Generation

Unlike the rigid cell sizes of many graphic display systems, the 8600 character generation is under software control. Characters can be programmed to any size or shape including the creation and display of foreign languages such as Arabic, Hebrew, Russian, etc., mathematical symbols, primitives, specially configured letters, characters or symbols and a host of others.

Fill Algorithms

Terak's fill algorithms are fast and allows you to fill the inside of simple or complex geometric figures without calculating points. This not only helps define charts, graphs, etc., but greatly enhances the appearance of presentation material.

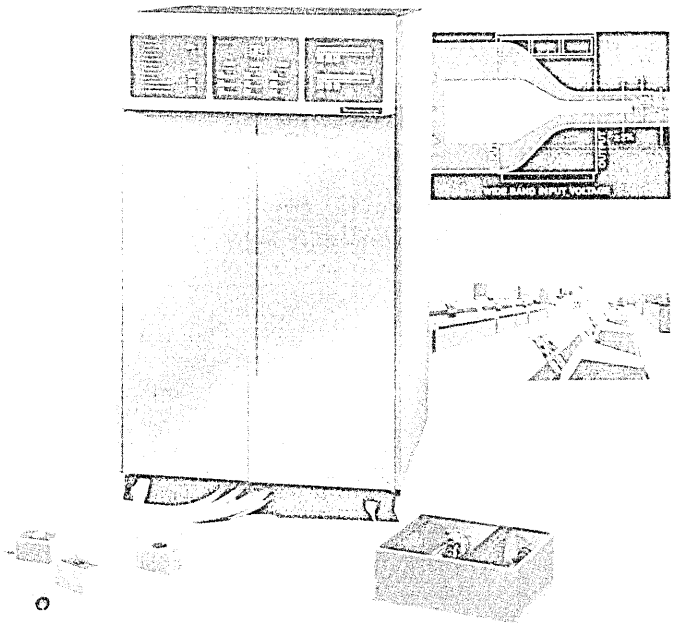
Smooth or Line Scrolling

The speed of the vertical, bi-directional scrolling is under operator control. It can be slowed down for text editing or speeded up for search. And, unlike most terminals that jump a line at a time, the 8600 moves in increments of one scan line. The result is a smooth moving text that is easy to read.

External Video Synch

The 8600 can be synchronized to receive externally generated RGB signals or transmit 8600 signals to external video monitors. This lets you combine and/or overlay internally and externally generated characters and graphics onto a single screen if mixing hardware is incorporated in the system.

"Fluctuating, unpredictable power was a constant computer room threat...until now"



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The industry has accepted KOPS as a measurement of computer throughput, but it is actually a measurement of processor speed.

TRACKING THE ELUSIVE KOPS

by Edward J. Lias

Buyers who window-shop for new cars have several criteria by which to judge the performance of the vehicle. A sticker on the side window clearly displays the number of cylinders, the engine liter size, and the estimated miles per gallon.

The prospective computer buyer has no sticker on the console window that gauges the anticipated capacity or throughput. Computer salesmen sometimes talk about MIPS (millions of instructions per second) or KOPS (thousands of operations per second), but the measurement is unfortunately much less standardized than the measurement of the horsepower of a car engine. The need for an indicator of computer throughput is legitimate and serious. Where there is a vacuum, something will fill it, as KOPS measurements have.

In the preparation of this article, the major computer vendors were invited to provide official KOPS or MIPS ratings. The outcome was anything but official, not because the vendors were trying to hide the truth about their machines, but because they know that KOPS and MIPS speed ratings have shortcomings. Some vendors were willing to give "unofficial" figures over the telephone, provided their names were not associated with the figures. One vendor stated immediately the belief that KOPS ratings were worthless and unscientific measurements. With some wisdom, then, NCR, Honeywell, and Burroughs discourage their salesmen from using KOPS or MIPS ratings altogether.

Computer buyers, like automobile buyers, want to know the performance they can expect from their next machine. Administrators require this information for all their planning and forecasting work. Because of this need for measureable computer horsepower, KOPS (which are generally thought to be scientific measurements) have been accepted quite broadly by corporate executives as indicators of throughput. Bid documents often contain phrases such as "a machine of 860 KOPS will be considered as the minimal speed capable of satisfying the requirement. No machine rated below 860 KOPS will be considered as eligible for review or consideration."

We will attempt to expose the KOPS and MIPS ratings as essentially unsupported by the vendors and to explain some of the factors that erode these so-called standards. Unofficial lists of KOPS ratings are published at the end of this article. They are as accurate as research can provide, but the possibility of 10% to 30% inaccuracy in the ratings was admitted by nearly all the sources.

HOW KOPS ARE MEASURED

KOPS are claimed to be a measure of computer machine power under real working conditions. With a healthy mix of programs and compilations all in execution, what average instruction speed does the machine achieve? The answer is given in thousands or millions of operations (such as addition or move characters) per second. MIPS are average measurements of the instruction cycle times. They are not meant to give a scientific understanding of specific hardware speeds, but rather a prediction of what the average instruction speed will be after the hardware has begun to do something productive.

This measurement is 100% processor dependent; it ignores all other throughput factors such as the efficiency of the operating system, the configuration, and the channel speeds.

The KOPS rating is obtained by pretending to load the computer with executable jobs. IBM job mix number 5 is commonly used, composed of 5% sort jobs, 7% commercial compile jobs, 58% commercial application programs, 15% technical compile jobs, and 15% technical application programs.

With this job mix in imaginary execution, KOPS are calculated by multiplying the execution time of the various operations by the number of times the operation is expected to be called. By ranking the instructions, weighing them, and then calculating, the KOPS rating is obtained.

Why, then, is the KOPS measurement unsupported by the vendors? KOPS measurements were probably a reasonable rating standard during the early '70s, when computer architectures were simpler and operating systems were batch-oriented. Today, however, the processor is not the king of the shop nor is a simple batch operating system the dominant style of processing. KOPS are a measurement of processor speed alone—the other devices and the efficiency of the operating systems are ignored when KOPS are calculated.

Users cannot ignore these other factors, however. In a system that has one to five front-end processors, memory controllers, I/O multiplexors, associated processors loosely or tightly coupled, and giant operating systems, the KOPS rating fades as a useful measurement. The vendors know that times have changed and therefore they wisely use internal benchmarking techniques to measure performance. NCR uses a program called the NCR Power Index Profile. Some vendors use the British "Whetstone" benchmark. Various other capacity planning tools are used by all the vendors as the older KOPS and MIPS rating fades away.

COMPOSITE HARDWARE LIST
by KOPS Rating

	Mainframe	KOPS		Mainframe	KOPS		Mainframe	KOPS
1	Univac 9200	19	**61**	NCR V-8560	281	**121**	Honeywell 66/17*	700
2	IBM System 3/32	20	**62**	Univac 70/61 (RCA)	287	**122**	IBM 360/75	700
3	IBM 360/22	36	**63**	Univac 70/7 (RCA)	287	**123**	Honeywell DPS 8/44	710
4	IBM 360/30	36	**64**	Univac 9060E	295	**124**	Burroughs 4840	718
5	Univac 9300	38	**65**	IBM 370/145	300	**125**	DEC 1077 (2X)	746
6	IBM 360/25	40	**66**	Univac 70/60 (RCA)	300	**126**	IBM 4341	758
7	Burroughs 1705	46	**67**	Univac 70/6 (RCA)	300	**127**	Univac 1108	760
8	Univac 70/35 (RCA)	54	**68**	DEC 1055 (2X)	307	**128**	Burroughs 6810	765
9	Burroughs 1707	55	**69**	CDC Omega 480-I	321	**129**	Burroughs 6811	765
10	IBM System 3	55	**70**	Magnuson M80/3	321	**130**	Burroughs 6812	765
11	IBM 370/115	55	**71**	Univac 90/70	329	**131**	NCR V-8585M	779
12	Burroughs 1709	60	**72**	Burroughs 4700	340	**132**	Univac 90/80-3	800
13	Burroughs 1713	65	**73**	Burroughs 3830	340	**133**	Univac 90/80	825
14	Burroughs 1830	70	**74**	Burroughs 6807	340	**134**	DEC 1090 KL	829
15	Burroughs 1715	70	**75**	Univac 9700	344	**135**	DEC 1080	829
16	IBM 360/40	70	**76**	Honeywell 66/10	350	**136**	DEC 2050	829
17	Burroughs 1717	75	**77**	Nanodata QMX 6333	380	**137**	IBM 370/158	829
18	Honeywell Level 62	75	**78**	Burroughs 6803	382	**138**	NAS AS/5-1	829
19	IBM 370/115-2	77	**79**	NCR V-8570	383	**139**	DEc VAX-11/780	831
20	IBM 370/125	80	**80**	Univac 1100/11	392	**140**	Magnuson M80/42	834
21	Univac 70/46 (RCA)	83	**81**	Univac 1106	400	**141**	Burroughs 7803	845
22	Univac 70/3 (RCA)	83	**82**	Univac 418-III	400	**142**	Burroughs 7750	845
23	Burroughs 2700	95	**83**	Honeywell 66/05 (2X)	405	**143**	Nanodata QMX 6343	880
24	IBM 370/125-2	99	**84**	NCR V-8565M	424	**144**	NCR V-8575 MP	884
25	Burroughs 1776	100	**85**	Burroughs 6700	425	**145**	Burroughs 7805	900
26	Honeywell 62/40B	100	**86**	IBM 370/148	425	**146**	Honeywell 66/40	900
27	Honeywell 64/20	100	**87**	Magnuson M80/31	430	**147**	IBM 370/158-3	900
28	Univac 90/25	100	**88**	Burroughs 6806	450	**148**	NAS AS/5-3	900
29	Univac 70/45 (RCA)	105	**89**	Burroughs 6805	459	**149**	CDC Omega 480-III	950
30	Univac 70/2 (RCA)	105	**90**	DEC 2040	462	**150**	Magnuson M80/43	985
31	IBM System 3/34	110	**91**	Honeywell DPS 8/20	473	**151**	CDC 72	1,000
32	Univac 9400	110	**92**	DEC 1060	496	**152**	NAS AS/4 MP	1,000
33	Univac 9480	110	**93**	DEC 1070 KI	497	**153**	Honeywell 66/20 (2X)	1,008
34	Honeywell 64/20C	125	**94**	DEC PDP 11/60	510	**154**	Univac 1100/12	1,044
35	Honeywell 64/30	135	**95**	CDC 171	520	**155**	IBM 3031	1,045
36	Univac 90/30	139	**96**	Honeywell 66/10 (2X)	525	**156**	Univac 1100/41	1,069
37	IBM 360/50	158	**97**	Magnuson M80/4	531	**157**	Univac 90/80-4	1,100
38	Univac System 80 Mod 3	160	**98**	Magnuson M80/32	531	**158**	Honeywell 66/27*	1,120
39	IBM 370/135	161	**99**	NCR V-8555 MP	531	**159**	Univac 1100/61 H1	1,120
40	Honeywell 64/40	162	**100**	Honeywell 66/07*	540	**160**	Univac 1110 (1X1)	1,143
41	Honeywell 62/60D	163	**101**	Burroughs 6807	544	**161**	Burroughs 6817	1,147
42	DEC 1040	165	**102**	Univac 110/60 C1	544	**162**	Burroughs 6818	1,150
43	DEC 1050 KA	166	**103**	Burroughs 6808	545	**163**	Univac 1100/60 H1	1,156
44	Burroughs 3700	170	**104**	IBM 370/155	550	**164**	DEC 1099 (2X)	1,160
45	Burroughs 1726	175	**105**	Nanodata QMX 6336	550	**165**	DEC 1088 (2X)	1,160
46	NCR V-8455	179	**106**	CDC Omega 480-II	553	**166**	Honeywell DPS 8/52	1,200
47	Burroughs 1860	180	**107**	Honeywell 66/20	560	**167**	CDC 172	1,230
48	Burroughs 2830	200	**108**	Univac 1100/61 C1	560	**168**	Burroughs 6821	1,260
49	Burroughs 1728	200	**109**	IBM 360/65	568	**169**	Burroughs 6822	1,260
50	Burroughs 1870	200	**110**	Univac 1106-II	571	**170**	Honeywell 66/60	1,266
51	Honeywell 64DPS320	213	**111**	NCR V-8575	576	**171**	Univac 1108 MP	1,290
52	IBM 4331	213	**112**	NAS AS/4	595	**172**	Burroughs 7755	1,300
53	IBM 370/138	214	**113**	DEC PDP 11/70	600	**173**	CDC 73	1,300
54	Honeywell 64/50	219	**114**	DEC 1066 (2X)	600	**174**	Honeywell 66/80	1,300
55	Univac 70/55 (RCA)	237	**115**	Univac 9080-2	600	**175**	NCR V-8585 MP	1,340
56	Univac 90/60	240	**116**	Univac 1100/11 (overlap)	614	**176**	Univac 1100/61 H2	1,344
57	Univac System 80 Mod 5	250	**117**	Univac 494	650	**177**	NAS AS/5-1 MP	1,407
58	Honeywell 66/05	270	**118**	NCR V-8565	656	**178**	Univac 1100/60 H2	1,496
59	Honeywell 64/60	273	**119**	Univac 1100/61 C2	672	**179**	Univac 1100/62 E1	1,496
60	NCR V-8555M	277	**120**	Univac 1100/60 C2	680	**180**	Burroughs 7760	1,528

	Mainframe	KOPS
181	NAs AS/5-3 MP	1,530
182	Honeywell 66/40 (2X)	1,620
183	Univac 1100/62	1,700
184	Univac 1100/81	1,800
185	CDC 173	1,870
186	IBM 370/165	1,900
187	Univac 1100/42	1,918
188	Univac 1110 (2X2)	1,943
189	Burroughs 7770	1,950
190	Honeywell DPS 8/70	1,987
191	Burroughs 7811	2,100
192	IBM 360/85	2,100
193	Univac 1100/62 H1	2,244
194	Honeywell 66/60	2,278
195	IBM 370/168	2,300
196	Honeywell 66/80 (2X)	2,340
197	Burroughs 7765	2,350
198	Amdahl	2,487
199	CDC 74	2,500
200	CDC 6600	2,500
201	IBM 370/168-3	2,500
202	IBM 3032	2,500
203	Burroughs 7780	2,535
204	NCR V-8650	2,650
205	Univac 1100/43	2,798
206	Univac 1100/62	2,800
207	CDC 174	2,805
208	Amdahl 470 V/5-II	2,850
209	Burroughs 7775	3,000
210	NAS AS/6	3,000
211	CDC 76	3,120
212	Univac 1110 (4X4)	3,303
213	Univac 1100/82	3,360
214	Amdahl 470/V6	3,450
215	Honeywell DPS 8/70	3,576
216	Univac 1100/44	3,615
217	CDC 6700	3,700
218	Amdahl 470V/6-II	3,750
219	Amdahl 470 V/7B	3,825
220	Burroughs 7785	3,900
221	Burroughs 7821	4,000
222	IBM 3033N	4,000
223	Amdahl 470V/7A	4,250
224	NCR V-8670	4,293
226	IBM 370/195	4,750
227	Honeywell DPS 8/70 (3X)	5,007
228	Univac 1100/83	5,040
229	CDC 175	5,060
230	IBM 3033U	5,900
231	Amdahl 470 V/7	5,950
232	Amdahl 470 V/8	6,375
233	Univac 1100/84	6,400
234	Honeywell DPS 8/70 (4X)	6,510
235	CDC 176	9,360
236	CDC 7600	10,000
237	CDC Cyber 205 (vector)	800,000
238	Cray 1-S (vector)	800,000

*Time-shared

NO RATING BUREAU

Another reason for the lack of trust in KOPS ratings is the absence of a bureau of standards or a committee of inspectors to enforce standards and handicap the subtle hardware variances that will be described later. What specific programs constitute IBM job mix number 5? If each vendor is privately selecting the 7% commercial compile jobs, the 58% commercial application object code, etc., the basis for the measurement is not only unscientific, it is without any foundation. The calculation process is not observed by independent auditors and, therefore, the vendors are probably wise to suppress the MIPS outcomes. Thus no one can harass the vendor for delivering a machine whose MIPS did not seem to measure up.

In researching the method of calculating KOPS, no one could actually produce a table that lists the number of instructions contained in job mix number 5, although some vendors believed it had been published at one time. With these tables (if they actually exist) anyone could calculate KOPS without going near a machine. No benchmark team of statisticians would be required; it would be a kitchen table exercise using instruction speeds listed in the common processor manual.

A fourth reason the vendors cannot fully support the KOPS rating is that subtle hardware differences mar the purity of the KOPS measurements—even within the product lines of a single vendor. For instance, machines with byte architecture behave differently from word-oriented machines because the word-based instructions sometimes do more functions than the equivalent byte instructions.

UNIVAC traditionally measured its word-oriented machines in MIPS while the UNIVAC series 90 products (and other byte machines) were commonly measured in KOPS. In order to compare the two product lines, UNIVAC estimates that MIPS ratings can be multiplied by 800. ($0.8 \times 1{,}000$) to obtain the equivalent KOPS ratings. Word-based instructions accomplish 20% more than byte instructions on the average. Since FORTRAN instructions, however, execute slightly faster under the word architecture and COBOL instructions execute slightly slower, it must also adjust the FORTRAN/COBOL mix to be 50/50 for its 1100 series measurements.

This caution is not required on byte-oriented machines. No standards require the measurement staffs to take this factor into account. Worse, many word machines have *some* byte instructions, and a hopeless or frustrating measurement task is encountered.

Prior to 1974, instruction sets functioned at about the same level across most machines. After 1975, systems sometimes provided instructions that directly supported high level language or operating system functions. These new operations were lengthy—one statement performing dozens of functions. They improved throughput but reduced the KOPS rating considerably.

The internal measurements staff and benchmark teams at IBM, DEC, UNIVAC and all the other vendors expose the inconsistencies of the KOPS ratings at almost every benchmark session. Benchmark measurements are quite different from KOPS measurements. Just as "miles per gallon" is probably more important to the car buyer than the engine liter size, so also the benchmark activity focuses wisely on actual output and throughput capacity rather than instruction speeds. The IBM 4341, UNIVAC 1100/80C2, Burroughs 4840, and DEC 1077 all have a KOPS rating between 680 and 758, so their throughput powers would be thought by many to be similar. But when these four machines are benchmarked against each other, the KOPS inconsistencies begin to surface.

CAVEAT EMPTOR

But the corporate buyer must beware. If the shop requires 150 time-shared concurrent tasks and five background batch jobs, those operating systems that contain integrated communications modules and memory management for the on-line work might achieve double the throughput of those that require CICS or other communication monitors. Conversely, if the benchmark requires 30 concurrent batch jobs and five time-shared terminals, those operating systems that are encumbered with communication services may run 2-to-1 circles around another machine with the same KOPS rating.

Machines that steal cycles to complete I/O activities will have lower throughput than those that have independent processors to handle I/O—even though KOPS might be identical. Thus, even if the KOPS measurements were scientific and supported, it would be possible to order a machine of higher KOPS whose actual throughput could be noticeably lower—a fact not likely to be observed until benchmark or installation time.

The measurements team with one hardware vendor claimed to have witnessed a benchmark comparison between a minicomputer and a mainframe computer. When loaded with a single scientific program, the minicomputer outperformed the mainframe 10 to 1. When loaded with commercial programs that required multiprogram execution, the mainframe surpassed the minicomputer 2.5 to 1.

The obvious maxim to draw from this illustration is that no factor affects throughput more than the customer's intended use and application. KOPS are not measures of throughput; they measure raw speeds of execution.

Given the problem, what is the corpo-

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We also pay air fare for high schoolers visiting parents in Saudi Arabia—three trips per year. (The same goes for air fares for college students but they get fewer trips.)

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Free life insurance and health care

You're automatically covered with a life insurance policy the day you join Aramco. No cost to you.

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Will your retirement home be near some mountain greenery, or farther south within the Sun Belt, or on the shores of the Pacific? Aramco's big bundle of benefits will help you secure it sooner than you think. See below.

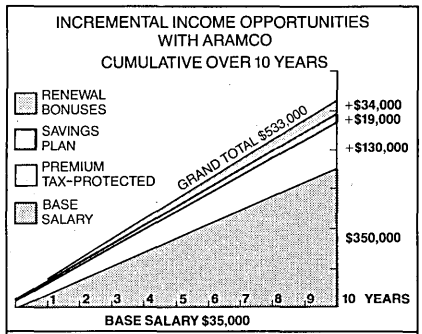
All your medical needs are free while you are in Saudi Arabia — even your prescriptions.

Unlike medical care, dental care is not free for Aramco employees. However, the costs are comparable to what you'd expect to pay back home.

A chance to save huge sums of retirement money

We can only give you a bare idea of how the money can multiply over a 10-year span. For the sake of illustration, let's add up the fortunes of an engineer working for Aramco in Saudi Arabia making $35,000 U. S. in base pay, with no raises for the 10 years (not likely!). Remember this is just a hypothesis.

Right off, you see that our imaginary engineer in Saudi Arabia can gross around $183,000 more. The amount saved out of that grand total is strictly up to the individual.



This is not an offer or an indication of wage scales. It is merely a hypothetical example of how your gross income can accumulate dramatically when you work for Aramco in Saudi Arabia. Employees are not fully vested in the savings plan until 60 months of continuous service. All projections subject to change.

But look at that $130,000 premium. Whatever the dollars work out to in your case, please remember that this is the bundle which is *totally* tax-protected.

This graph doesn't show what you save on medical expenses, it doesn't show the allowances on your children's education, it doesn't show the travel allowances which cut down on vacation costs, it doesn't show the retirement benefits you may accumulate.

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ARAMCO
SERVICES COMPANY

CIRCLE 88 ON READER CARD

MAINFRAME KOPS RATINGS
By Vendors

MAINFRAME	KOPS
Amdahl	
470V/5	2,487
470V/5-II	2,850
470V/6	3,450
470V/6-II	3,750
470V/7B	3,825
470V/7A	4,250
470V/7	5,950
470V/8	6,375
Burroughs	
1705	46
1707	55
1709	60
1713	65
1830	70
1715	70
1717	75
2700	95
1776	100
3700	170
1726	175
1860	180
2830	200
1728	200
1870	200
4700	340
3830	340
6807	340
6803	382
6700	425
6806	450
6805	459
6807	544
6808	545
4840	718
6810	765
6811	765
6812	765
7750	845
7803	845
7805	900
6817	1,147
6818	1,150
6821	1,260
6822	1,260
7755	1,300
7760	1,528
7770	1,950
7811	2,100
7765	2,350
7780	2,535
7775	3,000
7785	3,900
7821	4,000
Control Data Corp.	
Omega 480-I	321
171	520
Omega 480-II	553
Omega 480-III	950
72	1,000
172	1,230
73	1,300
173	1,870
74	2,500
6600	2,500
174	2,805
76	3,120
6700	3,700
175	5,060
176	9,360
7600	10,000
CYBER 205 Vector	800,000
Cray	
1.5 Vector	800,000
Digital Equipment Corp.	
1040	165
1050 KA	166
1055 (2x)	307
2040	462
1060	496
1070 KI	497
PDP 11/60	510
PDP 11/70	600
1066 (2x)	600
1077 (2x)	746
1090 KL	829
1080	829
2050	829
VAX-11/780	831
1099 (2x)	1,160
1088 (2x)	1,160
Honeywell	
Level 62	75
62/40B	100
64/20	100
64/20C	125
64/30	135
64/40	162
62/60D	163
64/50	219
64DPS 320	213
66/05	270
64/60	273
66/10	350
66/05 (2x)	405
DPS 8/20	473
66/10 (2x)	525
66/07 (time-shared)	540
66/20	560
66/17 (time-shared)	700
DPS 8/44	710
66/40	900
66/20 (2x)	1,008
66/27 (time-shared)	1,120
DPS 8/52	1,200
66/60	1,266
66/80	1,300
66/40 (2X)	1,620
DPS 8/70	1,987
66/60 (2x)	2,278
66/80 (2x)	2,340
DPS 8/70 (2x)	3,576
DPS 8/70 (3x)	5,007
DPS 8/70 (4x)	6,510

Note: All Honeywell numbers are based on the 66/80 performance.

MAINFRAME	KOPS
IBM	
System 3/32	20
360/22	36
360/30	36
360/25	40
System 3	55
370/115	55
360/40	70
370/115-2	77
370/125	80
370/125-2	99
System 3/34	110
360/50	158
370/135	161
4331	213
370/138	214
370/145	300
370/148	425
370/155	550
360/65	568
360/75	700
4341	758
370/158	829
370/158-3	900
3031	1,045
370/165	1,900
360/85	2,100
370/168	2,300
3032	2,500
370/168-3	2,500
3033N	4,000
360/195	4,750
370/195	4,750
3033U	5,900
Magnuson	
M80/3	321
M80/31	430
M80/4	531
M80/32	531
M80/42	834
M80/43	985
Nanodata	
QMX 6333	380
QMX 6336	550
QMX 6343	880
National Advanced Systems (Itel)	
AS/4	595
AS/5-1	829
AS/5-3	900
AS/4 MP	1,000
AS/5-1 MP	1,407
AS/5-3 MP	1,530
AS/6	3,000
NCR	
V-8455	179
V-8555M	277
V-8560	281
V-8570	383
V-8565M	424
V-8555MP	531
V-8575M	576
V-8565MP	656
V-8585M	779
V-8575MP	884
V-8585MP	1,340
V-8650	2,650
V-8670	4,293
Sperry-Univac	
9200	19
9300	38
70/35 (RCA)	54
70/46 (RCA)	83
70/3 (RCA)	83
90/25	100
70/45 (RCA)	105
70/2 (RCA)	105
9400	110
9480	110
90/30	139
System 80 Mod 3	160
70/55 (RCA)	237
90/60	240
System 80 Mod 5	250
70/61 (RCA)	287
70/7 (RCA)	287
90/60 E	295
70/60 (RCA)	300
70/6 (RCA)	300
90/70	329
9700	344
1100/11	392
1106	400
418-III	400
1100/60 C1	544
1100/61 C1	560
1106-II	571
90/80-2	600
1100/11 (overlap)	614
494	650
1100/61 C2	672
1100/60 C2	680
1108	760
90/80-3	800
90/80	825
1100/12	1,044
1100/41	1,069
90/80-4	1,100
1100/61 H1	1,120
1110 (1 by 1)	1,143
1100/60 H1	1,156
1108 MP	1,290
1100/61 H2	1,344
1100/60 H2	1,496
1100/62 E1	1,496
1100/62 E2	1,700
1100/81	1,800
1100/42	1,918
1110 (2 by 2)	1,943
1100/62 H1	2,244
1100/43	2,798
1100/62 H2	2,800
1110 (4 by 4)	3,303
1100/82	3,360
1100/44	3,615
1100/83	5,040
1100/84	6,400

TABLE I

CALCULATING THE KOPS

Using IBM Job Mix #5, and ignoring all supervisory calls to the operating system:

1. For each instruction, count the number of times it will be called or executed.
2. Multiply each count by the execution time of the instruction.
3. Total these counts.
4. Divide by the total number of instructions executed.

Table II

THE MISSING KOPS KEY

An actual table like this one must exist somewhere (for each mainframe series) in order for KOPS measurements to be calculated.

TABLE FOR IBM 370-148

MACHINE INSTRUCTIONS	HARDWARE SPEED IN MICROSECONDS (Actual)	NUMBER OF TIMES THIS INSTRUCTION OCCURS IN IBM JOB MIX #5 (fictionized here)
ADD *AR*	1.238	300
ADD DECIMAL *AP*	6.221+	7,427
ADD HALFWORD *AH* etc.	2.318	798
ADD LOGICAL *ALR* etc.	1.058	10
BRANCH & LINK *BALR*	1.148	8,275
BRANCH & LINK *BAL*	2.036	15,180
BRANCH ON CONDITION *BCR* etc.	.743+	1,370
COMPARE *CR*	1.328	1,170
COMPARE & SWAP *CS* etc.	3.701	0

rate decision maker to do? Clearly some rating system is needed to help the administrator rank the alternatives, but if the KOPS ratings are 10% to 30% in doubt, if throughput can vary by a factor of 2 within a single KOPS number, and if the vendors will not officially publish the numbers, the decision maker is left without any performance criteria. For this reason, a few institutions have literally spent a million dollars and obtained machines that provided less throughput than the machines that were replaced.

One factual and reliable test does exist that can help the administrator—benchmarking. It is the best existing activity to put the corporate officer in the driver's seat. Only about 10% of computer buyers, however, submit to this exercise. The process of benchmarking requires competent planning, the investment of expensive staff time, and technical interpretation of the results. By investing in the benchmark, however, the throughput and cost/performance ratio can be more legitimately measured and understood. A computer vendor would be legally accountable for installing a machine that matches the benchmarked standard.

A second option for the administrative decision maker is to make use of the accompanying KOPS listings. The KOPS rankings can be interpreted internally by technical staff members who probably have the wisdom to demythologize the numbers. Using the facts of their local shop as input, they can interpret the likely throughput gain (or loss) based on the variables described earlier. Such subjective interpretation, if conducted by experienced internal staff, does have some value. Until a better standard is forged, KOPS will probably continue to be referenced—even with all the provisos.

SOURCE OF RATINGS

In preparing the list of KOPS ratings that accompany this article, we used several sources. We obtained official vendor statements, data from internal measurements staffs, lists from computer salesmen, and material from reference organizations.

1. *Official Vendor Statements*. Of 12 vendors who were contacted, three provided partial and qualified statements of KOPS ratings (Amdahl, Magnuson, and Sperry-Univac). All vendors received their final list by mail and had opportunity for adjusting the ratings as desired.

2. *Internal Measurements Staffs*. Vendor measurement and benchmark teams who work with performance measurement on a daily basis were often helpful in improving questionable ratings. They invariably requested anonymity. Competitors' ratings were often known and discussed because of the benchmark process, which compares known machines to foreign machines.

3. *Computer Salesmen*. Because of the public need for performance criteria, salesman often carry unofficial or unauthorized lists of their products' KOPS ratings. Such lists are usually in line with the other sources but were treated as less authoritative.

4. *Reference Sources*. Datapro, Auerbach, and International Data Corp. were all used as sources for cross-checking and verifying that gross errors would not be published. Contacts inside these companies affirmed the need for a better throughput measurement.

The interest we find in these ranked lists bears witness to the need for standardized certification. Even though the members still contain minor inaccuracies and are not vendor supported, they do fill a void that nearly every other industry satisfies with ratings like BTU, candlepower, horsepower and money-back performance guarantees.

In England the British government requested the Central Computer Agency to develop a tool for measuring computer performance. Their solution is widely known in the scientific community as the "Whetstone Benchmark."[1] Like KOPS, it measures processor instructions per second and is based on FORTRAN operations exclusively. It suffers from the same problems as the KOPS measurement but it has been officially recognized as a standard in England. In the United States, no standard is recognized. If our industry is more complex and/or exact than others, it should apply standardization methods more carefully to this problem.

A final caution: remember that KOPS ratings measure processor speed, not throughput. ✱

1. Curnow, H.J., and Wichmann, B.A. "A Synthetic Benchmark," *The Computer Journal* vol. 19, no. 1, pp. 43-48.

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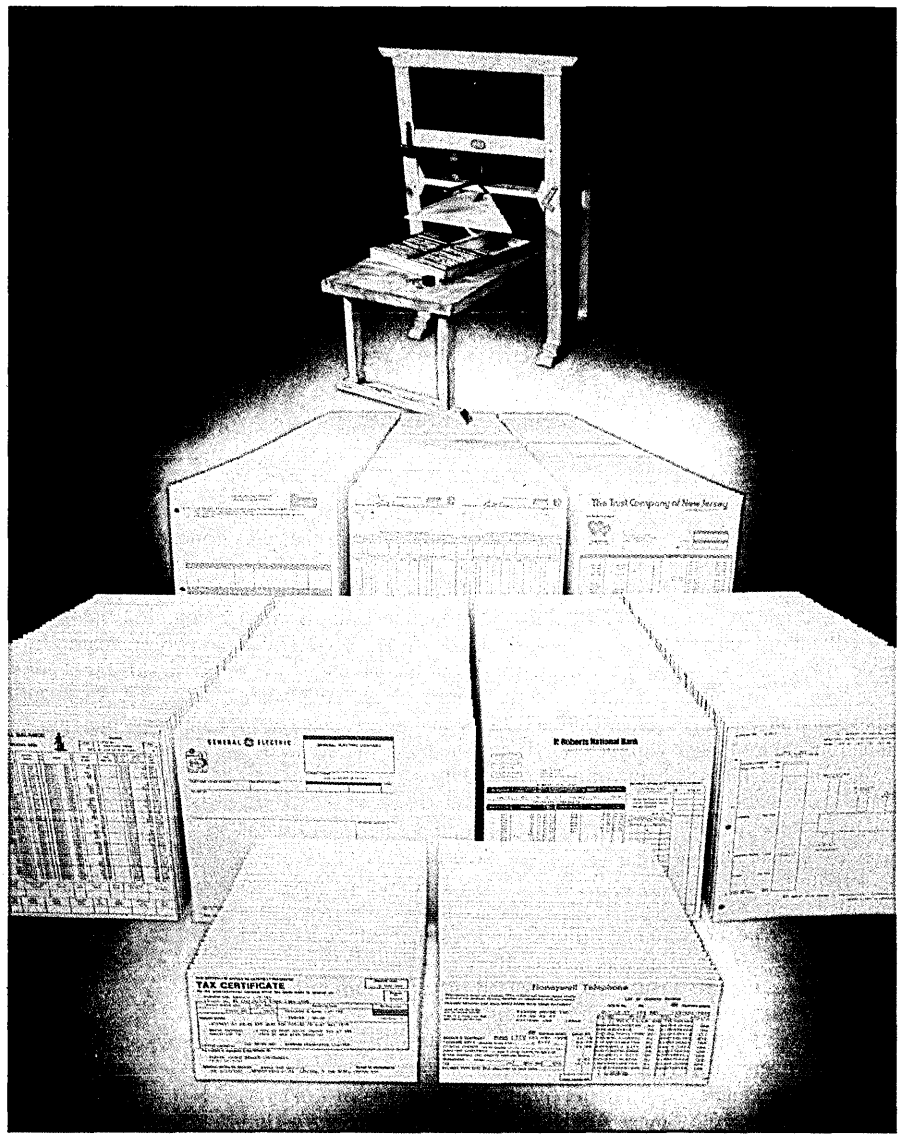
Dr. Lias is a regional manager with Systems and Computer Technology Corp., a Malvern, Pa., firm that specializes in facilities management. He is a graduate of New York University and is a speaker at many computer conferences.

PRINTING PROGRESS.



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A project manager debunks some mistaken ideas about computer system project management.

MYTHS THAT MISS

by David M. Farbman

Gather 'round, my project management friends . . . the iconoclast has come to town with a bag of broken myths.

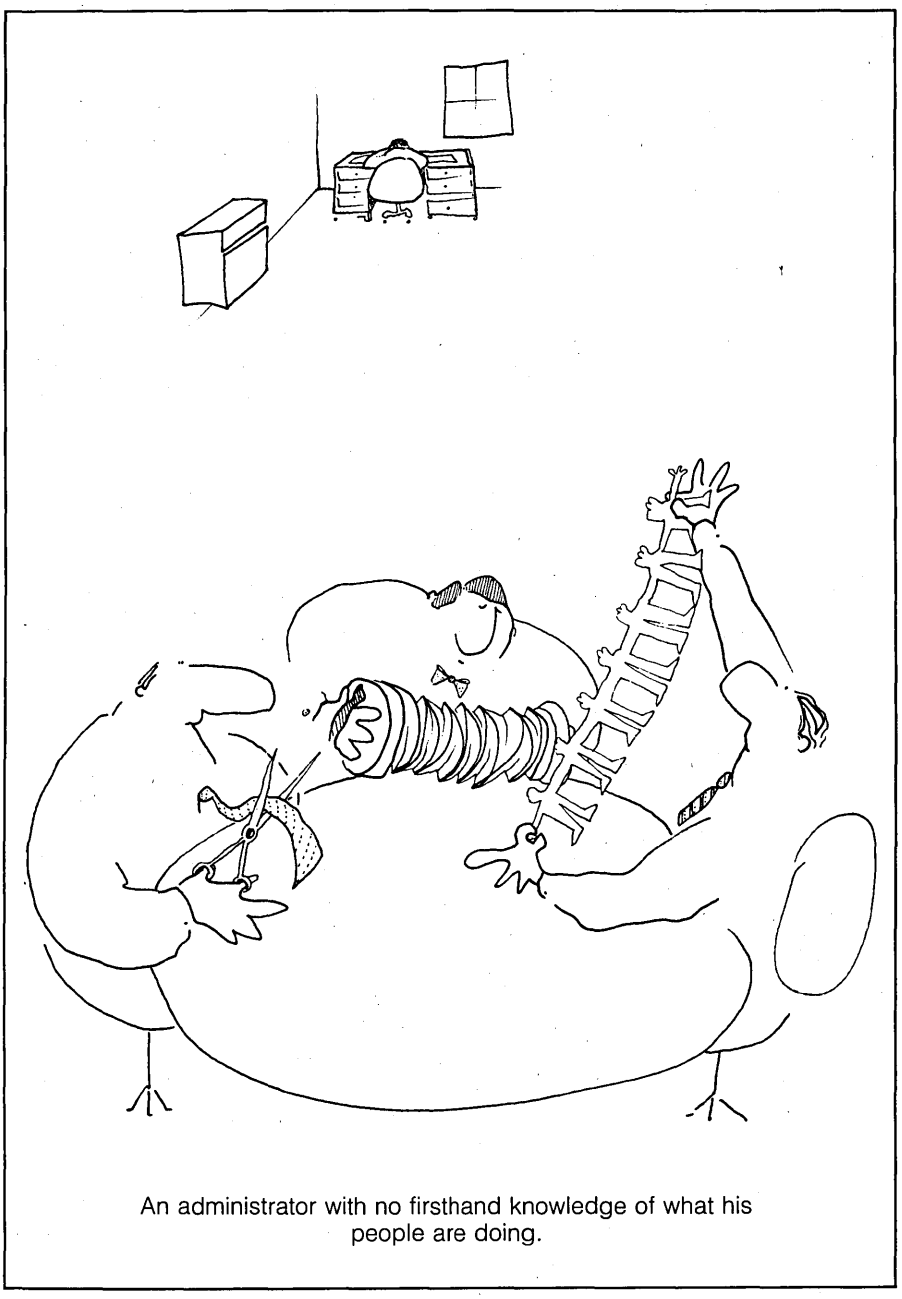
Opinion
Managing a computer system development project is like any business. A truly knowledgeable, competent administrator can apply generally accepted personnel, budgeting, and motivational techniques to manage a development effort. Should this fail, a chief programmer or consultant can provide technical advice and act as a translator.

Fact
An administrator who has not personally programmed, or personally specified, or personally designed, or personally tested a system has no firsthand knowledge of what his people are doing. He cannot respond to delays or user concerns. He is at the mercy of incompetent staff or external forces.

The best way for a nontechnician to manage technical people is to turn over the entire project—people, users and all—to a chief programmer. Then, the administrative details should be turned over to a good chief of staff. After that, the administrator can perform the more important tasks himself.

Opinion A
Once the agreed functionality has been documented and signed, the user can relax and let you build your system. Of course, you will send him a copy of the weekly project status report to keep him informed. You will also expect him to witness the acceptance test so that he will sign a memo to the effect that all is as agreed upon.

Opinion B
It is poor practice to mail the status report to your user. You should appoint one of your junior analysts to hand-carry it over, so he can answer any of the user's questions about the project and its status. The analyst can also bring a list of questions from your programmer to the user.



An administrator with no firsthand knowledge of what his people are doing.

ILLUSTRATIONS BY BRUCE CAYARD

You can drive consultants harder than someone who will be with you after the project has been completed.

Fact
The user is the most important member of the team. He should be in almost continuous contact with you and can therefore pick up his own copy of the status report. He will then use it to assist you with his supervisors.

Designers and programmers should make a habit of showing the user partial solutions, doing walkthroughs, discussing implications to the user of technical options, etc. This will reduce acceptance test time, ease customer conversion, reduce maintenance, etc., when the user installs *his* system.

Opinion
The user must tell you what he needs. You document it. He signs it. All changes to applications are indications of the user's failure to know what he wants.

Fact
Most users don't know what they want; they almost never know what they need. Your job is to observe the problems he describes, suggest alternative solutions, verbally describe (or even act out) some work flows, and only then fully document the selected proposed functionality.

Any changes to specifications are indications of your failure to get into his brain, to see with his eyes, to extract his requirements, and to propose solutions to his needs.

Opinion
The best (or only) way to develop moderate-to-complex systems is by the enforced use of a staged development methodology (or project life cycle). This will assure that you know where you are at all times and force you to finish/demonstrate/document/walkthrough and get approval for Stage N before starting Stage N+1.

Fact
Systems developed "by the book" will inevitably miss every milestone. The book will be used by compulsive types to cross t's and dot i's rather than to expedite the delivery. The delays between stages can total more calendar days than the project itself.

Once the user has agreed that the rough functionality and approach is definitely cost-effective and viable, there is no reason why the design/development team could not start work a few days behind the analysis team. Further, the technical writing, training, conversion, and acceptance test team can each (on a part-time basis) be a week or two behind the design/development. This is similar to a programmer coding a single module and getting it into unit test while he is coding other modules or integrating several of them. These are all highly parallel situations; they can be sequenced to optimize overlap.

Every team must recognize that its success depends on the successful programs of the preceding teams. All will succeed—or none. A down-line person who observes a potential design improvement can discuss the issue with the designer who just finished it.

Opinion
Give me 10 good analysts, programmer/analysts and programmers and I will build the best computer system in the company.

Fact
You and 10 good technical people will cost your company over $500,000 a year in salary, space, benefits, holidays, vacation, etc. This does not include necessary resources such as computer time, printout and paper, etc. To make matters worse, if you succeed, what will you do with these good people (who love challenges, impossible deadlines, etc.) after the project is finished—put them on maintenance?

You would be better off with fewer people plus several consultants or temporary people. These can be let go the day you discover that they cannot perform as expected or when the project is completed and turned over. You also can drive consultants harder than someone who will be with you after the project is completed.

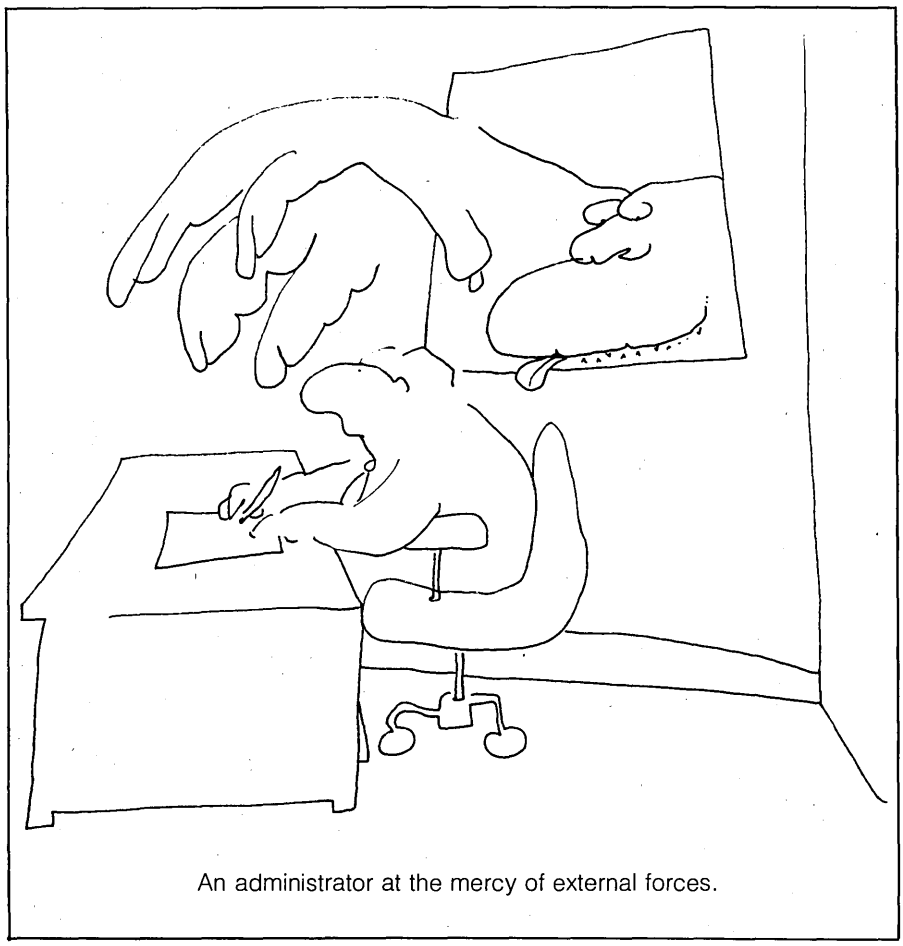
Opinion
The biggest waste of time/money/skills is to get halfway through projects and then pull the plug.

Fact
The true waste occurs when the project has been totally completed, turned over to the users, and the users won't (or can't) use it because of technical, political, or even apparently irrational reasons.

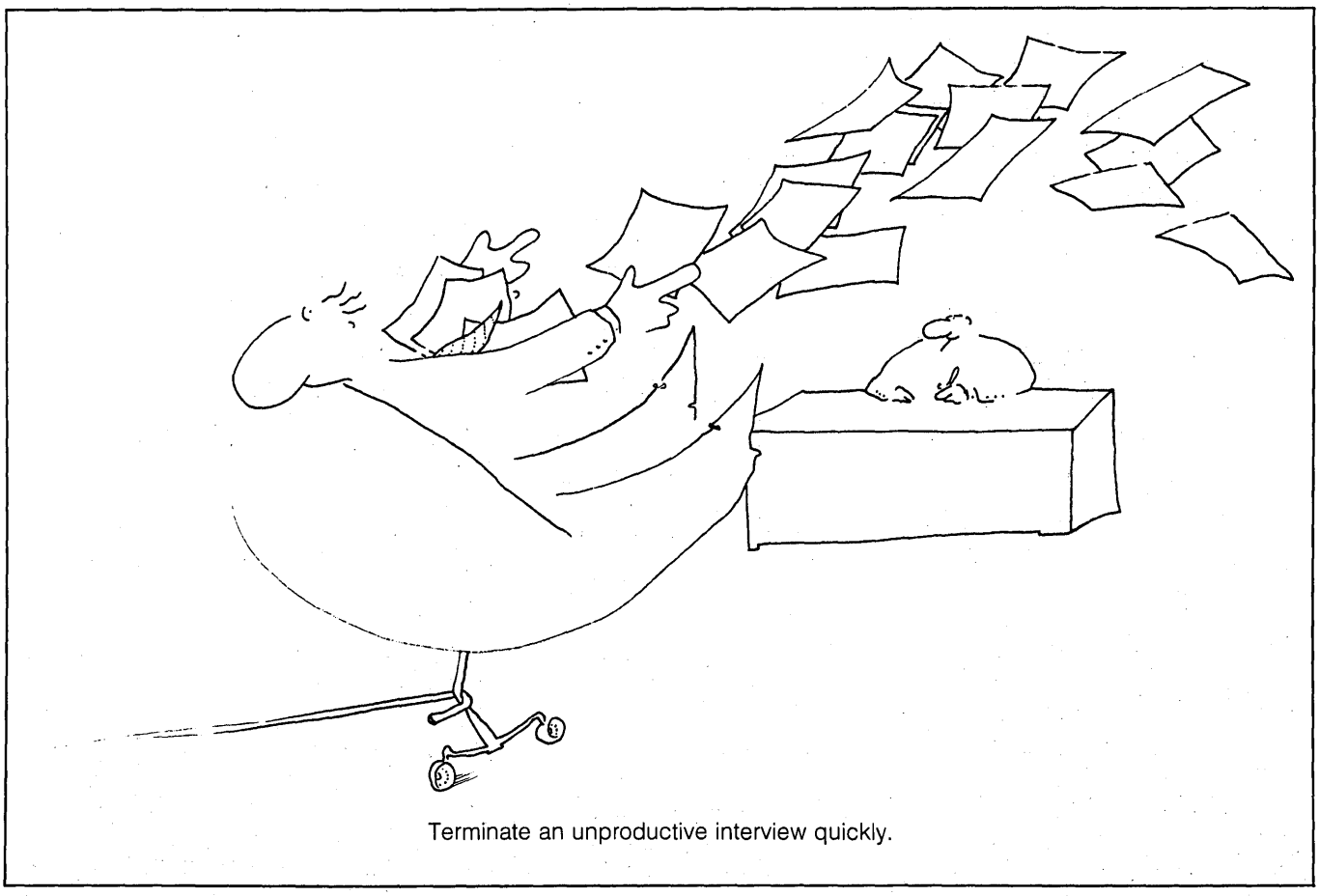
Opinion A
Before you write one line of code or draw the design flow diagram, the users must sign the functional specifications (including throughput). They are told over and over that you will develop the system exactly to the specs. Any changes will cause a sequence of meetings, threats, and cost overruns.

Opinion B
Actually it would be best to tell the user that all changes to the specs will be implemented in Phase II so that you can complete your initial agreement.

Fact
Your user is the person who requests your services, assists you in your job, demonstrates your system to upper management, tells the world of your success (or lack of it), and, in effect, signs your paycheck.



An administrator at the mercy of external forces.



Terminate an unproductive interview quickly.

The best way to deal with functional changes is to separate them into two categories. The simple changes, such as report or screen layouts or modified computation, should be accepted without argument and documented back to the user to reflect understanding of the changes.

Complex changes, such as new files or completely new functionality or different/additional interfaces, must be thoroughly analyzed. They must be presented honestly, clearly, and calmly to the user with all options and all information about effects on cost and time for each option. No pressure should be applied. The user will then accept the heat for delays or overruns due to his corrected requirements.

Opinion

Preferred ways to estimate the probable length of a project are to:

1. Average the guesses of three of your analysts.
2. Use the IBM manual which allows 3.72 days per line of code per complexity factor (CF).
3. Ask a consultant.

Fact

The only way to estimate is to break down the total project, from absolute end to absolute end, into specific milestones with specific deliverables. Then, take each task and break it down to its basic components. Without buffers or allowance for problems, estimate the number of hours or days for each component. Make a list of all assumptions and constraints. Place the result on Gantt, Pert, and/or Milestone charts.

Opinion

Now that you have estimated correctly, add a 30% buffer to allow for those annoying contingencies that will delay your project. Make it 50% if what's-his-name is doing it.

Fact

Good programmers love challenges. After you have estimated correctly, cut the time by 50%. Give your staff a few days to relax before the impossible is started. Meanwhile, figure out a way. Line up your resources. Tell your management and user of your attempt—and good luck. If you miss your deadline, you still will be finished a lot sooner than if you were 30% later than your 30% buffered commitment.

Note: this procedure tends to "burn out" programmers, damage family life, and frazzle users. When it's over, be sure to properly reward those members of your team who will be expected to drive the next challenge. Don't reward those who failed to push or those whom you would like to demoralize.

Opinion

If you want a truly objective study of a project, or potential project, get a consultant. The more prestigious the company, the more thorough the study. When the effort starts, be open with the study team. Tell them your problems, doubts, and concerns. Also, describe some examples of solutions to the problem so that they can get a better picture of the scope of the desired product.

Fact

Ten out of ten studies, given the above, will run several weeks or months and will present you with a significant report on rag paper that you can take to your management. The study will restate, in four-syllable words, all your problems, doubts, and concerns. For an extra $10,000 they will throw in one of your originally described solutions.

To really get your money's worth, interview the consultants as if they were applying for a job in your problem area. Be extra rough during the interview; really make sure that the assigned people are absolutely qualified. It's O.K. to describe your problem as you see it today. Also, list the constraints. If, during the interview, the consultant fails to

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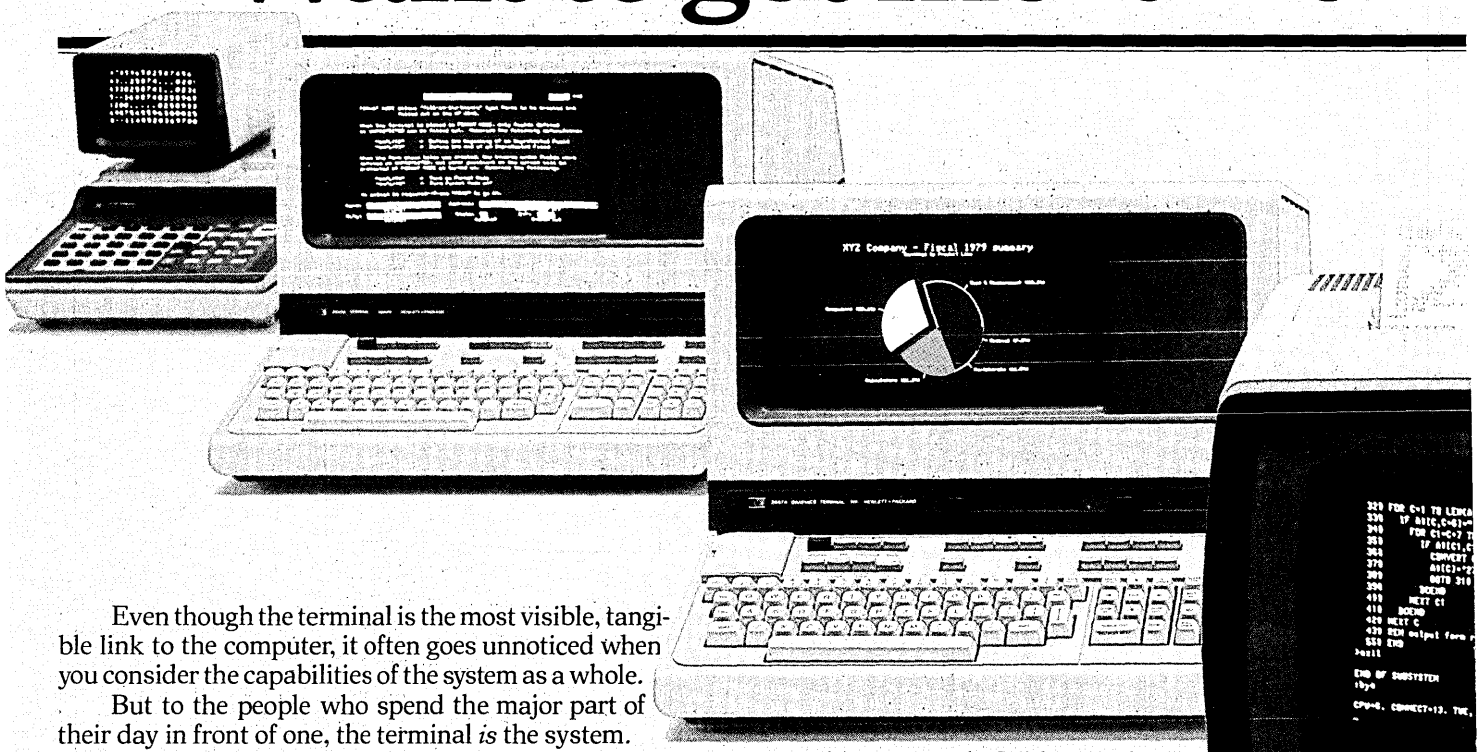

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Look at it this way.

your computer system?

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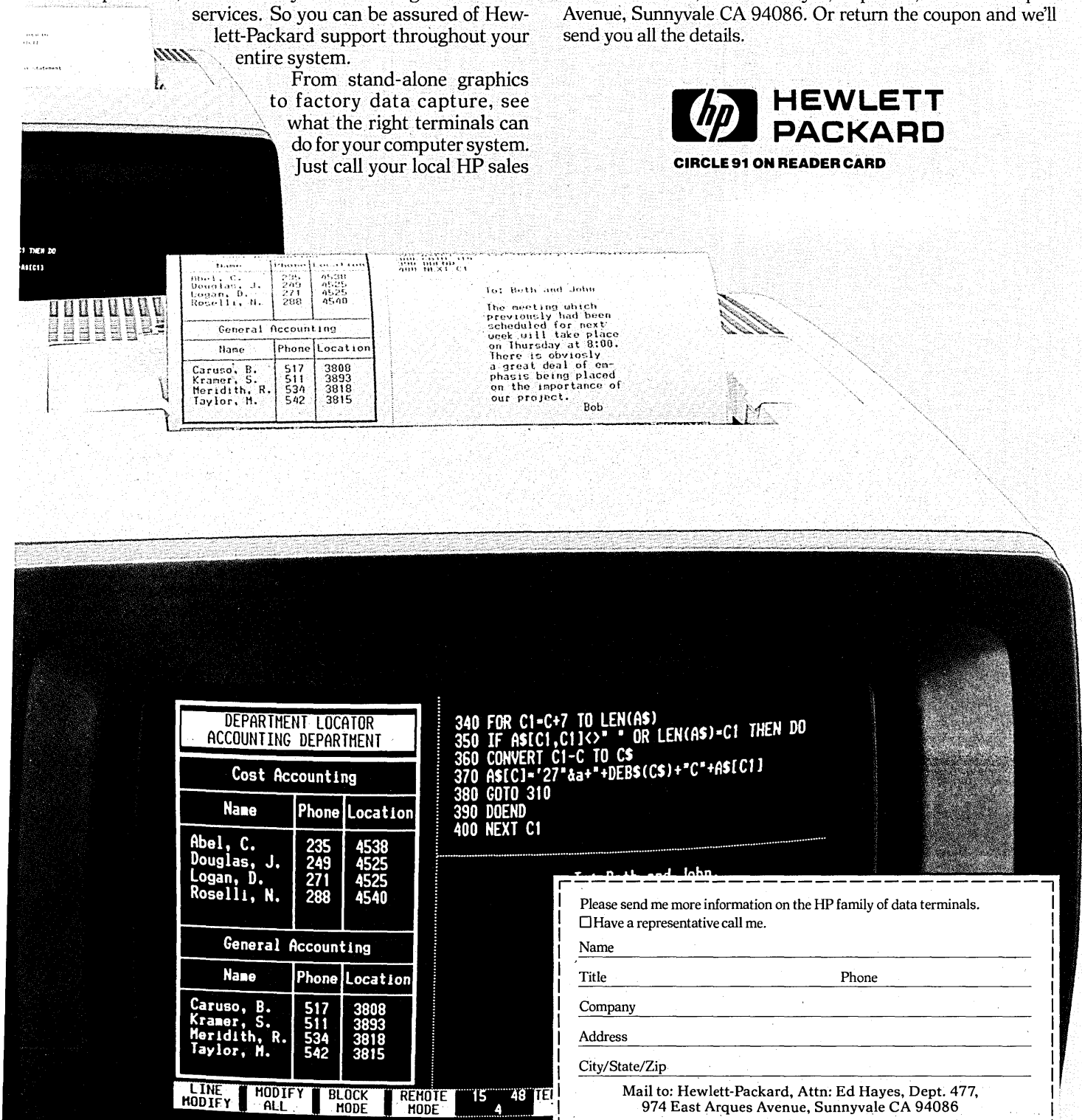

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exhibit understanding and offer examples of viable solutions, end the interview. Do not waste further time. Do not be polite.

Opinion

The best way to interview technical people is to show them your area, tell them what you do, and explain what you expect from them. Observe such things as eye contact. Be sure that the person understands what is expected of him. Ask questions regarding goals, objectives, reasons for leaving, etc.

Fact

The best way to interview technical individuals is with the aid of your best technician. Ask highly specific closed questions in each area that may be required in the job. Ask, e.g.:

- What does a BCTR do?
- Why is four-wire bisynch not really considered fully duplexed?
- When would you use a Level 88?
- What are the sections of a functional specifications document?

Only after you have determined that the person has the skills you need should you bother to find out what he wants.

Opinion

Unfortunately, a good interview takes 60 to 80 minutes: 15 to 20 minutes for technical evaluation, 15 to 20 minutes for general evaluation, 15 to 20 minutes to talk about the company, and 15 to 20 minutes to wrap up, answer questions, and say goodbye.

Fact

A string of interviews by yourself, one of your project leaders, and your user that fails to lead to an offered and accepted job wastes everyone's time. If, during the initial technical evaluation, you determine that: the person could not do the job, cannot take pressure, does not know what he does not know, or the chemistry is bad because of quirks in your personality or his, terminate the interview. If you feel bad about this, have an associate call you away, and reschedule the interview to a future, indefinite time.

The above messages represent bits of hard-earned wisdom, gathered by an admitted iconoclast. It is hoped these bits will light the tunnel for the novice and alleviate the guilt the masters may feel for having practiced these rules all along. ✲

DAVID M. FARBMAN

Mr. Farbman is a senior product manager with Citicorp. He is responsible for the design and development of a set of minicomputer-based packages to be provided to other banks. He has worked with IBM, Univac, Chase and other companies, and has taught computer science at the City University of New York.

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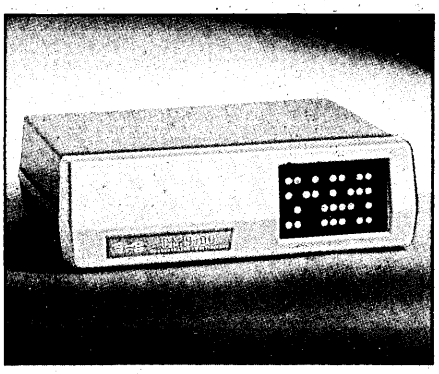

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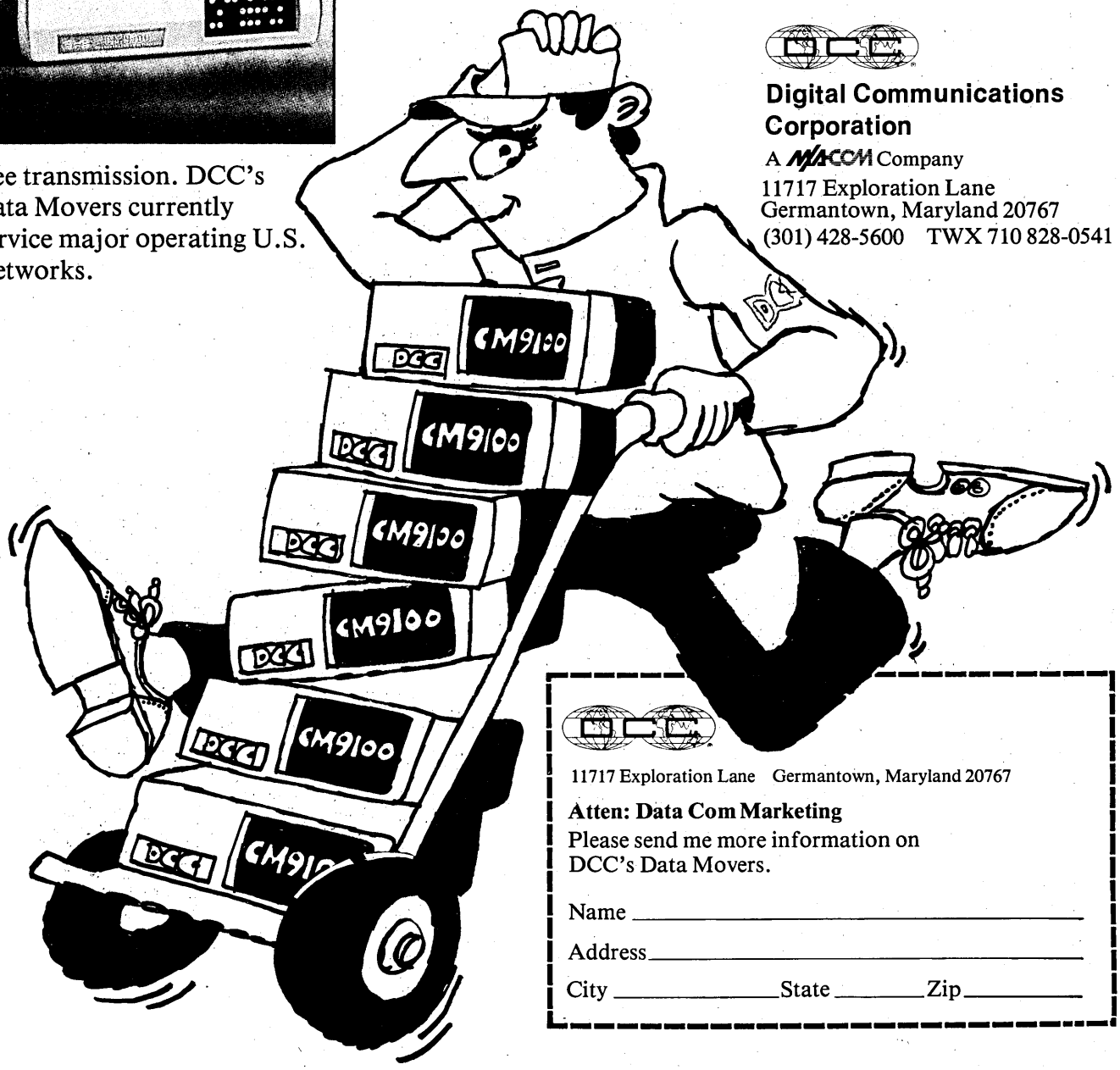

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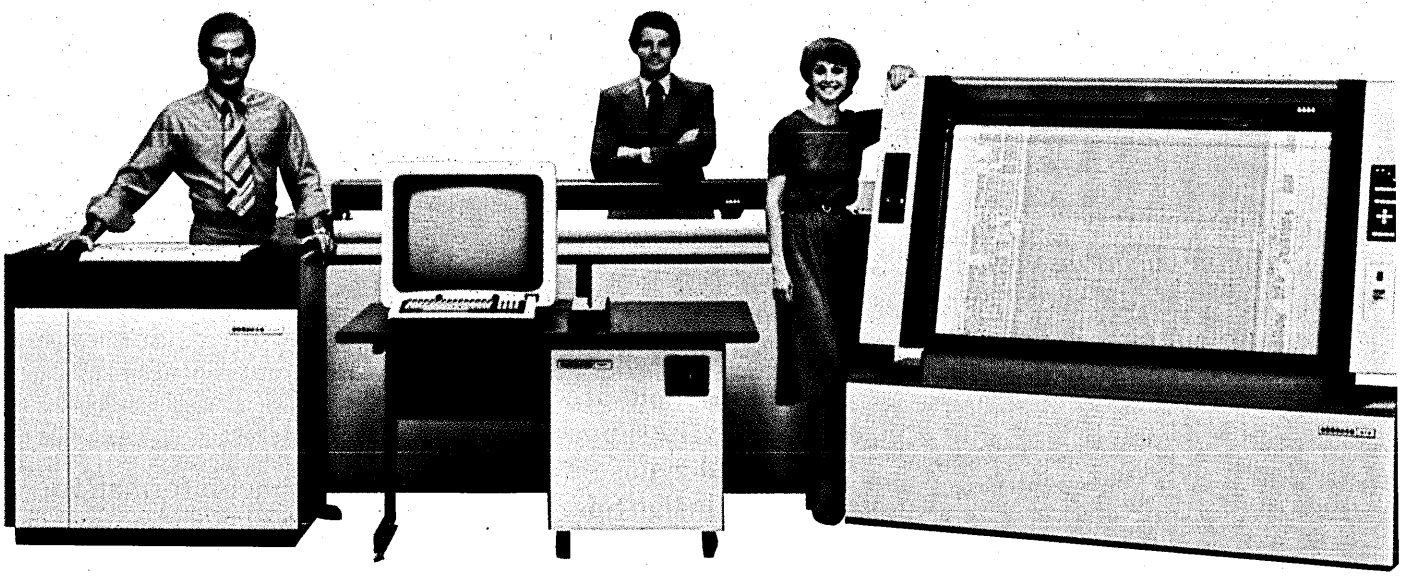

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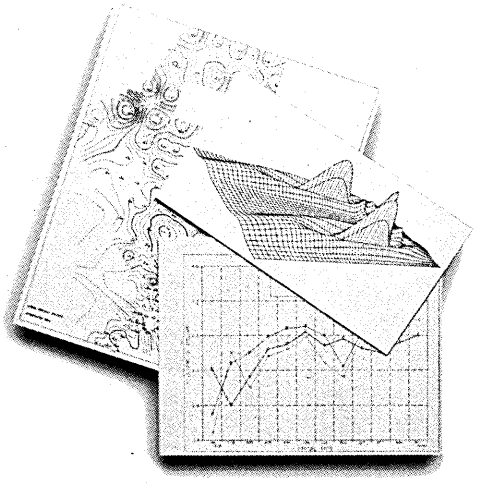

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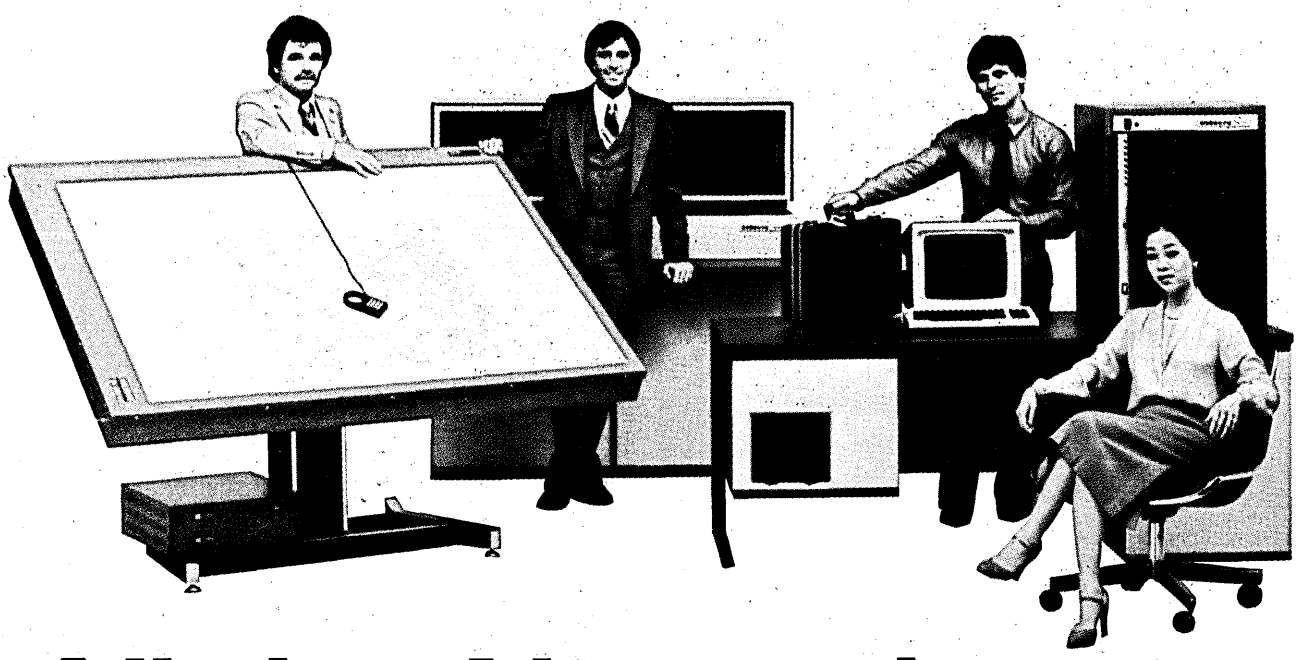

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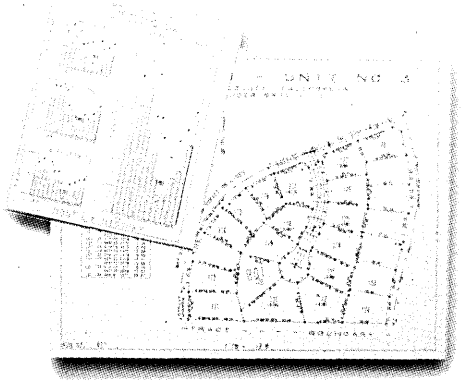

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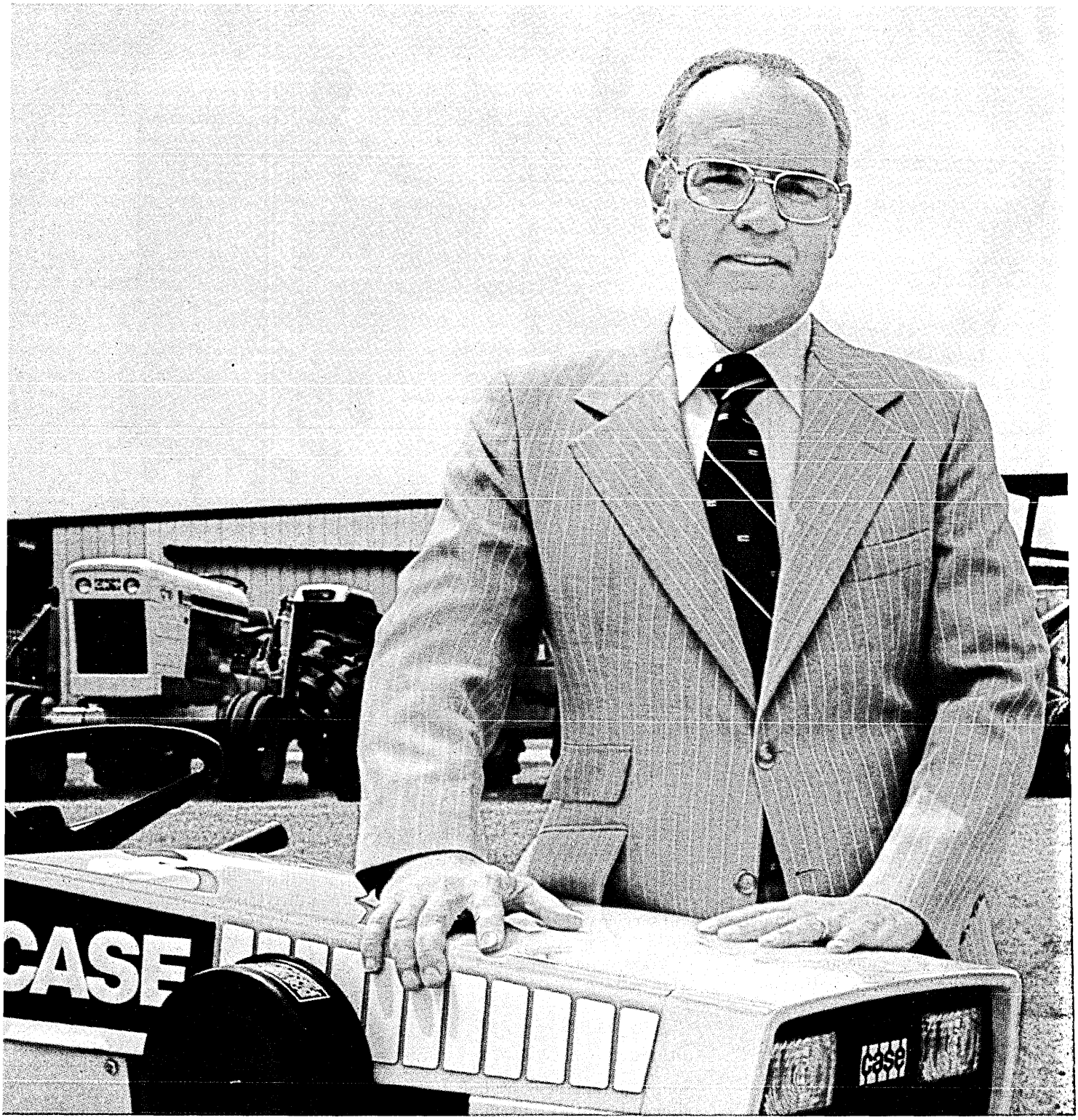

R.W. Bare, Assistant Corporate Controller, J I Case, A Tenneco Company, Racine, Wisconsin

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"By speeding order handling and accounting procedures, the system has cut related workloads in half in some stores, helping to support a 10% to 20% growth in parts sales in the stores in which it is used. This productivity benefit alone justifies the system for us. Most important, by transmitting consolidated data daily to Case headquarters, it gives management greater control over financial and production planning."

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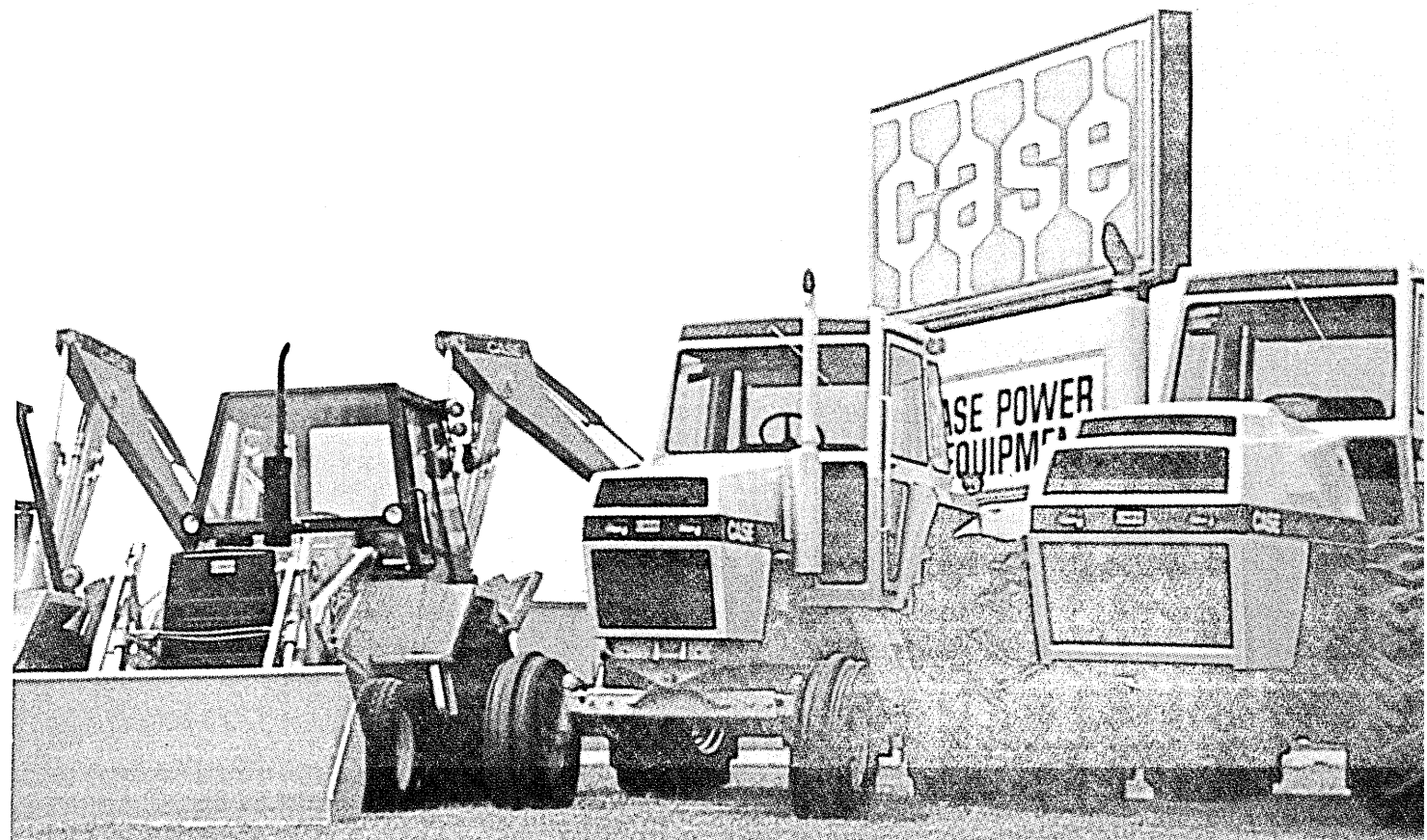

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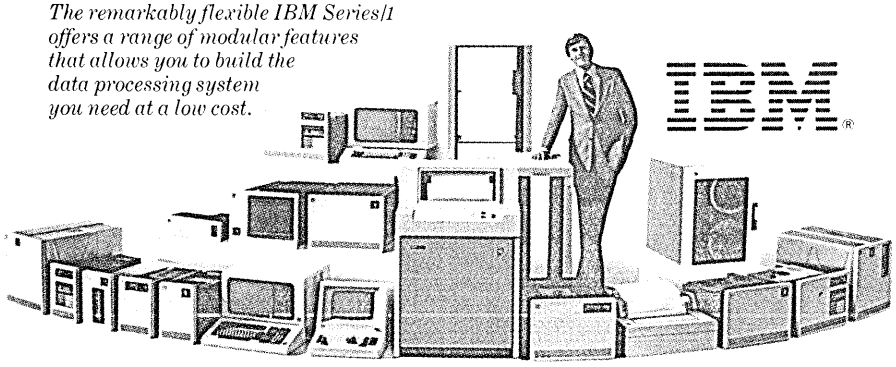

A small computer can make a big difference.

CIRCLE 100 ON READER CARD

South Central Bell wrote its own access method for overlapping local and regional data networks.

SPREADING NETS

by Charles E. Price

In late 1977, South Central Bell was faced with a make or buy decision. A new data networking system would be needed to support a major conversion effort.

Our six regional dp centers had been using RCA 3301 host processors and Spectra 45 and 46s (renamed Univac U-4 and U-6s) with RCA 1600s as communications front-end processors to the U-4s and U-6s. Our dp center headquarters was expanding rapidly, adding IBM 370/158 and 168 processors.

The new network would need to support the six area dp centers, each with at least two 370/158s driving networks of approximately 2,000 terminals per area, as well as central site networking applications. Some regional terminals would require access to central site applications, and the nature of some of the applications also required application-to-application communication. Terminal-to-application and terminal-to-terminal (printer) communications regardless of location, and multiple host processor support at each site were also required. In addition, we knew we needed advanced network control capabilities, such as remote diagnostics, multidrop simultaneous delivery, guaranteed delivery, and automatic reentry.

On-line applications included customer billing and records, mechanized time reporting, service order switching, repair service, message switching, premise modular wiring information or phone center support, cable and trunk record keeping, and customer information for use by marketing account executives. Batch applications included transmission of toll call records to proper offices and distribution of regular internal reports. All segments had to support local applications as well as those written by AT&T, Bell Labs, and Western Electric.

The task of recommending a vendor to fill these networking requirements was given to the developers of the 3301 emulator for the 370/158s. John Hart was the manager and lead designer, Bob Burt and Jerry Pruett were key systems programmers, and Mickey Hodson and Clyde Robichaux later joined the group to form the nucleus of the South Central Data Network (SCDN) development team. The principal candidate to solve our networking problems was IBM's newly developed Systems Network Architecture (SNA).

Most firms initially proposed alternative boxes to the 3705 with their own versions of NCP driving the networks. On examination of SNA, however, it became evident that it could not satisfy our complex networking needs, because SNA at that time dictated that there would always be one network control point knowledgeable about all network elements residing in a 370 host processor. Fully compatible network gens for VTAM and NCP (plus IMS when applicable) assured this. In our distributed network with multiple hosts in each dp center and overlapping networks, this was impossible. SNA also restricted terminal selection, and we could not economically justify, even if we had wanted to, the discarding of thousands of usable Teletype 28s and 35s, and similar devices.

IBM had not yet announced its Advanced Communications Function (ACF) version of SNA, and it was unwilling to undertake a joint development effort with us or to provide a modified VTAM-NCP on a contract basis. It was, however, extremely cooperative during our analysis of SNA.

We explored the feasibility of modifying VTAM and NCP code on our own, but the complexities involved and the problems associated with keeping current with MVS made this unwise. We also investigated using BTAM (Basic Telecomm Access Method) and some virtual network mapping scheme in the front-end processor. IMS warm start and recovery, however, would not allow mapping to be economical or accurate. Polling by the 370s with some being selectively ignored by the front-ends made this a very wasteful technique.

REDESIGN AND REWRITE

After much analysis and debate, it was decided that VTAM was the one MVS element that would have to be replaced. The decision made in May 1976 from a study begun in late summer 1975 was that we would write our own access method, based on the well-designed layer concepts of SNA, but without restrictions we did not want and interfaces we did not need.

Previous efforts by other companies to modify an IBM access method and still remain current and compatible with IMS and the operating system had failed. A total redesign and rewrite was the only viable solution. The new product would have to use MVS prescribed control blocks and interface procedures in order to assure ongoing compatibility.

Control Data Corporation agreed to develop fully compatible software for the front-end processors (Cyber C1000s, known as terminal handling processors) based on a system it had recently installed in the Barclay Bank of England. Its software is called Distributed Networking System (DNS), while our access method has come to be known as DNAM (Data Network Access Method).

A distributed network should allow complete distribution of both function and control. Any authorized user or service should be free to use the entire network without concern for hardware characteristics, physical paths, or physical locations. Control of the network should be distributed so that as the network grows, its control capabilities grow proportionally. Also, the effect of physical component failures should be isolated so that the remaining part of the network automatically allows for the loss and continues without any reduction in networking capabilities.

In a network containing both communication processors and host processors, the full exploitation of a distributed network can occur only when the functions of each are well defined and completely compatible. Combining Control Data's Distributed Networking System in Cyber C1000 communication processors and South Central Bell's Data Network Access Method in System/370 host processors results in such a network.

DNS independently controls and manages the terminals' use of the network, while DNAM independently controls and manages the application use of the network. This combination working in conjunction with block

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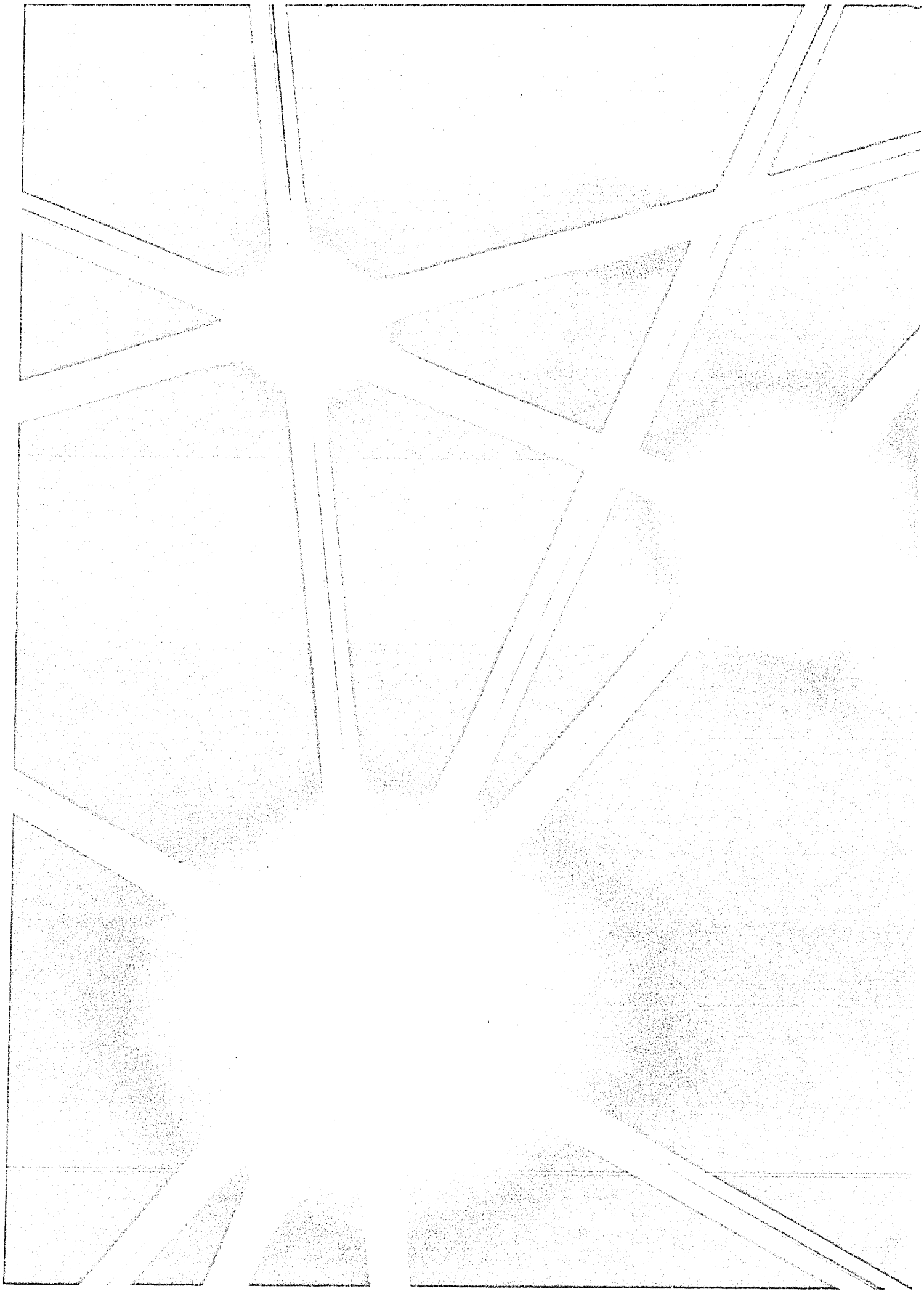


multiplexor channel interfaces allows the network to function. (Figs. 1 and 2). Some of the advanced communication functions obtained in a DNS/DNAM network are as follows:

Multiple Communication and Host Processor Support: A site can support up to eight DNS communications processors and eight DNAM host processors. A network can support up to 256 sites.

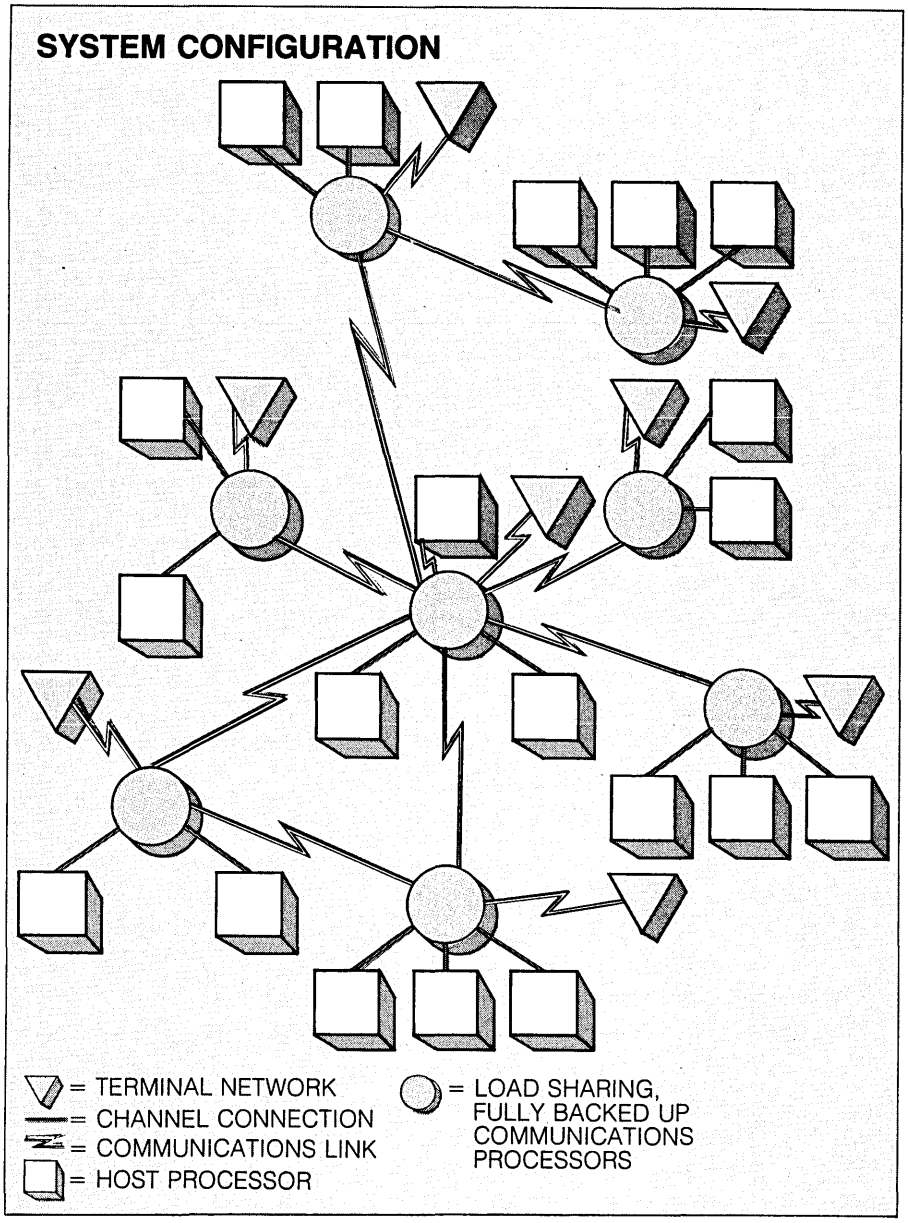
Authorized Terminal-to-Application Communication: Any DNS terminal has access to any DNAM application with which it is authorized to communicate. Both the terminal operator and the application program are free to interact at a completely logical level without concern for the physical attributes of either. The network matches speeds—asynch, synch, and bisynch. Conventional problems of lines or terminals associated with only one host or application are eliminated completely. Network generations specify which terminals are authorized to log on to which applications, and password protection is provided for further security.

Authorized Application-to-Application Communications: Any DNAM application has access to any other DNAM application with which it is authorized to communicate. The applications interact in a consistent manner and at a logical level regardless of their respective locations (same host, different host in the same site, different sites). The complexities of applications having to control communication lines for intersite data transfer are eliminated. An application may interact concurrently with as many other applications as necessary.

Dynamic Application/Host Association: A DNS/DNAM network dynamically determines application to host association. A site can thus alter the DNAM host in which a particular DNAM application resides as often as desired, without changes to DNS or DNAM.

No Predefinition of Terminals in Host: DNS requires that terminals be predefined only in the communications processor (C1000) to which they are physically attached. DNAM requires no predefinition of the terminal network. Control blocks to support terminal-to-application communication are dynamically and efficiently obtained at LOG ON time and purged at LOG OFF time. Both the coordination of the predefinition of terminals in multiple processors and the proliferation of unused control blocks are eliminated.

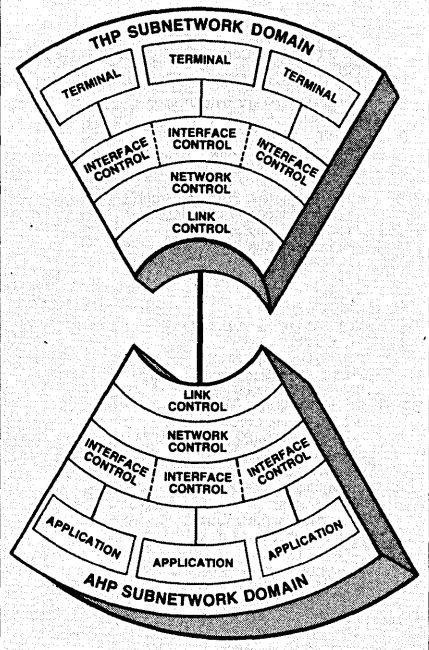
Reduced Path Lengths and Memory Requirements: The advantages of distributing the network control functions over the entire network are exploited to produce a considerable reduction of path lengths and memory requirements of both DNS in a communication processor and DNAM in a host processor (particularly when compared to access methods which run in host-controlled networks). Also, because of the distributed characteris-



CHARTS BY CYNTHIA STODDARD

FIG. 1

DNS/DNAM ARCHITECTURE

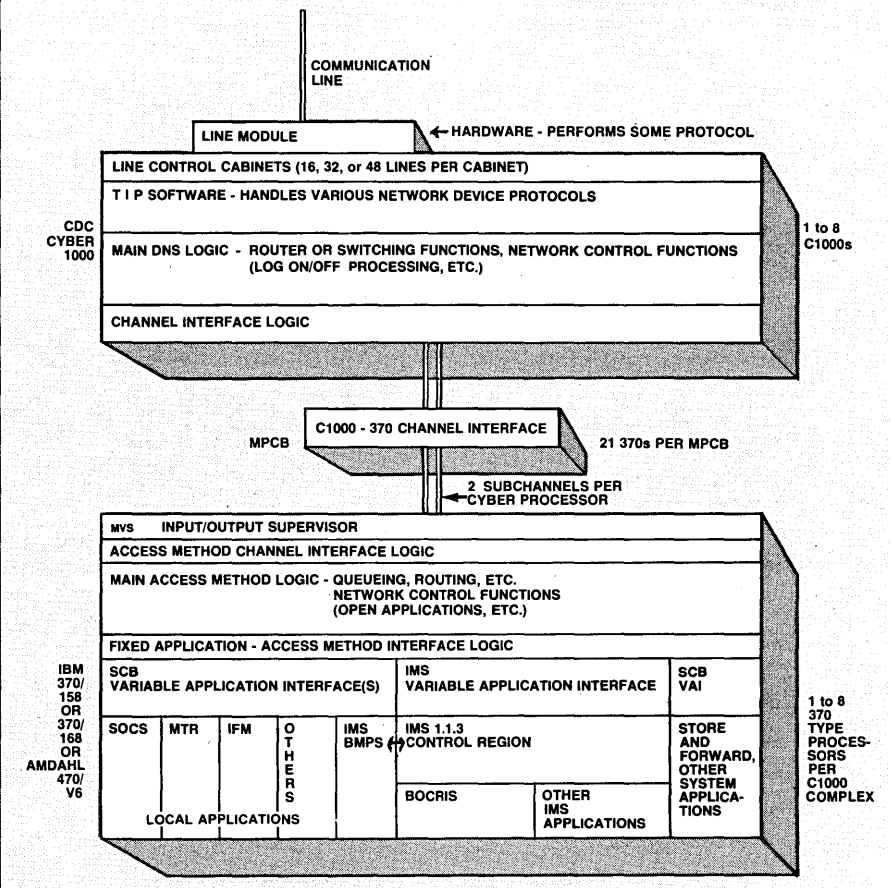


(AHP = APPLICATION HANDLING PROCESSOR

THP = TERMINAL HANDLING PROCESSOR)

FIG. 2

DNS/DNAM - IMPLEMENTATION



tics, the effect of network growth on any one communications or host processor is minimized and consequently will not normally be the limiting factor to the size of a supportable network.

Automatic Recovery from Network Failures: DNS and DNAM collectively recognize and recover from network failures. The remaining part of a network automatically continues to function. The failure is limited to a loss of communication with certain applications and/or terminals. All alternate path capabilities are explored automatically; no manual intervention is required.

A network component is considered failed only when there is no physical path to it. If no existing alternate path exists, a failure that results in a broken connection between working DNS and/or DNAM processors will automatically cause two independent networks to emerge. Also, the two independent networks will merge back into one when the connection is restored.

Terminal and Application Interfaces to the Network: A DNS/DNAM network architecture is functionally layered. In DNS all terminal interface functions are contained within one layer, and in DNAM all application interface functions are contained within an equivalent layer. Terminals with different interface requirements can thus coexist and function efficiently. For this reason, DNS is able to support most nonprogrammable terminals as well as programmable ones.

The implementation of this layering principle in DNAM allows a standard IMS system to be interfaced using its set of interface requirements and user written applications. Regular assembler or COBOL programs also have predefined interfaces to DNAM. The result is an implementation that allows diverse terminal and application types to function within a common network architecture. These applications include assembler, COBOL, IMS controlled, and CICS controlled. Any level of security can be achieved, delivery guaranteed. Other terminals are listed throughout this article.

As mentioned before, this architecture is very similar to IBM's SNA, depicted in Fig. 1. A more detailed listing of functions within each layer is shown in Figs. 2 and 3.

Network Management Capabilities: All DNS and DNAM components will process commands and inquiries from authorized terminals or applications anywhere in the network. Likewise, alarms may be directed to numerous locations throughout the network. Using these features, network operators may be located as desired and still have visibility into remote parts of the network. Network management functions include monitoring network traffic levels, submitting best transactions to time transactions in network or application, adding or deleting terminals, directing alternate delivery of messages, and suspending application, line, and cluster controllers or individual devices. This function may be entered directly from 370 or C1000 systems consoles, and can take place in all five states of the network from any terminal. Also, a single network management application with visibility throughout the entire network may be utilized to facilitate and enhance the network operator functions. Multiple network management applications could also be used for the regionalization of some or all functions.

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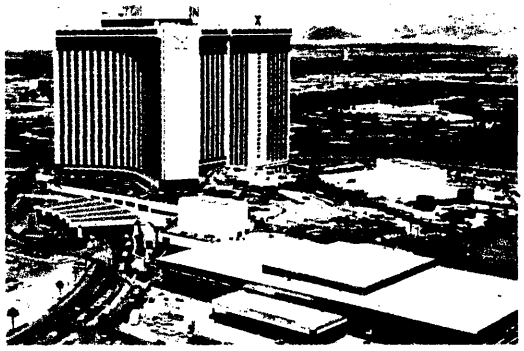

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The new network had to support six area dp centers, each with at least two computers driving nets of about 2,000 terminals per area.

TRAITS OF DNAM

DNAM currently runs on System/370 type cpus under the MVS operating system (Release 3.7 and up). The access method does not require any modifications to MVS code and uses standard system macro interfaces. Some of the technical characteristics of DNAM are the following:

Input/Output Subsystem (IOS) Driver: DNAM uses the extremely efficient MVS IOSB/SRB IOS interface for communication with C1000s. Two block multiplexor subchannels are required for each C1000 with DNAM receiving data over one subchannel and sending data over the other. DNAM can receive or send up to 4062 bytes of data in one execution of a channel program, and any I/O transfer may contain multiple messages. The channel interface strategy is such that both DNS and DNAM are effectively prepared to accept the next message at the termination of one I/O. This results in the elimination of inefficient signaling techniques, such as the use of the attention interruption as seen in SNA.

DNAM is a subsystem of MVS. Any command entered from a system console with a percent sign as the first character will be routed by MVS to the DNAM console interface logic. Responses to commands will only be routed back to the console (and printer) that entered the command. All console interfaces with DNAM use this interface, so the necessity of an outstanding console request (WTOR, Write to Operator with Reply) is removed. DNAM applications may also optionally receive commands and send responses using this interface.

System Resource Block Mode: DNAM was designed to both minimize cpu overhead and service multiple applications. In order to obtain these objectives, the low MVS overhead associated with SRB scheduling is utilized. The DNAM normal path logic runs completely in the SRB mode.

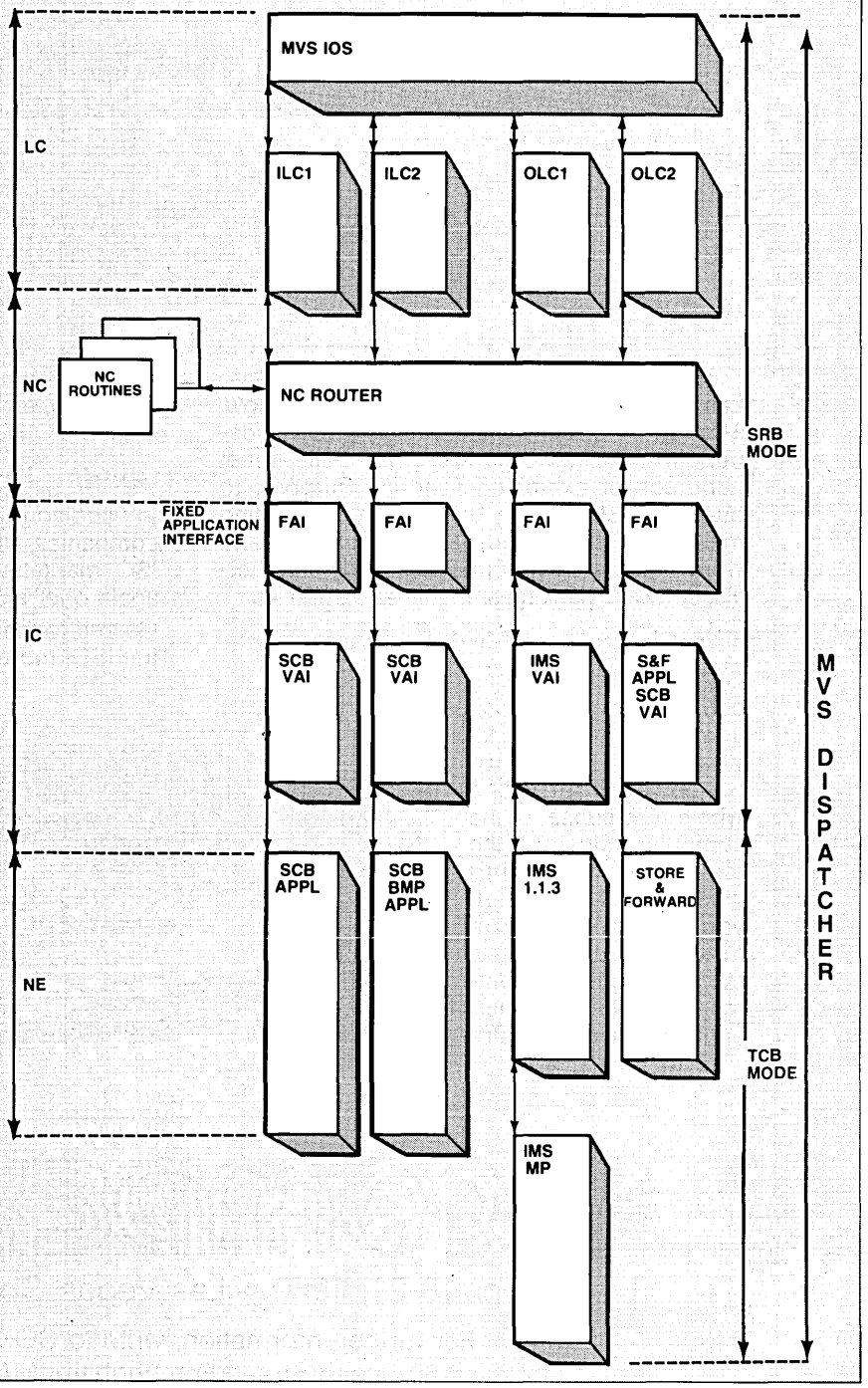
Special supervisor calls are required only in the application interface area, and as a result their use is based on application interface requirements.

DNAM can concurrently execute in multiple application address spaces, performing unique or identical functions for each application. Most DNAM work done for an application runs in that application's address space and at that address space's priority. Common functions, such as interfacing with a C1000, are executed in the DNAM address space priority (high priority).

The logic and data structures are essentially extensions of the MVS operating system, and they receive equal protection and priority. The reentrant multiple-address-space logic resides in the nucleus and in the link pack areas. The associated data structures are located in the common storage area. DNAM service and control logic resides in the

FIG. 3

AHP SUBNETWORK OVERVIEW



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The access method does not require any modifications to MVS code.

DNAM address space.

DNAM is designed so that the MVS locking mechanisms—local and global locks—for resolving asynchronous processing contention are not required. The design allows DNAM to process better than 2 to 1 in an attached processor or multiprocessor environment.

At low transaction rates, DNAM's approximate path length is one-tenth of comparable vendor access methods. As transaction rates increase, the path length overhead for each transaction decreases. DNAM was written to minimize costs, and since it does not interact with any other applications, its specialization can also increase efficiency.

Since DNAM requires no code changes, inclusion of the access method into MVS requires that no "fixes" be applied or maintained. DNAM has been migrated from the original MVS level through many selectable units (SU) and PTF (Program Temporary Fix) changes without modification. DNAM has also migrated from IMS level 1.1.3 to level 1.1.5., for which some additions are required.

The Cyber C1000s must be added to the operating system, each as two 2400 tape drives (Cyber 1, Cyber 2, etc.) The subsystem and any required DNAM SVCs must be defined. The entry point names of these DNAM modules which run in fixed global storage should be placed in proper systems libraries. The procedure DNAM must be added to SYS1.PROCLIB.

Finally, two data sets of about 12 cylinders each must be allocated for dumps. The DSNs and volume serial numbers of the data sets must be specified on the DD statements DNAM dump and DNAM snap in the DNAM procedure, and the following DCB information used:

RECFM = U
BLKSIZE = 4104
DSORG = PS

SCDN is expected to satisfy all of South Central's data communications needs through the mid-1980s. The SCB configuration initially completed in March 1979 is shown in Fig. 4. The network anticipated in 1984 is depicted in Fig. 5.

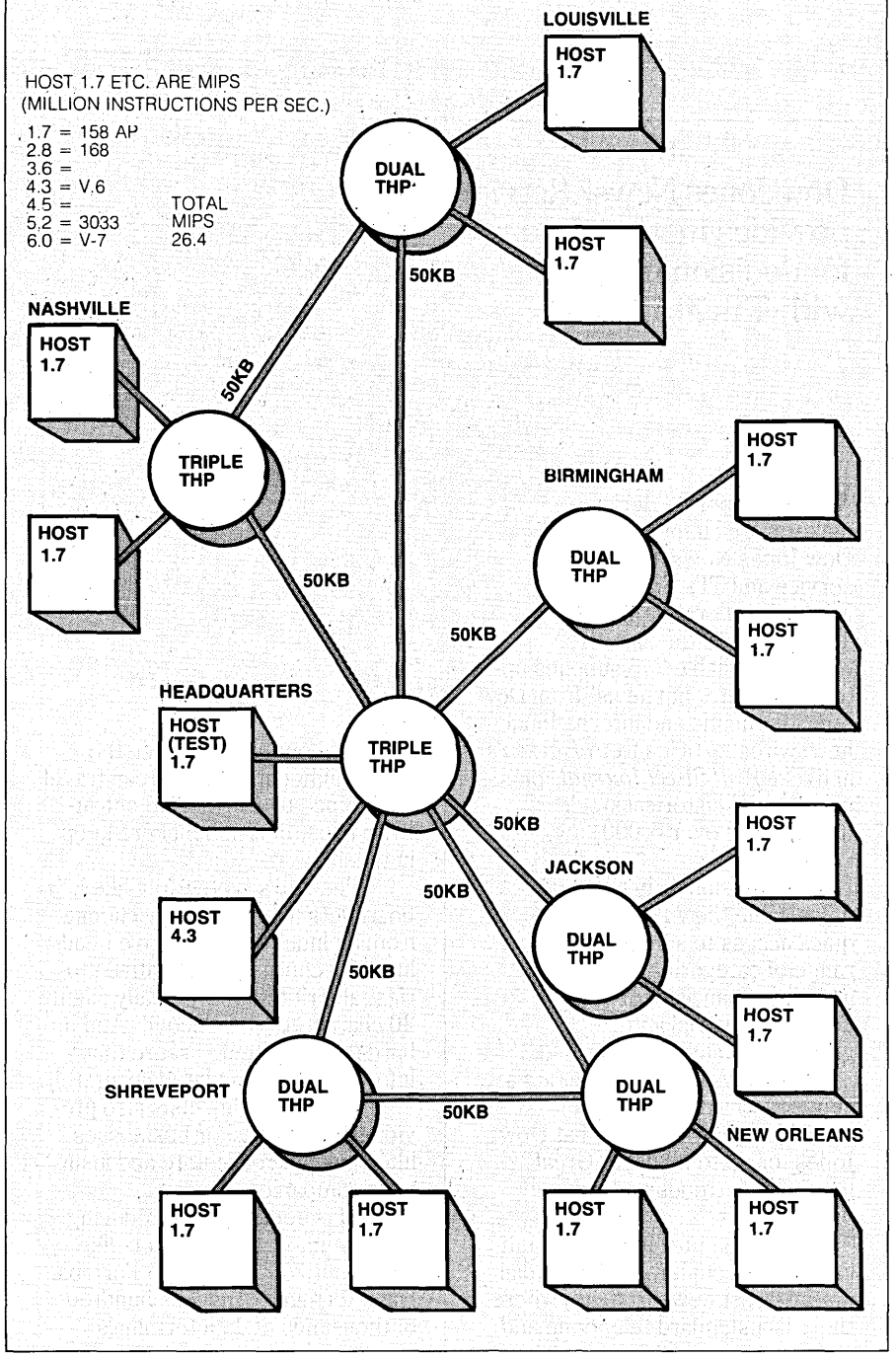
SCDN has been adopted for general use in the Bell System, to be supported by Bell Laboratories. It is part of a general product from BTL known as BANCS (Bell Administrative Network Communications System) which includes the following components:

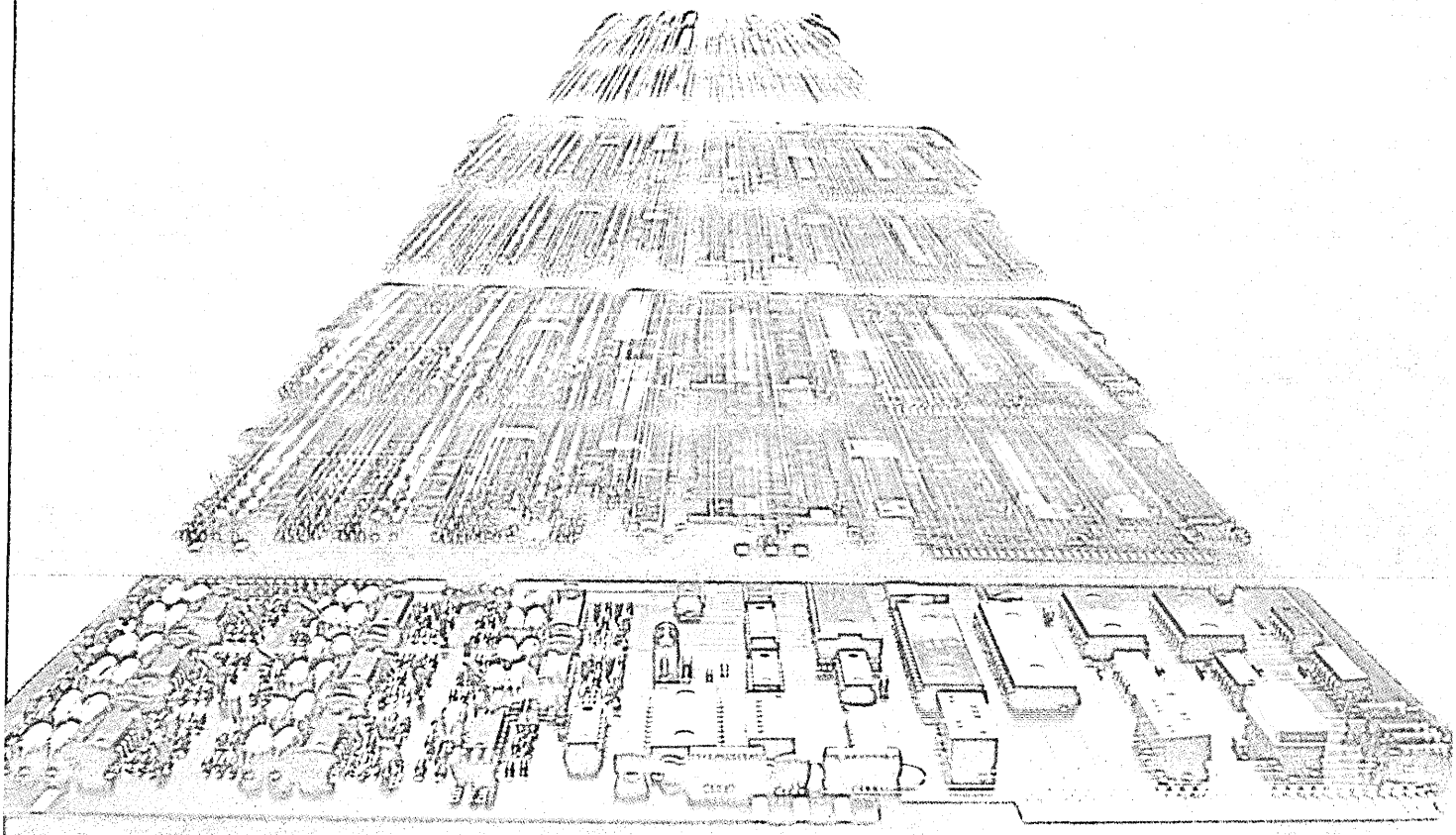
THP—The Terminal Handling Processor is the Cyber 1000 running DNS code as developed by CDC.

DNAM—The host access method developed at SCB.

FEP—A Front-End Processor designed to connect to host computers running standard IBM BTAM via channel and to the

FIG. 4
SCDN AS ORIGINALLY DESIGNED
(INSTALLED AS OF 3/79)





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The network is expected to satisfy all of South Central's datacom needs through the mid-1980s.

Cybers via a communications link. The FEP basically emulates DNAM to the Cybers and a 370X or 270X to BTAM.

This allows companies to retain pure IBM code in the host at the expense of decreased throughput and certain networking features from DNAM. New York Telephone uses this concept—New York Telephone's system is THP to FEP to HOST; this incurs less risk, lower performance, and higher cost. Using DNAM, the code is already in the host, so THP is directly connected to host. The FEP software runs on COMTEN 3650s or 3670s.

RFS—This is a Report Forwarding System being developed for use on Data General Eclipse computers. It is a Store and Forward System, and this function is handled by a host resident application at SCB.

RTC—The Remote Terminal Controller is also under development on DG computers and will be for line concentration.

CNM—Centralized Network Management is a series of programs to be run on PDP VAX computers. This product will be used for network definition, statistical network evaluation, and centralized network control.

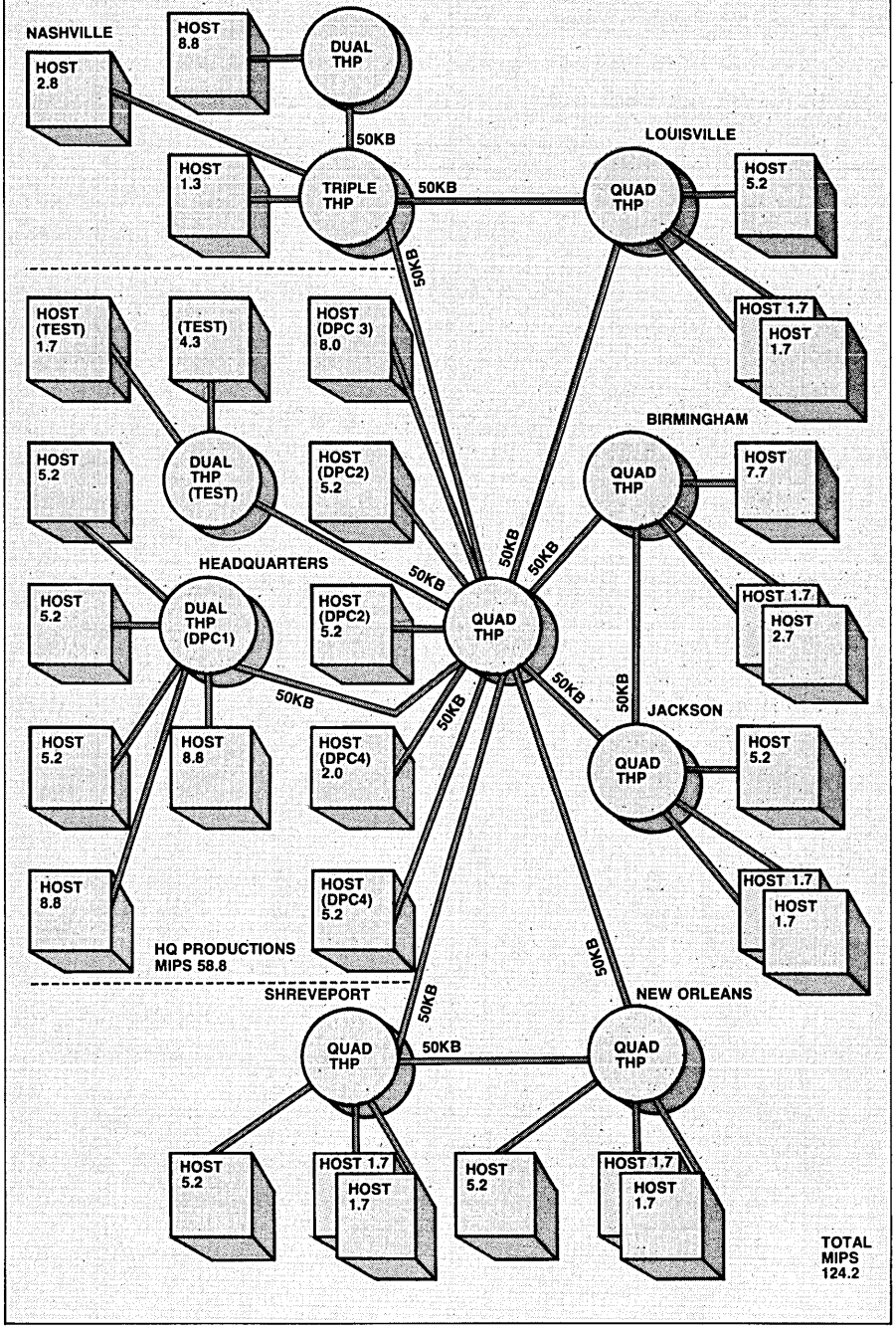
The DNAM concept can be used to connect to host computers via communication lines as well as the channel technique used at SCB. This has been done at BTL for Univac, DEC computers, and Data General's, and is being added to DNAM for 370-type hosts. CDC has purchased the software for DNAM and all supporting routines, and is evaluating the possibility of marketing SCDN-type systems to non-Bell System companies.

The South Central Data Network uses a well-defined, systematic approach patterned after SNA, while simultaneously providing much greater throughput and increased flexibility for supporting multiple site, multiple host processors of different types, and a variety of terminal equipment and application types. ✻

FIG. 5

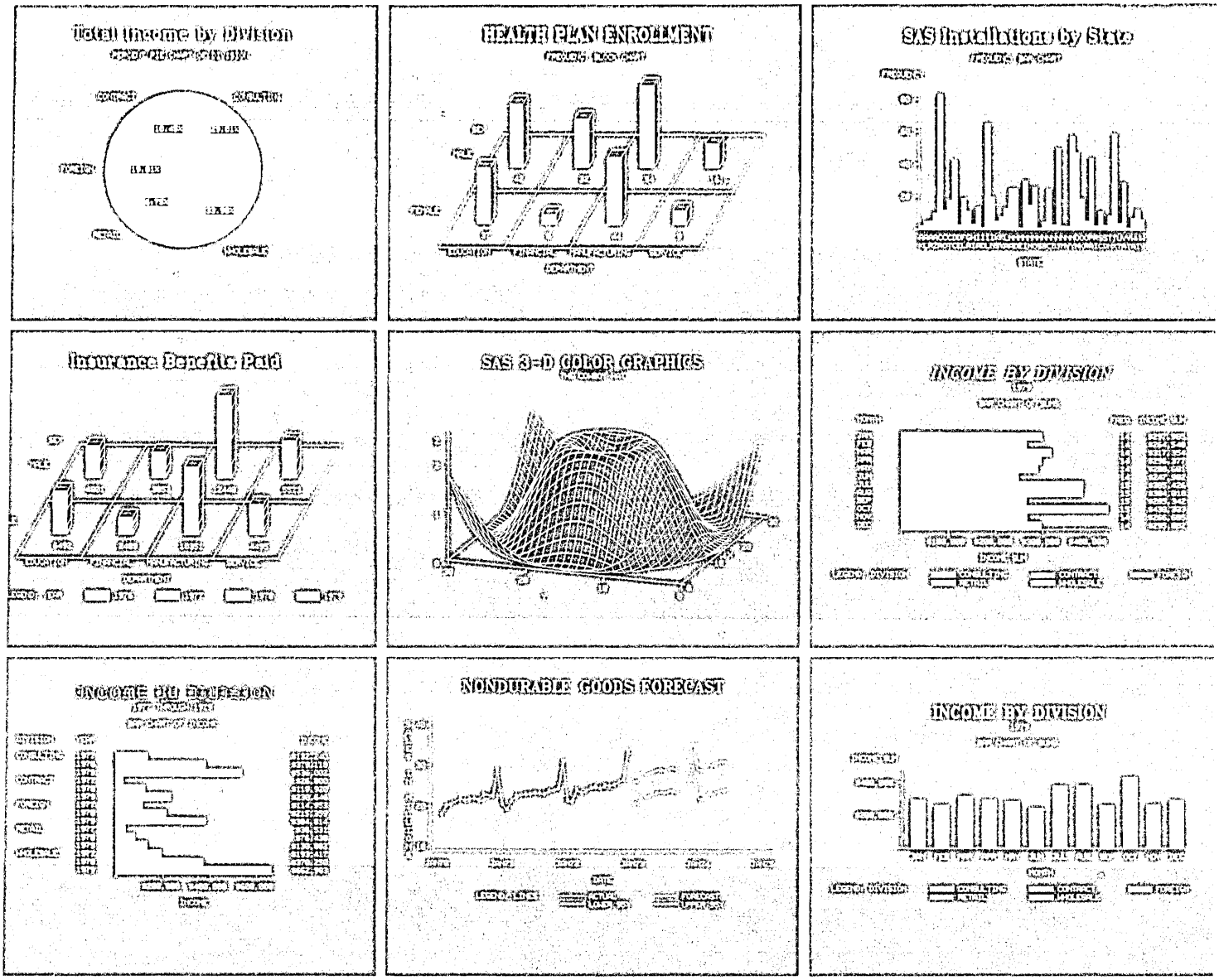
SCDN PROJECTION FOR 1984-85

(NO CURRENT INSTALLATION PLAN)



CHARLES E. PRICE

Mr. Price is currently a division manager with the data systems organization at South Central Bell in Birmingham, Ala. He is responsible for corporate communications, Univac-based applications and standards, and interdepartmental applications, primarily those supporting the business and residence segments. Price received his BS in engineering from the U.S. Air Force Academy and his MBA from UCLA.



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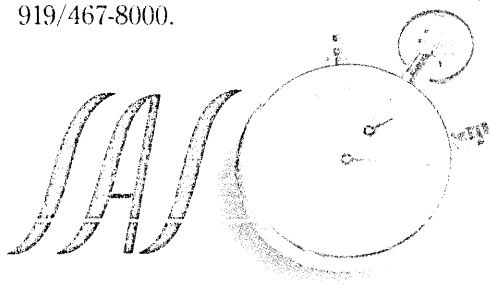

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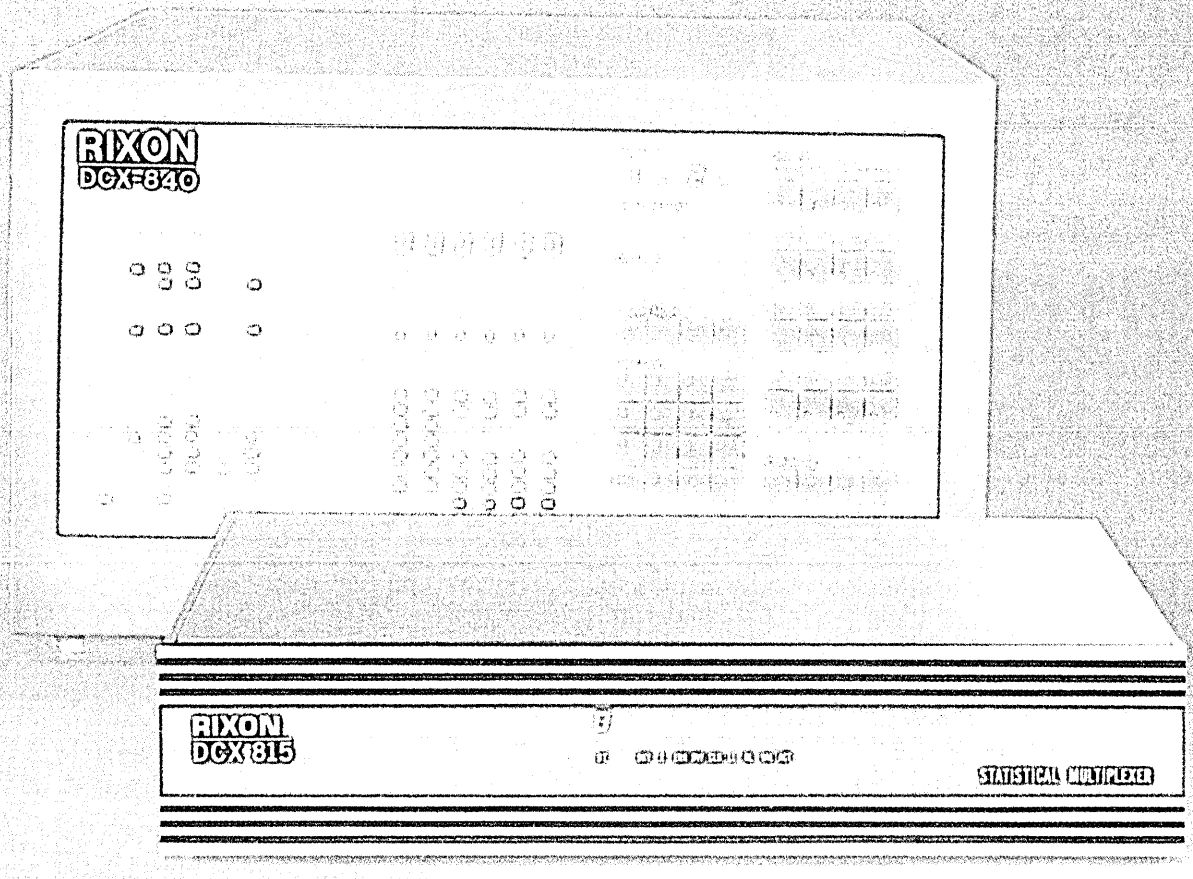

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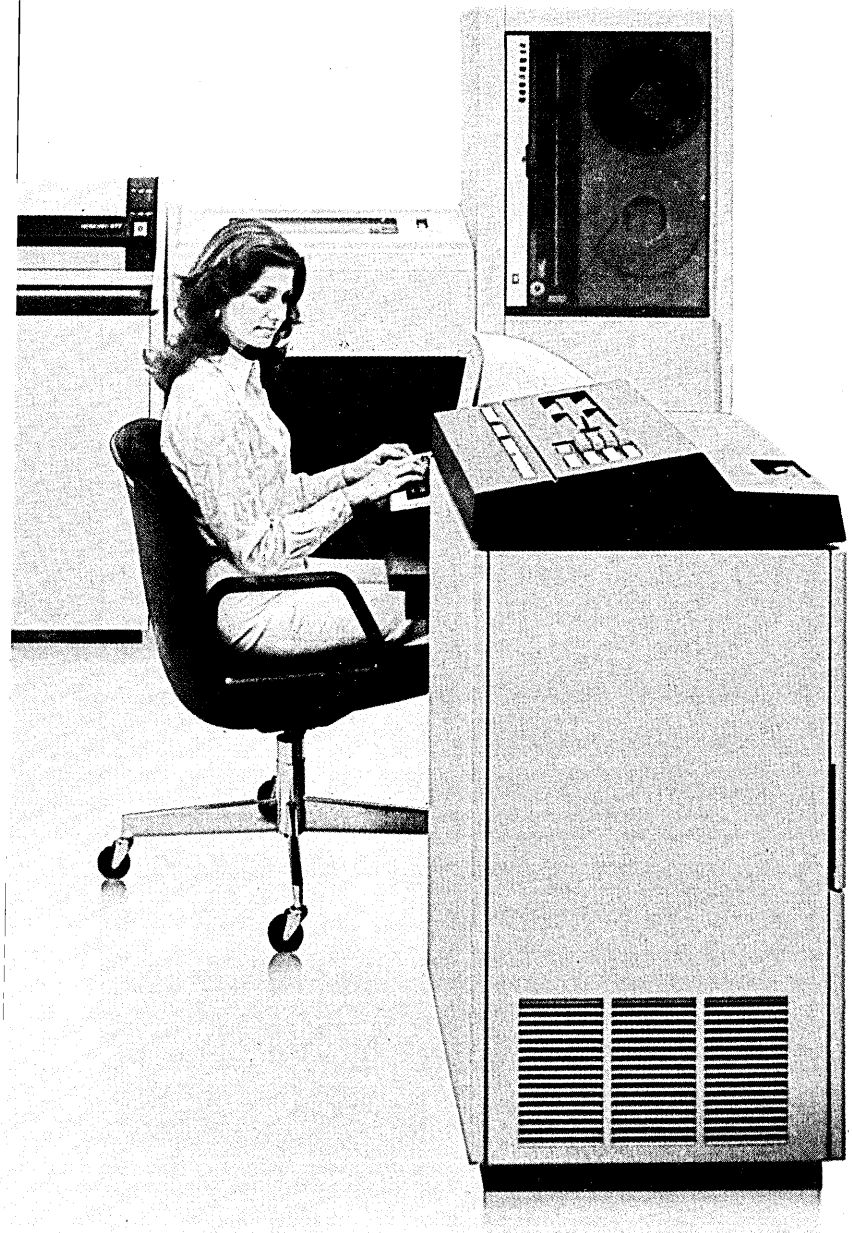
CIRCLE 106 ON READER CARD

Two Pi announces a new Foundation System for OEMs.



New Integrated Peripheral Controllers make possible a low cost IBM compatible system.

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What is the Foundation System? It's the field-proven Two Pi V32 CPU (over 100 have been shipped already). Plus:

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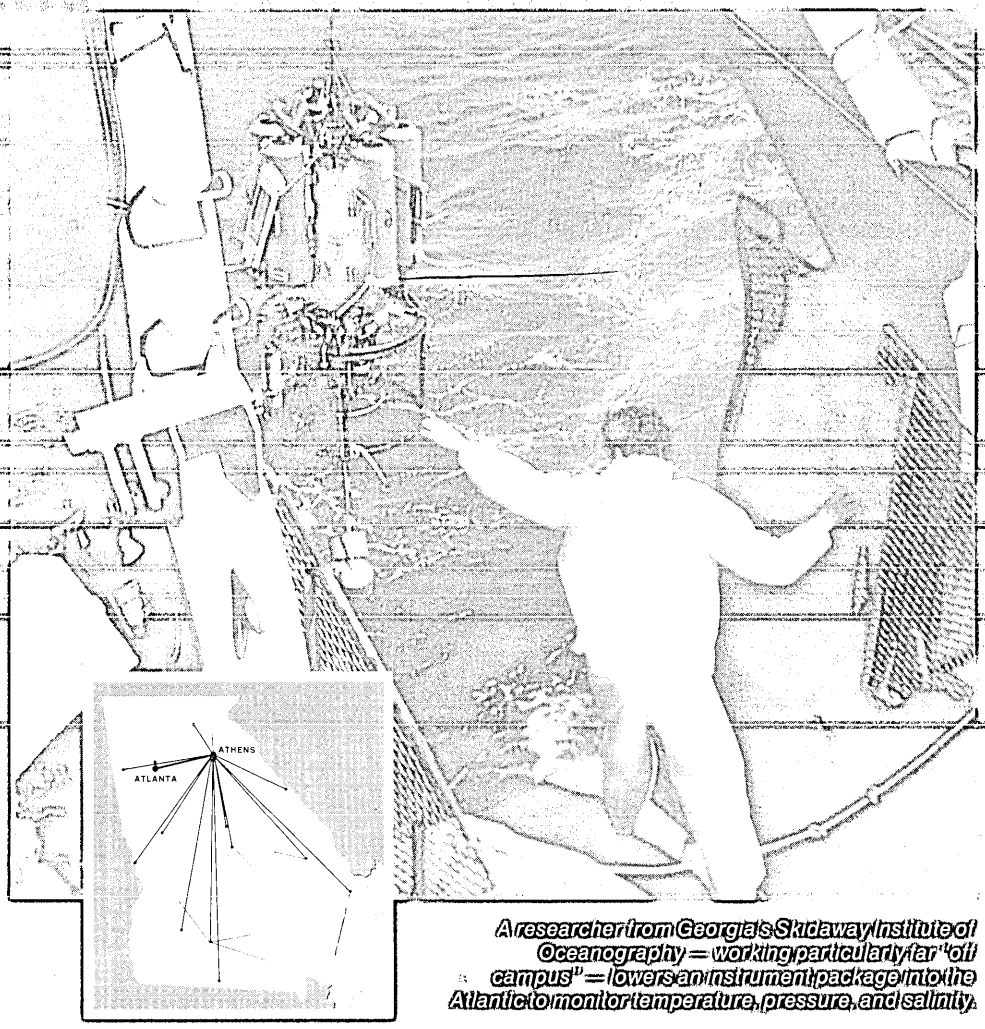
Georgia's USCN Network ...



A researcher from Georgia's Skidaway Institute of Oceanography — working particularly far "off campus" — lowers an instrument package into the Atlantic to monitor temperature, pressure, and salinity.

... is also a Tran Network.

Georgia's University System Computer Network was officially established in May, 1970 to provide access to major computer resources for all units of the university system. The problem then, as now, was in providing a cost effective communications path from any terminal to any computer.

Today USCN encompasses hundreds of pieces of communications equipment and over 2,500 miles of private and foreign exchange telephone lines. It links the central office, 33 campuses, experiment stations, the Skidaway Institute of Oceanography, and several other user sites throughout the state. And dial-up facilities further extend its reach.

The all-digital complex concurrently supports switched synchronous and asynchronous traffic at up to 9600 bits per second statewide, plus simultaneous packet and time division switched traffic at 50,000 bits per second between its main nodes in Atlanta and Athens.

Over thirty computers are tied to the network at present, the largest of which are Control Data Cyber 70/74s, IBM 370/158s, and Univac 9080s which serve as network hosts. Remote job entry stations plus many hundreds of remote and local terminals keep the processors busy.

No census of the rapidly growing and changing mix of computers, front end communications processors, and terminals stays current long. Anticipating this, USCN designers produced a network which is easily reconfigured and which can quickly grow to accommodate new users and applications. In these respects too, USCN continues to be a happy success, confirming the original design philosophy.

Tran has installed several such networks for university systems, and many more for sophisticated users in private industry, financial institutions, government agencies, telephone operating companies, and others both in the United States and in other nations. As a result, Tran now has more international experience in the construction of digital data networks than any other communications company in the world.

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CIRCLE 104 ON READER CARD

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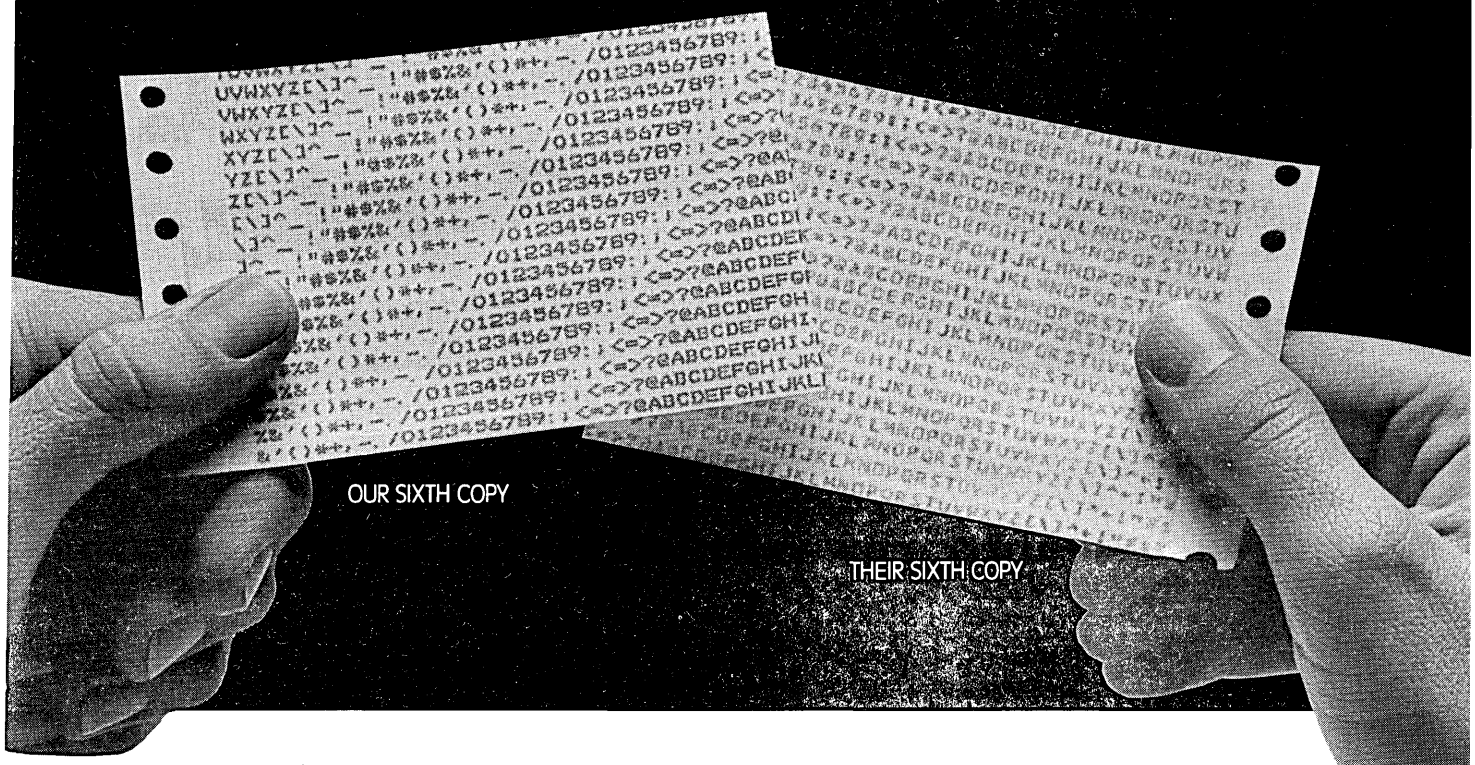

Many printers can give you good print quality on a first copy. The real challenge is to give you that same quality, copy after copy, on multi-part forms.

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CIRCLE 107 ON READER CARD

THE LEADING EDGE

#1 in a series of reports on new technology from Xerox

About a year ago, Xerox introduced the Ethernet network—a pioneering new development that makes it possible to link different office machines into a single network that's reliable, flexible and easily expandable.

The following are some notes explaining the technological underpinnings of this development. They are contributed by Xerox research scientist David Boggs.

The Ethernet system was designed to meet several rather ambitious objectives.

First, it had to allow many users within a given organization to access the same data. Next, it had to allow the organization the economies that come from resource sharing; that is, if several people could share the same information processing equipment, it would cut down on the amount and expense of hardware needed. In addition, the resulting network had to be flexible; users had to be able to change components easily so the network could grow smoothly as new capability was needed. Finally, it had to have maximum reliability—a system based on the notion of shared information would look pretty silly if users couldn't get at the information because the network was broken.

Collision Detection

The Ethernet network uses a coaxial cable to connect various pieces of information equipment. Information travels over the cable in packets which are sent from one machine to another.

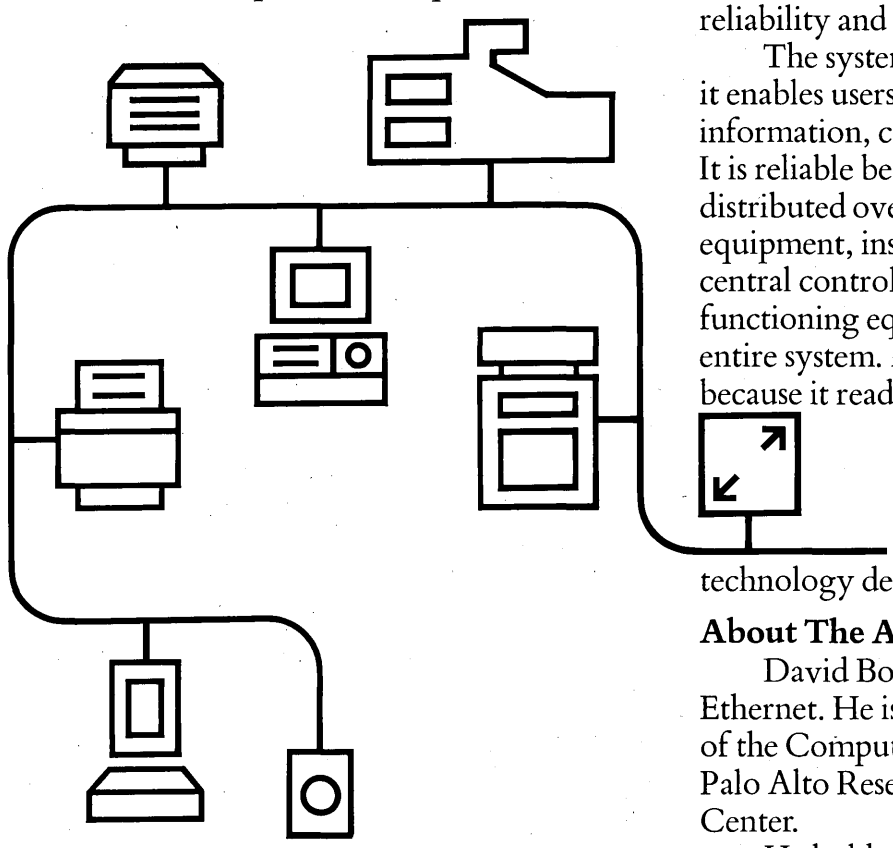
A key problem in any system of this type is how to control access to the cable: what are the rules determining when a piece of equipment can talk? Ethernet's method resembles the unwritten rules used by people at a party to decide who gets to tell the next story.

While someone is speaking, everyone else waits. When the current speaker stops, those who want to say something pause, and then launch into their speeches. If they *collide* with each other (hear someone else talking, too), they all stop and wait to start up again. Eventually one pauses the shortest time and starts talking so soon that everyone else hears him and waits.

When a piece of equipment wants to use the Ethernet cable, it listens first to hear if any other station is talking. When it hears silence on the cable, the station starts talking, but it also listens. If it hears other stations sending too, it stops, as do the other stations. Then it waits a

random amount of time, on the order of microseconds, and tries again. The more times a station collides, the longer, on the average, it waits before trying again.

In the technical literature, this technique is called carrier-sense multiple-access with collision detection. It is a modification of a method developed by researchers at the University of Hawaii and further refined by my colleague Dr. Robert Metcalfe. As long as the interval during which stations elbow each other for control of the cable is short relative to the interval during which the winner uses the cable, it is very efficient. Just as important, it requires no central



control—there is no distinguished station to break or become overloaded.

The System

With the foregoing problems solved, Ethernet was ready for introduction. It consists of a few relatively simple components:

Ether. This is the cable referred to earlier. Since it consists of just copper and plastic, its reliability is high and its cost is low.

Transceivers. These are small boxes that insert and extract bits of information as they pass by on the cable.

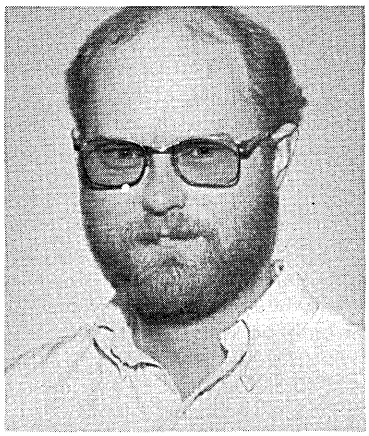
Controllers. These are large scale integrated circuit chips which enable all sorts of equipment, from communicating typewriters to mainframe computers, regardless of the manufacturer, to connect to the Ethernet.

The resulting system is not only fast (transmitting millions of bits of information per second), it's essentially modular in design. It's largely because of this modularity that Ethernet succeeds in meeting its objectives of economy, reliability and expandability.

The system is economical simply because it enables users to share both equipment and information, cutting down on hardware costs. It is reliable because control of the system is distributed over many pieces of communicating equipment, instead of being vested in a single central controller where a single piece of malfunctioning equipment can immobilize an entire system. And Ethernet is expandable because it readily accepts new pieces of information processing equipment. This enables an organization to plug in new machines gradually, as its needs dictate, or as technology develops new and better ones.

About The Author

David Boggs is one of the inventors of Ethernet. He is a member of the research staff of the Computer Science Laboratory at Xerox's Palo Alto Research Center.



He holds a Bachelor's degree in Electrical Engineering from Princeton University and a Master's degree from Stanford University, where he is currently pursuing a Ph.D.

XEROX

CIRCLE 108 ON READER CARD

Corporate planning for automation is a must, but there is no single preferred approach.

FOUR ROADS TO OFFICE AUTOMATION

by Roger W. Ketron

Office automation is a fact of business. For the corporate executive, the question that remains is whether to plan for it or to let it develop willy-nilly—as is happening in most corporations today. Technological short-range solutions are popping up in various offices throughout the corporation, office managers are locking themselves into ad hoc solutions, and major opportunities to steer the corporation into effective systems are slipping away. To avoid this, corporations must plan.

The primary reason to plan at the corporate level is to increase profits by maximizing return on investments in office systems. Where corporate level planning does not exist, equipment decisions are made at lower levels. Though each of these decisions may be marginally profitable, the sum of such acquisitions across an entire organization results in a total return to the company far smaller than that which could have been achieved with a broader and more comprehensive plan.

A comparison of actual experiences in two companies can best illustrate this point. In the first, a multibillion dollar company, no corporate planning for office automation exists. Decisions to acquire office systems are left to division managers operating with a ceiling of $25,000. More than 40 separate decisions to acquire word processors have resulted in expenditures of approximately $700,000 for 86 stations of 25 varieties from 10 different vendors. In other words, the average purchase decision was for less than $20,000, and the average cost per station approximately $8,100. The equipment purchased can only perform the single function of word processing.

The second company, Lincoln National Life Insurance, is developing office automation based upon a corporate plan supported by its chief executive officer. More than 130 workstations have been installed, at a total cost comparable to the amount spent by the first company. The workstations perform all the basic functions—word processing, data processing, electronic mail, filing/retrieving of information and documents, and such administrative functions as appointment scheduling, personal calendar maintenance, tickler file, and project management. Prorating the costs of minicomputers, communications equipment, printers, and terminals among the workstations results in an average cost per station of less than $5,000. Lincoln National Life claims that the cost per station is decreasing rapidly as more workstations are installed.

Another major reason to plan is to minimize negative impact of office automation on personnel. Most people react unfavorably to the stress caused by change, including the changes necessitated by the introduction of automation. The corporate planning group, being aware of this phenomenon and being in a position to view human resource needs across the entire organization, can help the human resources department train people to adjust to these changes. Obviously, even the most wonderful technological advances will not increase productivity in an atmosphere of distrust and resistance.

A final argument in favor of corporate planning addresses the potential impact of automation on the business of the organization. For many organizations, the effective use of office automation is becoming a matter of survival in the competitive arena, particularly in the service industries. Those banks and insurance companies that have introduced efficient means of dealing with their customers are the ones thriving today. They are positioning themselves for the 1980s when the cost ratio of people/systems will continue to increase. Planning is simply too critical for top management to ignore.

FOUR PLANNING EXAMPLES

There is no single preferred approach to planned development. The best strategy for an organization will depend largely on its management style. Any number of approaches will work. What follows is a brief description of four approaches based upon their actual implementation within four major companies: Union Carbide, Security Pacific National Bank, Continental Bank of Illinois, and Lincoln National Life Insurance Co. Although their approaches differ in scope and emphasis, all four companies have given planning and implementation full top management support.

Union Carbide: Distributed Word Processing.

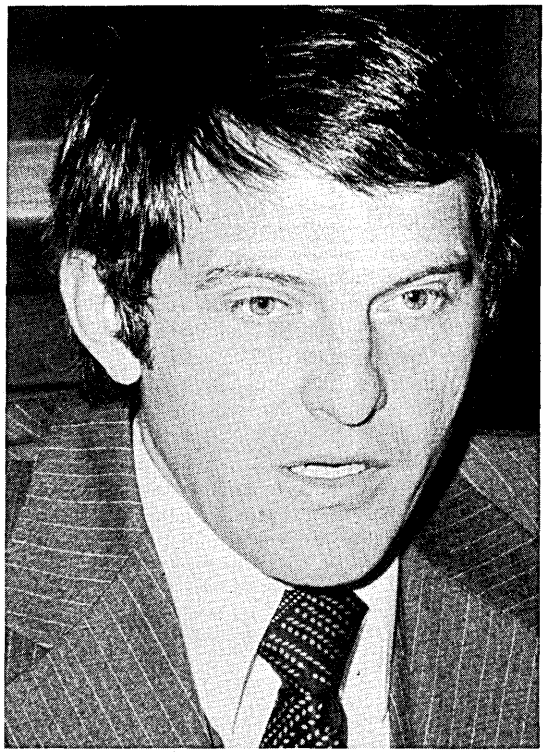
Most organizations fit into the category of distributed word processing. Union Carbide is an excellent example. Office managers throughout the organization select word processing equipment from a list of approved vendors. The list is maintained by a corporate office automation staff responsible for insuring that each purchase decision for word processing equipment is cost justified and that guidelines set up by the corporate staff are followed.

Note that this profile differs significantly from the situation described earlier to show the results of *not* planning, where there were no guidelines, no plans, and no corporate staff. With the distributed word processing strategy, the corporate staff can insure that the corporation as a whole receives quantity discounts and better service from the selected vendors. Training of personnel can be standardized on several brands. Most important, the corporate staff can plan the eventual connection of these various distributed word processors to a communications facility so that additional office automation functions such as data processing, electronic mail, and electronic filing/retrieving can eventually be delivered to all offices.

Of the four approaches, distributed word processing is by far the easiest to implement. It produces quick results with minimal disruption to the organization. Its focus on word processing, however, limits its ability to expand to provide office automation functions for professionals and managers. Another disadvantage is that although this approach may be the least costly in the short run, it may prove to be the most costly in the long run, when the companies using it want to provide functions to professionals and managers.

Security Pacific National Bank: Centralized Word Processing.

The centralized word processing ap proach can be seen at Security Pacific Nation



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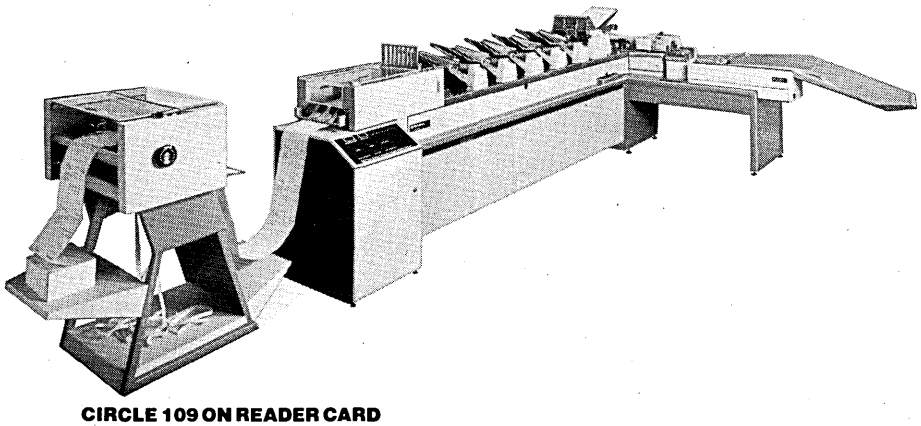

CIRCLE 109 ON READER CARD

The Security Pacific approach is not the one for faint hearts.

al Bank, where the entire typing function for the headquarters building has been gathered into a single word processing production center. Instead of having distributed word processing machines sitting idle much of the time, Security Pacific keeps their machines busy at three shifts a day. The word processing department has a staff of about 50 employees and serves approximately 800 authors. Work enters the word processing center through a telephone dictation system, and documents are delivered back to originators via mail service.

As in the case of Union Carbide, emphasis is placed on the word processing function. But by removing the text entry task from offices, Security Pacific has set the stage for introduction of management and professional workstations unencumbered by the text entry requirement. These workstations will be relatively inexpensive and easy to use by people fearful of typewriter keyboards.

The Security Pacific approach is not the approach for faint hearts. A large capital outlay is required to establish the centralized word processing center. Also, moving the typing function out of all offices poses serious personnel problems. The company tackling this approach must plan well and resolutely implement the plan over several years.

Continental Bank of Illinois: Centralized Data Processing.

The Continental Bank of Illinois exemplifies the centralized data processing approach. A centrally managed and controlled computer facility provides remote access to terminals in the bank's offices around the world.

What distinguishes this computer facility from other centralized dp installations is the degree to which office functions are performed by the computer. Access to information is made easy. The storage and retrieval of information is under the control of each user. Word processing takes place on standardized word processors that are connected to the central computer, so that documents can be sent from the word processors for storage in large files on the computer. An electronic message switching system is another feature of this system. Since everyone talks to the same central computer, messages and documents can easily be passed back and forth.

The Continental Bank of Illinois approach may be the least expensive method in the long run for providing automation to a large organization. If an organization already has a large computing facility with a sophisticated communications network providing easy access to the computing facility, then the incremental costs of providing office automation functions, excluding word processing, are minimal.

Implementation of this approach requires strong central control of all information processing. This may alienate various sectors of the organization, since different offices will have different requirements and everyone cannot be satisfied simultaneously. The approach fosters a tremendous dependence upon one part of the organization—the information processing division—since the technicians in the central computing facility are the only ones who can maintain the required complicated systems. Such dependence may not ultimately be healthy for the overall organization.

Lincoln National Life Insurance Company: Distributed Data Processing.

The design chosen by Lincoln National Life Insurance has already been mentioned to illustrate the potential economic advantages of corporate planning. The objective of this distributed data processing approach is to improve the productivity of managers, professionals, and secretaries by providing them with workstations that perform all administrative and communication functions. With all work functions readily and easily available on every workstation, these workstations become as essential to office life as telephones.

This approach can be tailored to the needs of the people using it. The horsepower for such a system comes from small microprocessors and/or minicomputers specifically designed to meet office requirements. These small computers may service one or several offices and can connect to an organization's central computing facility or to a common communication network for passing messages to other office systems, or they can simply remain unconnected. At least three vendors now offer these full-function workstations (AXXA, Datapoint, and PRIME). A much wider choice will soon be available.

This distributed data processing approach is not easy to install. It requires thorough training of people and a real commitment to change, which can foster inflated expectations. Planning at all organizational levels is essential, and strong management of the change process is required to insure success. The flexibility of this approach and its focus on the problems of professionals and managers, however, make it very attractive. And increased competition is driving down prices of the workstations while increasing their functionality. This approach will undoubtedly be the most popular approach to office automation in the '80s.*

"It keeps saying 'Rosebud.' "

©DATAMATION

CARTOON BY WALT MILLER

ROGER W. KETRON

Mr. Ketron is a senior consultant with Citibank's Systems Consulting Services, a department of Correspondent Resources, Inc. He provides management consulting services for office automation and information processing to banks nationwide. Mr. Ketron has an MBA and AB in economics from the University of Washington, and has worked in information systems for 12 years.

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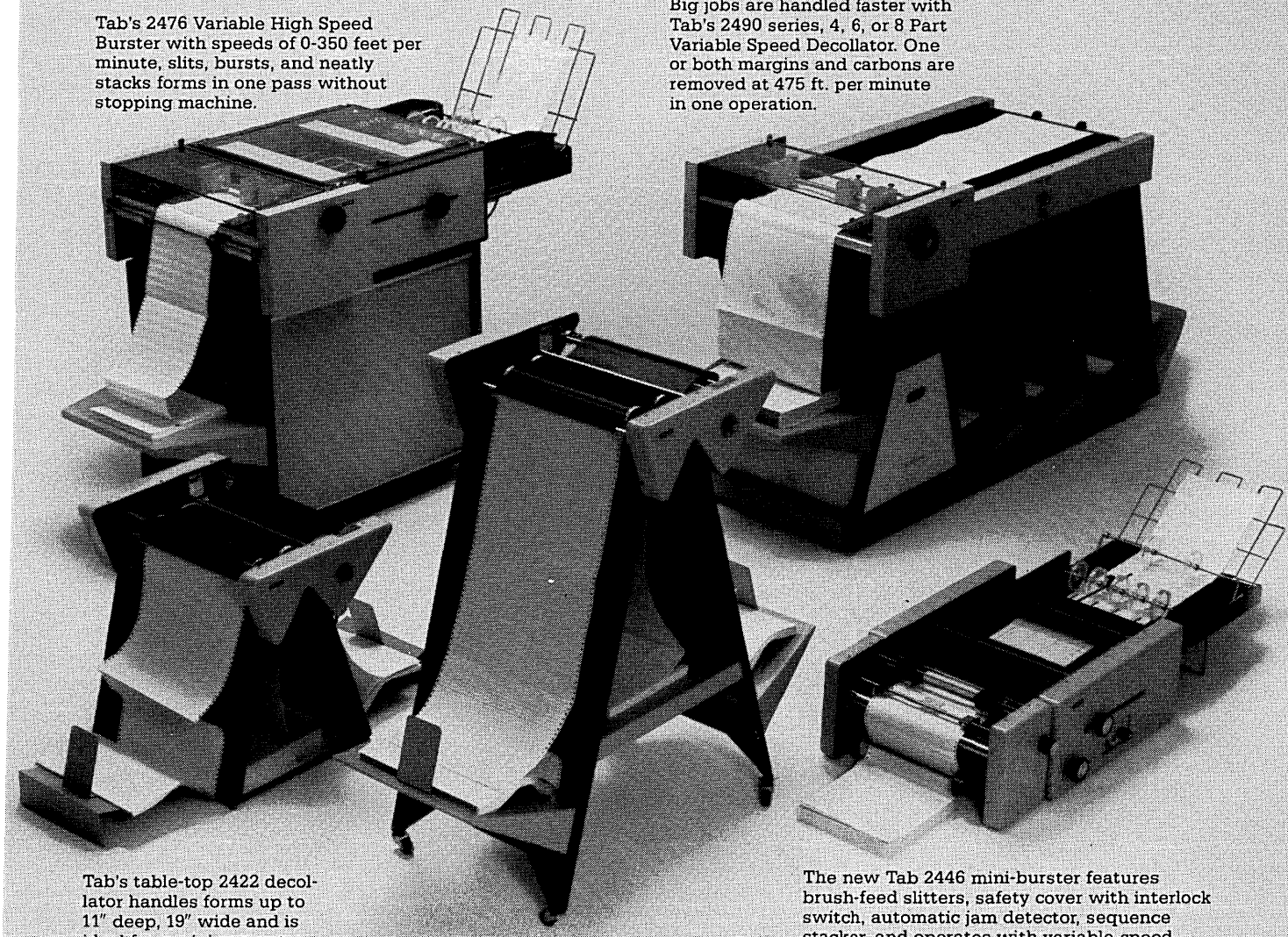
Tab's 2476 Variable High Speed Burster with speeds of 0-350 feet per minute, slits, bursts, and neatly stacks forms in one pass without stopping machine.

Big jobs are handled faster with Tab's 2490 series, 4, 6, or 8 Part Variable Speed Decollator. One or both margins and carbons are removed at 475 ft. per minute in one operation.



Tab's table-top 2422 decollator handles forms up to 11" deep, 19" wide and is ideal for a mini-computer installation.

For larger decollating capacity, Tab's 2424 two-part decollator cuts your handling time by operating up to 450 ft. per minute.

The new Tab 2446 mini-burster features brush-feed slitters, safety cover with interlock switch, automatic jam detector, sequence stacker, and operates with variable speed from 0 to 200 ft. per minute.

CIRCLE 110 ON READER CARD

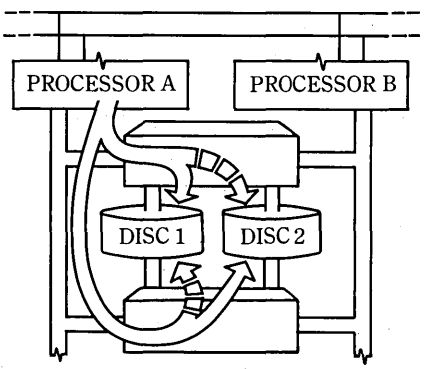
The World's First NonStop™ DBMS

Tandem NonStop™ ENCOMPASS

ENCOMPASS is the only DBMS with the benefit of running on a NonStop system. It's also the only high performance, relational data base management system designed from scratch to provide unmatched data integrity in high volume on-line transaction processing environments.

We made relational fast.

A true data base operating system is the foundation with much of the retrieval techniques designed right in. And the structure of data on disc is optimized to minimize head movement. Memory cache retains most frequently used items in a buffer. In fact, any information in a file that filled a 300M byte disc drive could still be retrieved with an average of one seek. Combined with Tandem's optional mirrored volumes, it all adds up to tremendous speed and throughput with all the benefits of relational structuring.



Mirrored volumes automatically maintain identical copies; write operations occur simultaneously, read operations performed using drive with head closest to data.

Networking made easy.

Each individual system can be expanded to sixteen processors, with additions of memory, terminals, discs, and there will be no loss whatsoever on the original investment—hardware or software.

The relational nature of ENCOMPASS, along with our networking software, EXPAND, allows a single data base to be distributed over multiple systems. Easily and safely. Up to 255 systems, each with as many as sixteen processors and thousands of terminals, each with unobstructed access to the data base distributed throughout the network.

Automatic Terminal Management.

Terminal management has been the classic nightmare of on-line data base systems. No more. ENCOMPASS automatically handles support for the Tandem 6520 Multi Page Display, Tandem 6510, and IBM 3270.
The Tandem system also supports a variety of communication methods and protocols, including Asynchronous, Bisynchronous, Multipoint, Point to Point, X25 and SDLC.

Screen formatting, data validation, screen sequencing and data mapping, plus sequencing and control of multiple terminals; these are all handled for the application programmer automatically and at a fraction of the cost in development time and dollars.

Backout and recovery over a distributed data base.

Consistency of the data base is essential. Multiple files must be capable of being updated simultaneously, even if located across distributed nodes. If for any reason a transaction cannot be 100% completed, this is the one system in the world which can un-do it completely. Automatically.

The system will recover each piece of the transaction from everywhere in the distributed data base. Without cost-killing overhead. A major breakthrough in a network, DBMS. No one else even comes close.

NonStop™ availability in Hardware and Software.

Because of its unique architecture, the system will keep on running without interruption, without loss or duplication of a transaction-in-process even if a failure occurs in any processor, I/O channel, disc or disc controller.

Tandem NonStop™ architecture provides not only this redundancy in hardware, but the software to take advantage of it, utilizing all available resources.

The NonStop™ system ensures that every update is completed to the data base. And with ENCOMPASS DBMS, NonStop™ operation is automatically built into all of your programs.

On-line's as easy to program as batch.

One key theme behind the performance and reliability of our NonStop™ DBMS, ENCOMPASS, is the ease of use for programmers, systems designers and users.

It's easy to extend the data base, to expand the system to a network, to manipulate the data. And it's easy to add new resources, new hardware, new software, new files. It's easy to provide controls and security. Easy to work with. Easy to repair. And above all, easy to learn.

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The All-ENCOMPASSing DBMS.

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- dynamic and automatic adjustment to varying transaction loads

All that remains for the user is:

- simple batch type application modules.

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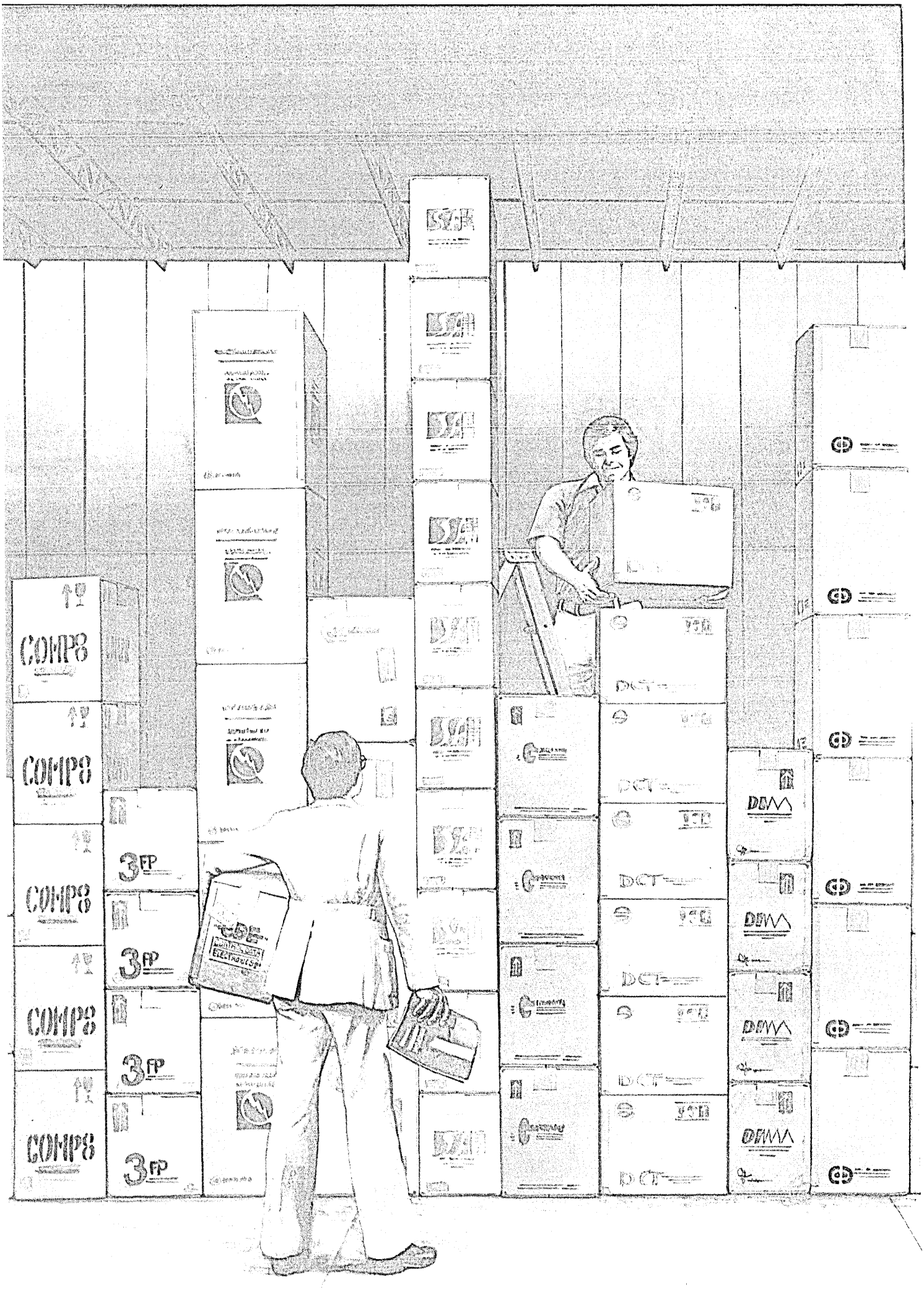
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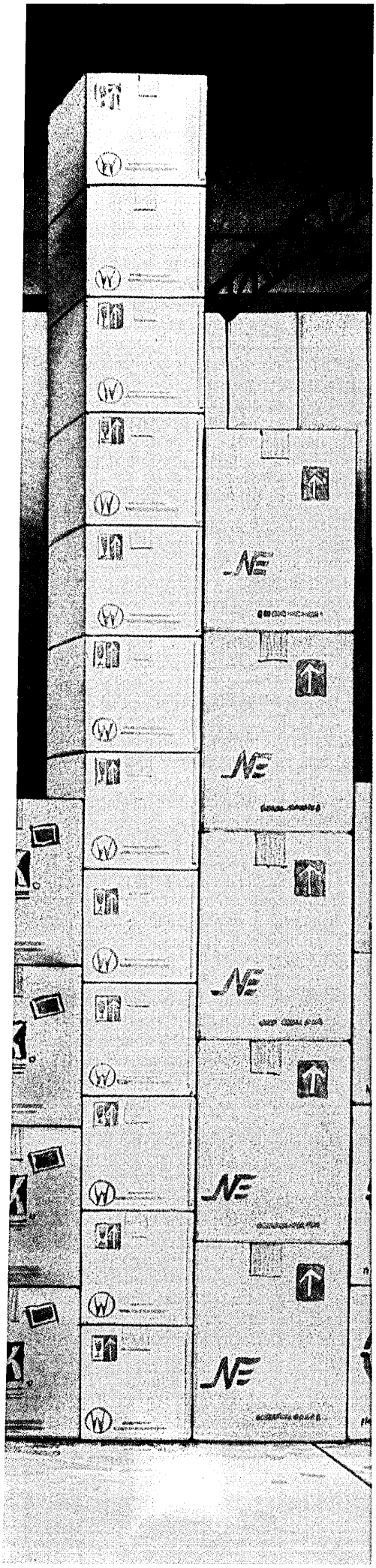

Figures indicate a less explosive but still far from mature marketplace.

ANNUAL MINICOMPUTER SURVEY

The 1980/81 Grumman/Cowen minicomputer survey is based on screened, unduplicated responses from 6,337 U.S. user/buyer sites with over 47,000 minicomputers or mini-based systems, intelligent terminals, data entry systems and/or office systems in place as of July 1980. Below are a few highlights from the survey, conducted by G. S. Grumman/Cowen & Co., and cosponsored by DATAMATION.

New user expansion of the minicomputer market has remained substantial over the past year, but the rate of growth for the past two years (12% for 1980 over 1979, down from 17% for 1979 over 1978) may indicate a less explosive, albeit still far from mature, marketplace.

Over the past eight years, the compound growth rate of the user base amounted to 22% (19% during the past five years), versus 23% in the 1979 survey. The five-year growth rate for the oem segment of the base was 13%; for systems houses it was a much heftier 22%, paralleling the strong growth of the commercial systems segment of the business. Tandem and Texas Instruments have had the greatest capture rate of new-to-the-industry users during the past two years, according to the survey.

The survey data show the most rapidly growing area of small computer usage in 1980/81 to be distributed business dp, continuing with the uptrend discerned for a number of years in past surveys. Shipments for data communications equipment and related applications also exhibited greater than industry average growth, whereas those intended for industrial automation purposes, most notably, evidenced less than the industry average growth.

In total, for all applications, 3,290 respondents reported taking delivery of 18,650 minicomputers with an approximate purchase value of $830 million during the 12 months preceding the survey. For the forthcoming 12 months, 2,730 respondents indicated plans to acquire nearly 23,200 systems valued around $1.02 billion.

End-user respondents expressing buying intentions for the upcoming 12 months planned to spend 15% more on average per site than they spent during the previous year. On a comparable basis, the oem and systems house respondents foresaw a nearly 40% step-up per site (a somewhat greater increase than they anticipated when surveyed in 1979), notwithstanding the current recession.

After an upward adjustment for the first-time end-user expansion of the marketplace, and some tempering of expectations on the oem systems house side to reflect the uncertain economic environment, overseas as well as domestically, worldwide minicomputer purchases are conservatively projected to advance by somewhat more than 25% year-over-year (versus the 28% increase forecast for the preceding 12 months in the year-earlier survey).

Oem systems house on-hand inventories of minicomputers held steady at the 2.6 months level indicated in the last two surveys, and this, coupled with the high incidence of cancellations/delayed deliveries already incurred in this year, when compared with the 1979 survey on this score (15.8% of all oem/systems house survey sites had canceled or delayed this year versus only 7.2% a year previously), suggests that any recession-related slowdown in this segment of the market may be relatively short-lived.

ILLUSTRATION BY TOM NEWSOM

Minicomputer users are more loyal to their vendors than ever.

Looking ahead one year, 32% of the respondents (61% of the oem/systems houses), versus 35% in the 1979 survey, anticipated higher spending during the forthcoming 12-month period than in the preceding year, whereas 24% expected their purchases to decline. Encouragingly, however, fully 48% of those who had canceled or delayed shipments this year anticipated a spending increase, which augurs an acceleration past the recession.

Modest decreases in average systems prices (for units to be acquired between July '79 and June '80) were indicated for traditional minicomputers, small business systems, and data entry systems, with increases, on the other hand for intelligent terminals and office systems. In aggregate, there was decline registered (from $44,600 to $44,000), but it was much less steep than those indicated in the previous two surveys.

DEC NUMBER 1 VENDOR

As a vendor, Digital Equipment ranked first among the user respondents by a customarily wide margin in the dollar value of systems acquired during the 18 months preceding the survey. IBM was second (third in 1979), followed by Honeywell, Hewlett-Packard, and Data General (second in 1979), respectively.

Looking at the small business systems market separately, the survey shows IBM with the largest share of shipments, with HP in the number two position for the prior 18 months and DEC in that slot for the ensuing 18 months.

In the oem/systems house submarket, the survey data place DEC in first position by a substantial margin, followed by HP, Honeywell, and Data General.

In this survey, hardware reliability took on new significance, usurping vendor reputation as the factor most important in the respondents' choice of supplier. Vendor reputation was ranked second overall by respondents and is still most important to small business system and office system users. Price, which ranked as the most important selection criterion in the 1978 survey, remained most important to intelligent terminal system users.

The 1980 survey indicates that minicomputer users are more loyal to their vendors than ever; only 6% of the respondents (vs. 7% in the 1979 survey) expected to switch to a vendor other than their current principal supplier during 1980/81, and only 11% (versus 12% in 1979) were seriously considering a move. This upward trend in vendor loyalty has potential negative implications for new entrants into the marketplace and smaller suppliers. Tandem and Prime continue to generate the highest degree of customer loyalty, followed by Datapoint, which experienced a significant upsurge, Hewlett-Packard, IBM, and DEC. End-users considering switching vendors most often cited dissatisfaction with software support. Oem/systems house respondents considering a change in vendor indicated delivery schedules were the leading cause of displeasure, confirming a trend that appeared to be resurfacing in last year's survey. Dissatisfaction with delivery schedules is particularly high among DEC oems.

Not surprisingly, the newest segment of the minicomputer market, office systems, is the most competitive, with 86% of respondents considering two or more suppliers in their most recent procurement. The most established section of the marketplace, traditional minicomputers, appears least competitive: 50% of the oems indicated that only a single manufacturer had been considered. Oem investment in a given supplier's software generally reinforces the trend toward sole-source buys.

The 1980 survey points out that the growth of business dp minicomputer applications continues to outpace all others, as evidenced by the rising use of commercially oriented programming languages such as COBOL and BASIC (which is the language most heavily used in the emerging office systems submarket). There is a general downtrend in simple batch processing accompanied by an increase in usage of multiprogramming, particularly by small business systems users. Real-time remains the principal orientation of traditional minicomputer respondent sites.

STAND-ALONE IS FIRST

The primary mode of use among survey respondents is standalone interactive, particularly for Basic Four, Prime, Hewlett-Packard, and Data General users. Network-oriented usage is still not widespread although it is pronounced among Four-Phase, Harris, Honeywell, Tandem, and Univac/Varian respondent sites. The survey indicates that networking is most important for data entry systems and at large user organizations. Use of DBMS continues to grow, especially at Prime, Perkin-Elmer, NCR, and Burroughs respondent sites.

This year's survey respondents indicate increasing reliance on the system's supplier for miniperipherals needs. Small business system and intelligent terminal suppliers typically retain a higher percentage of their customers' peripheral business than do traditional mini vendors.

Spending for miniperipherals is projected up across the board for 1980/81 by the respondents. Strong growth is foreseen in every category except low speed serial printers. The largest percentage increases were indicated for graphic display terminals (leading supplier: Tektronix); floppy disks (MPI); and high speed serial printers (TI). In terms of units and number of sites buying, the standout again this year was alphanumeric crt terminals with IBM moving into the leading supplier slot (up from fifth place in 1979).

The average minicomputer memory size has nearly tripled in the past two years. The average memory size of systems most recently purchased by the respondents rose to 319 Kbytes, up from 172 Kbytes in 1979 and 110 Kbytes in 1978. There is a nearly parallel trend in expansion in size of minicomputer disk storage, as the average disk climbed to 149MB in the 1980 survey, vs. 90MB in 1979 and 64MB in 1978.

In terms of respondent mentions, the IBM System/34 topped the list of specific systems acquired from January '79 to June '80, followed by the DEC PDP-11/34 and 11/70. For the forthcoming 18 months, the DEC VAX-11/780 was the system most often cited; the System/34 was second; and the IBM Series/1, third.

In terms of units purchased, the HP 21MX was first ranked for the past 18 months and the Series/1 for the upcoming 18 months.

Of the respondents who had bought or planned to buy the Series/1, 60% (52% a year ago) considered IBM the principal minicomputer supplier. Some 60% of the sites with Series/1 already installed or planned were also IBM mainframe users.

There was no increase over the 1979 survey in the percentage of respondents (27%) who would deem IBM/370 compatibility in a minicomputer "very desirable". Only 5% had installed or planned to install an IBM plug-compatible cpu as an alternative for a minicomputer, even with the inclusion in this category of the IBM 4331.

A continuing broadening of DEC's market penetration with the VAX-11/780 was evidenced by the survey: 9% of all sites and 28% of the DEC survey sites had already installed the VAX or planned to (up from 5% and 14%, respectively, in the 1979 survey).

For the MV/8000, Data General's initial entry into the 32-bit systems marketplace, some 9% of the Data General base indicated plans to buy (compared with 6% for VAX of the DEC base at a similar point in time following its introduction, per the 1978 survey).

Regarding 32-bit systems generally, 29% of all the 1980 survey respondents expressed some interest; two-thirds of these have already purchased or have specific plans to do so. The rest indicated that this capability is not yet offered by their current principal supplier.

As for nonstop (multiprocessor) systems, such as those marketed by Tandem Computers, there was a 37% expression of prospective interest among the respondents and it was most pronounced at Univac/Varian, Honeywell, and Perkin-Elmer user sites.

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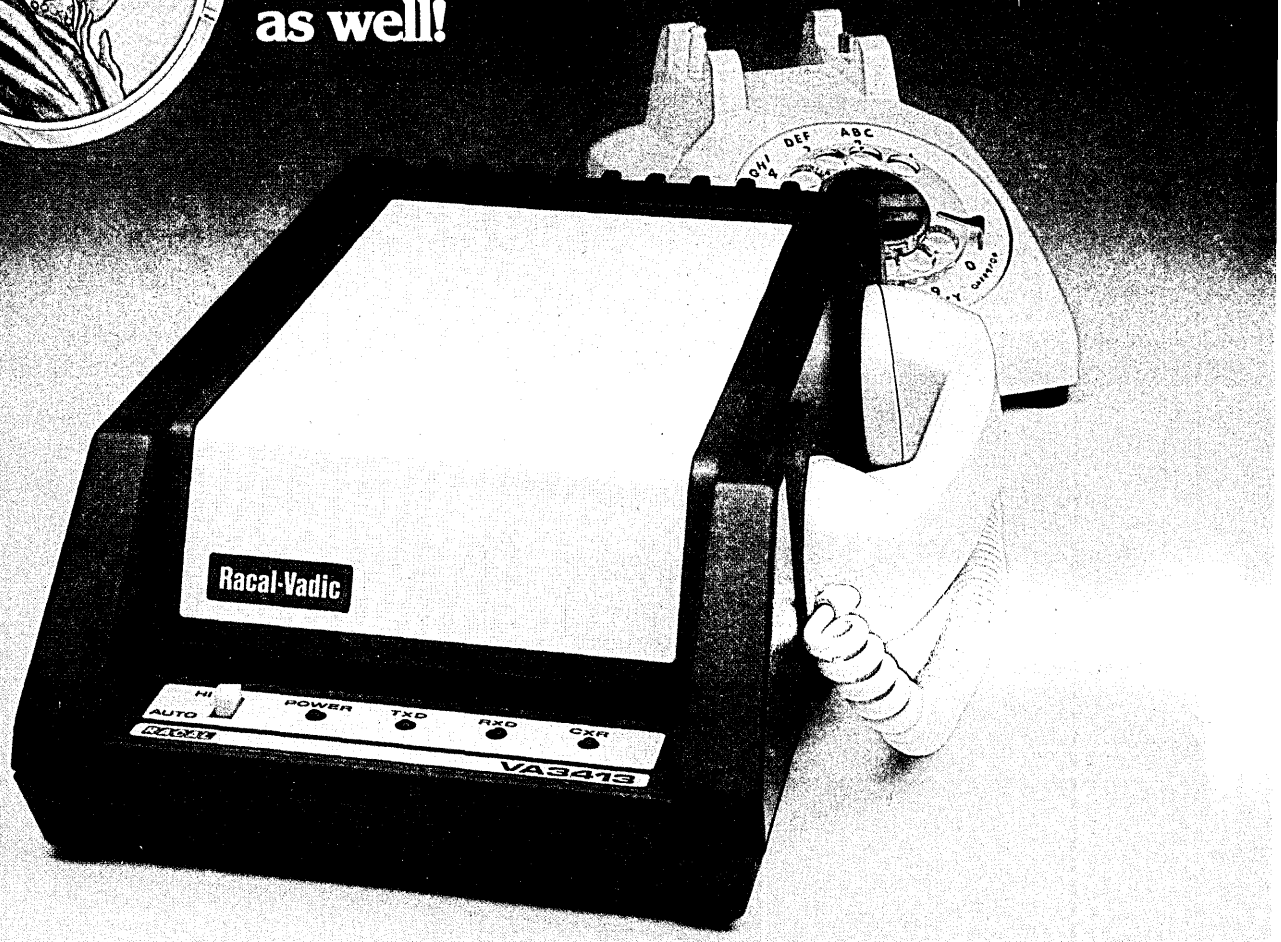
Racal-Vadic has the world's first Dual Acoustic Coupler... 1200 bps full duplex and 0-300 bps as well!



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"The System/38 significantly reduced the amount of code necessary to write a program and the time and effort required to move into new applications. We're extremely enthusiastic."—Larry Petterson, Director of Data Processing, St. Olaf College, Northfield, Minnesota.

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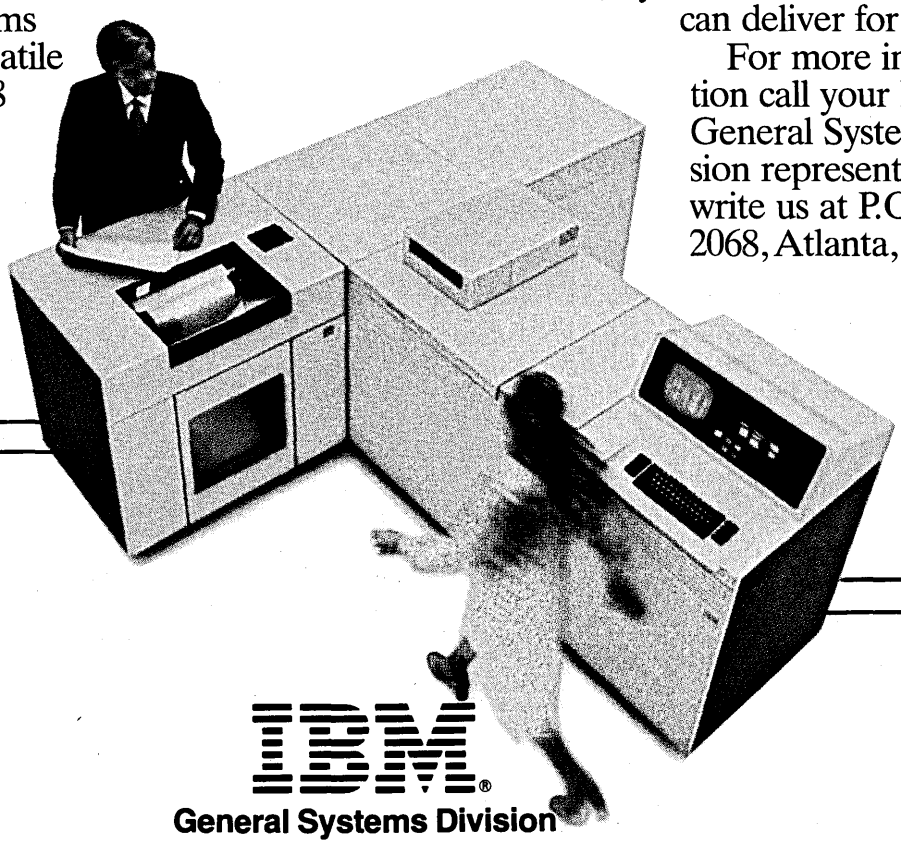

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General Systems Division

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Spending for miniperipherals is projected up across the board for 1980/81.

MICROS MOVE AHEAD

A steep increase was evidenced in the percentage of micros moving beyond pilot production and into the full volume production phase. Some 42% of the sites with a micro-based product/application had achieved full production (versus only 34% a year ago).

A nearly sixfold increase in 16-bit microprocessor purchases was foreseen by the respondents for the 12 months following the survey, which compared with a 63% increase projected for micro purchases in aggregate (off a much larger base of purchases in the prior year). The Motorola 68000 had the greatest share of these prospective purchases, followed closely by the Intel 8086. In total, the respondents said they had purchased 430,000 microprocessors during the 12 months preceding the survey and they planned to purchase 710,000 during the ensuing year. In addition, they had obtained 210,000 units from in-house sources during 1979/80 and had plans for 5 million units from such sources in 1980/81.

In the context of the survey, Intel garnered around 43% of the respondents' prospective (noncaptive) microprocessor purchases and Motorola, 34%, for an imposing 77% in the hands of the two leading suppliers. In the context of the survey, DEC maintained the major share of the respondents' microcomputer business, with 52% of the unit purchases anticipated in 1980/81 (down from 63% from 1979/80). Intel was second-ranked (24% up from 19%). In all, the respondents expected to buy close to 8,000 microcomputers in 1980/81, up from 4,000 during the 12 months preceding the survey.

As for micro-based personal/desktop computers, Apple's share of planned purchases exceeded Tandy's both in terms of mentions (39% versus 25%) and units (41% versus 16%) on the strength of several large quantity purchases. HP was third in terms of both units and sites buying.

The primary application indicated for already purchased personal computers was standalone business dp, but for those not yet acquired it was office systems.

The primary demand for personal computers continued to come from organizations (69%) rather than from individuals for their personal use (31%), but the survey response suggests an incipient pickup in purchases for personal uses.

For all micros and micro-based systems, the average size of memory, per the survey, was 43 Kbytes, a little more than one-tenth that indicated for minis.

To order the full Minicomputer Survey: D. Chamberlin, DATAMATION sales rep, P.O. Box 129, Riverside, CT 06878, (203) 661-0055.

TABLE I
MINICOMPUTER-RELATED SPENDING 1979/80

Percent Total Spending	End User: Own Use	End User: Implementer	OEM	Sys. House	Dealer/ Dist.	Total Sites
A. Directly with systems supplier						
1. Cpu's Memory, Peripherals	71.2	65.0	76.2	80.1	76.6	72.2
2. Software/ Programming	7.7	8.8	4.1	3.0	6.9	6.8
3. Maintenance/ Spares	7.9	11.6	3.6	5.8	5.5	7.7
B. With Independent Suppliers						
1. Memory, Peripherals	5.5	6.4	14.0	9.2	9.9	6.9
2. Software/ Programming	7.7	8.2	2.1	1.9	1.1	6.4

Table II
REASONS FOR PLANNING/CONSIDERING VENDOR SWITCH DISTRIBUTED BY CURRENT PRINCIPAL VENDOR (OEM/SYSTEMS HOUSE/SITES ONLY*)

Current Principal Vendor	Percent of Switching Sites Dissatisfied With: Del'y. Scheds.	Price	Hdw. Rel'ty	Sftw. Support	Sls/Serv. Org.	Other
Data General	18.2	13.6	22.7	22.7	27.3	27.3
DEC	69.4	19.4	11.1	8.3	27.8	11.1
Hewlett-Packard	10.0	50.0	—	20.0	20.0	50.0
IBM	28.6	57.1	—	28.6	42.9	—
Texas Instruments	30.0	30.0	—	40.0	40.0	30.0
TOTAL SITES	29.6	23.0	17.0	22.2	23.7	25.9

* Includes Dealer/Distributor respondents.

- Highest level of OEM/Systems House dissatisfaction:
  - Delivery Schedules—DEC
  - Price—IBM
  - Hardware Reliability—Data General
  - Software Support—Texas Instruments
  - Sales/Service Organization—IBM

Table III
SYSTEMS HOUSE DOWNTURN

Type Of Respondent	Higher: 1978	Higher: 1979	Higher: 1980	Lower: 1978	Lower: 1979	Lower: 1980
End User	28.2	28.4	26.2	25.3	26.0	26.6
Implementer	37.8	38.7	36.3	24.2	18.3	25.8
OEM	69.0	68.8	61.3	10.0	8.2	8.7
Systems House	64.4	69.7	61.6	7.9	6.2	12.3
Dealer/Distributor	N/A	71.1	73.5	N/A	10.5	6.1

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- NUMERIC PAD
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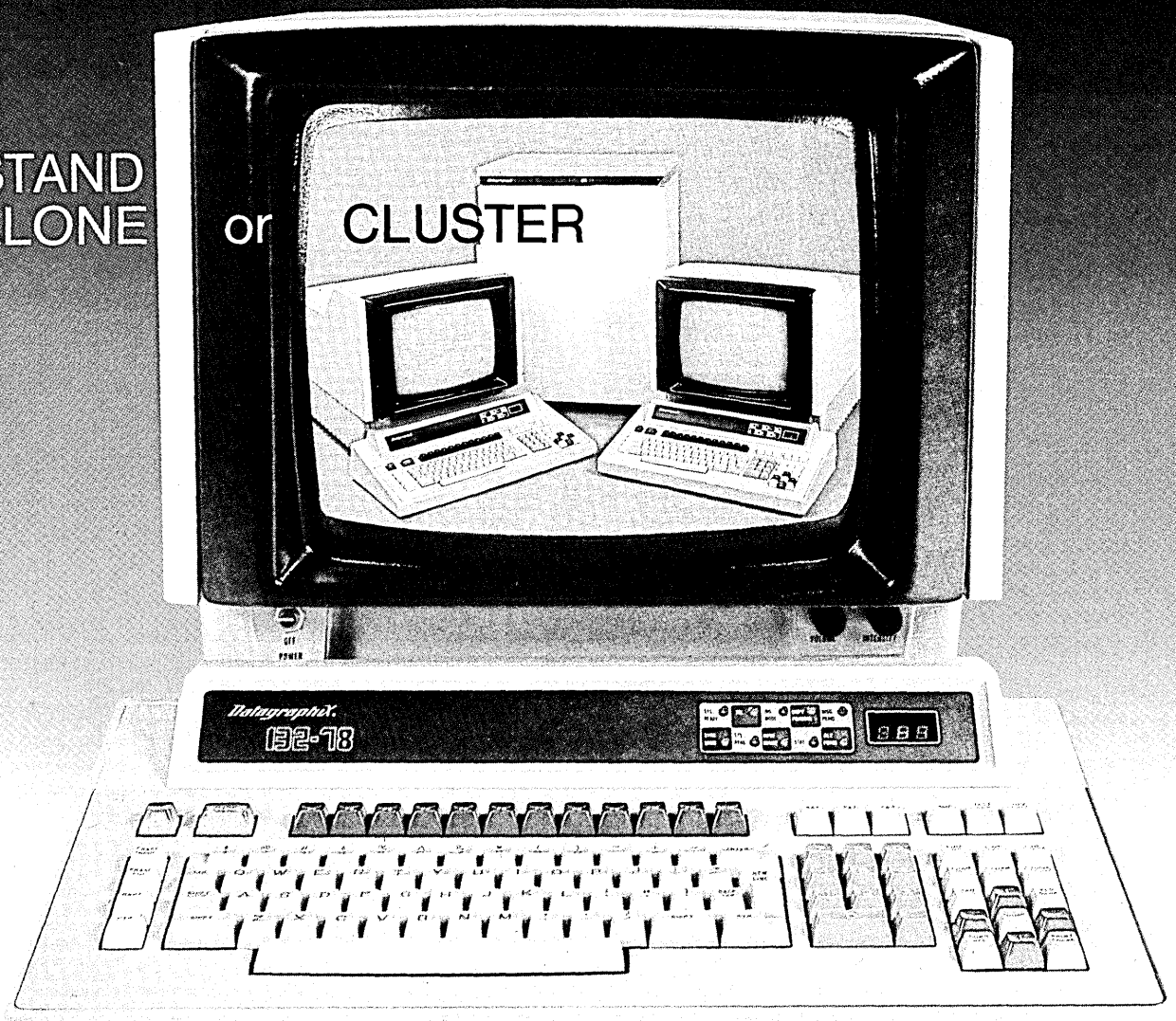
STAND ALONE or CLUSTER



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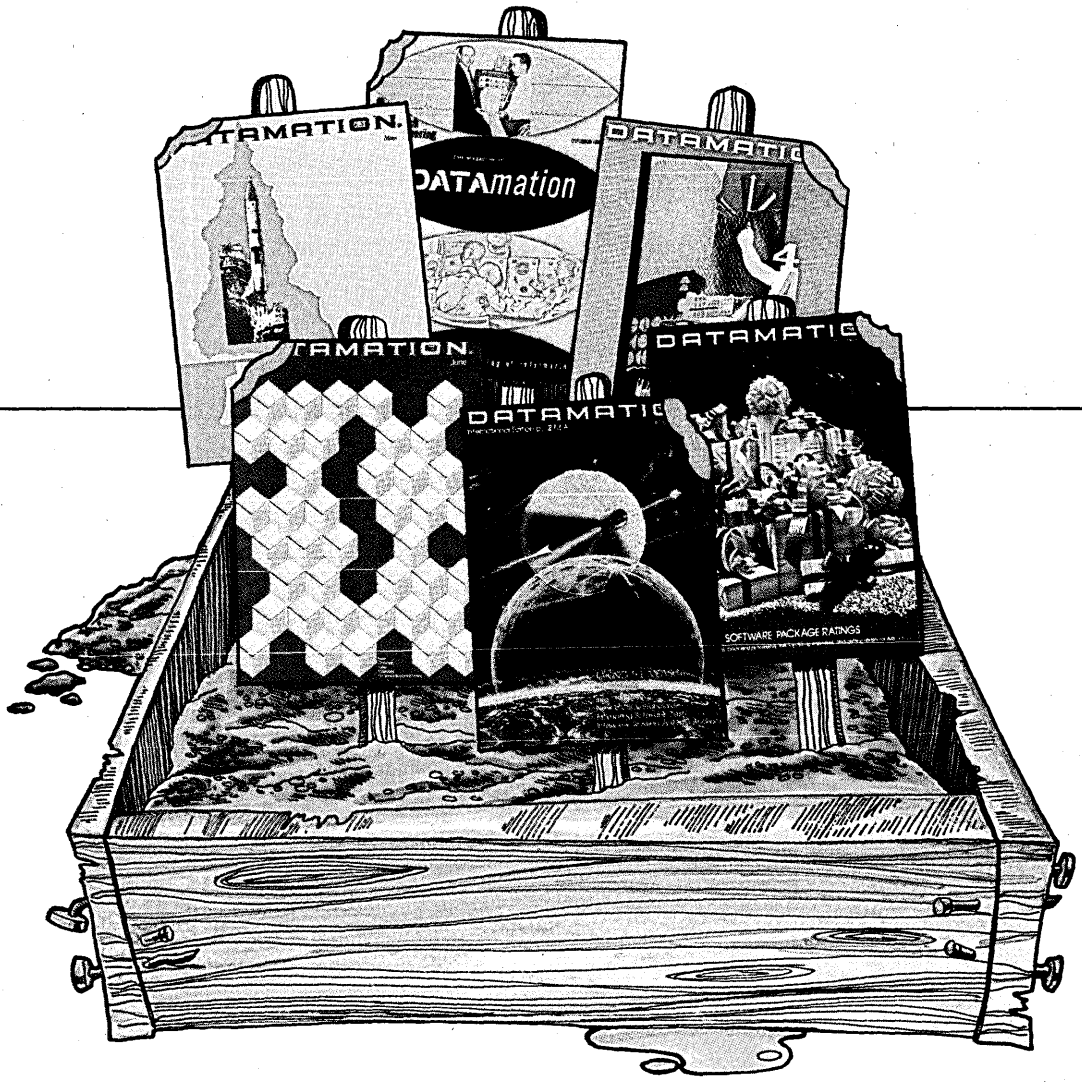

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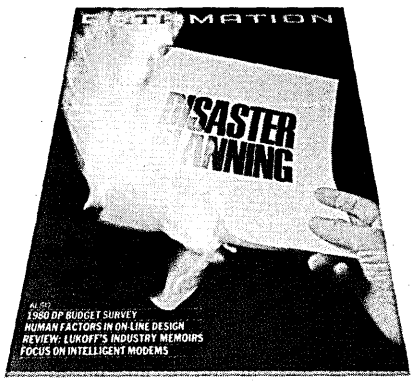

This long-time high reader involvement makes a fertile environment for data processing vendors since only the best of the crop—those with the right combination of job title and buying influence get picked to receive DATAMATION magazine.

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DATAMATION®

magazine

Introducing the Identification Network.

Data Collection, pure and simple.

From the moment your employees entered the front gate until they left for home, they've always been on their own.

And no matter how dependable they were it's been almost impossible to hold them accountable for their actions and their whereabouts.

Accounting for the heretofore unaccountable.

The Identification Network from Rusco Electronics gives you accountability for people and facilities that you never thought possible. It monitors and reports employee whereabouts and actions. And gives you an accurate, immediate record of who, what, where, and when.

Now basic data entry is available anywhere. For instance, you can control the locking and unlocking of doors on a pre-programmed time schedule.

Parking lot entrances and exits can be tied into the Identification Network. So you can always find out if an employee is on the premises.

You can account for the use of the copying machine and know how many copies each employee makes.

You can create an electronic time and attendance log of your employees ins-and-outs for automatic payroll processing.

You can even restrict after hours elevator use. For certain key people and certain floors.

Those are just a few examples.

How the Identification Network works.

Each of your employees gets an Identification Network EntryCard™ with a personalized code. Each room or piece of equipment that requires accountability has a single, compact CARDENTRY™ reader.

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

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

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

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

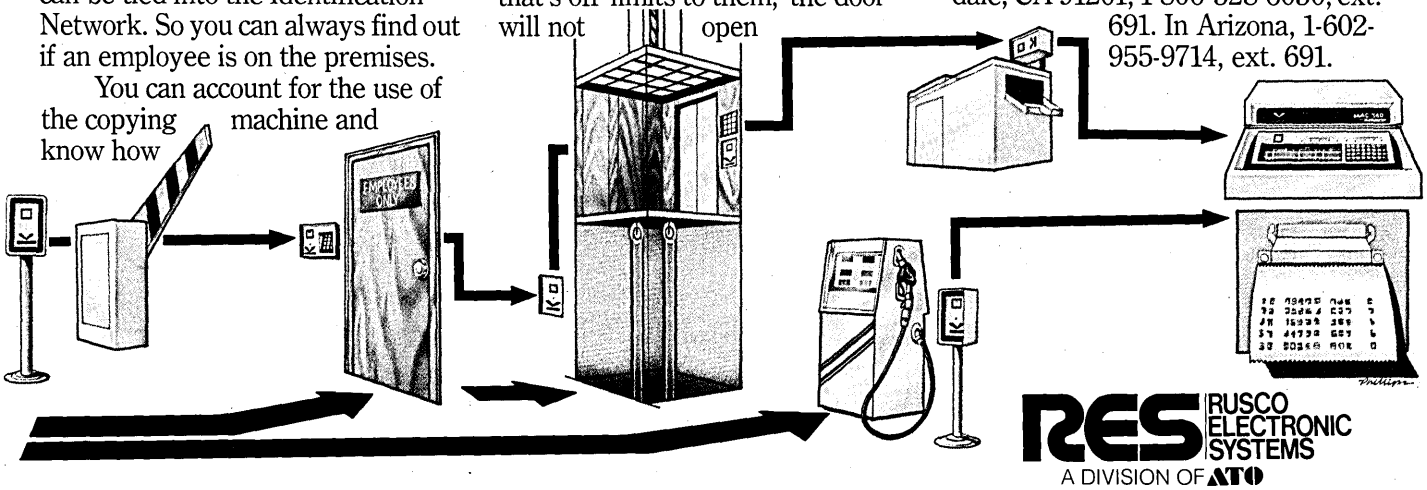
The most important control of all.

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

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

That's exactly what the Identification Network does. It saves a lot of money. In a lot of places.

Call or Write: Rusco Electronics Systems, 1840 Victory Blvd., Glendale, CA 91201, 1-800-528-6050, ext. 691. In Arizona, 1-602-955-9714, ext. 691.



RES RUSCO ELECTRONIC SYSTEMS
A DIVISION OF ATO

We give you controlling interest.

CIRCLE 201 ON READER CARD

Some 37% of respondents expressed interest in nonstop multiprocessor systems.

FIG. 1

USER POPULATION EXPANDS

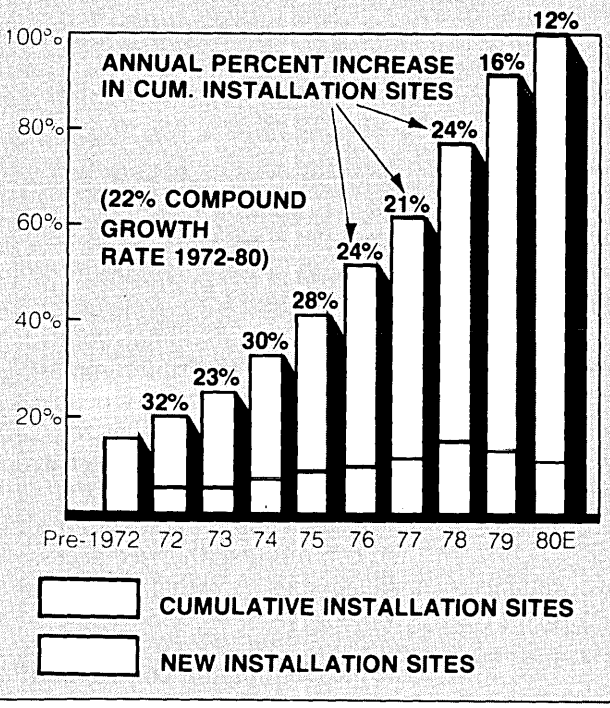


FIG. 2

TRADITIONAL MINI PURCHASES
(IN DOLLAR TERMS)

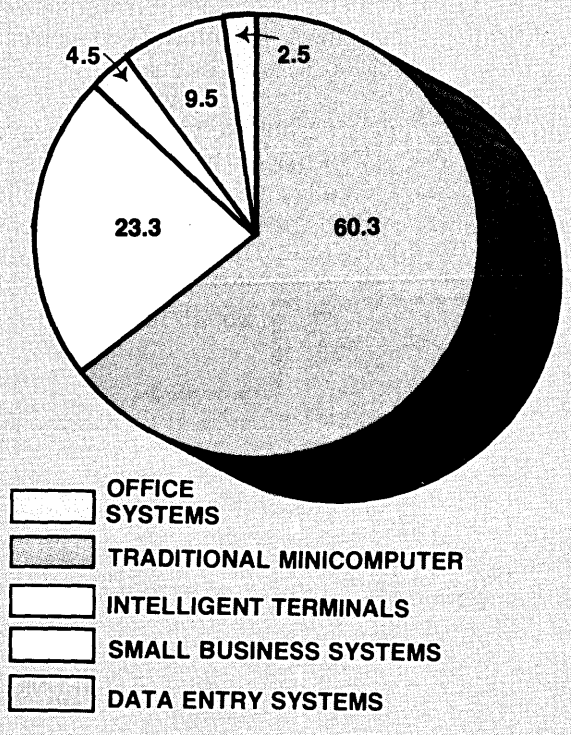
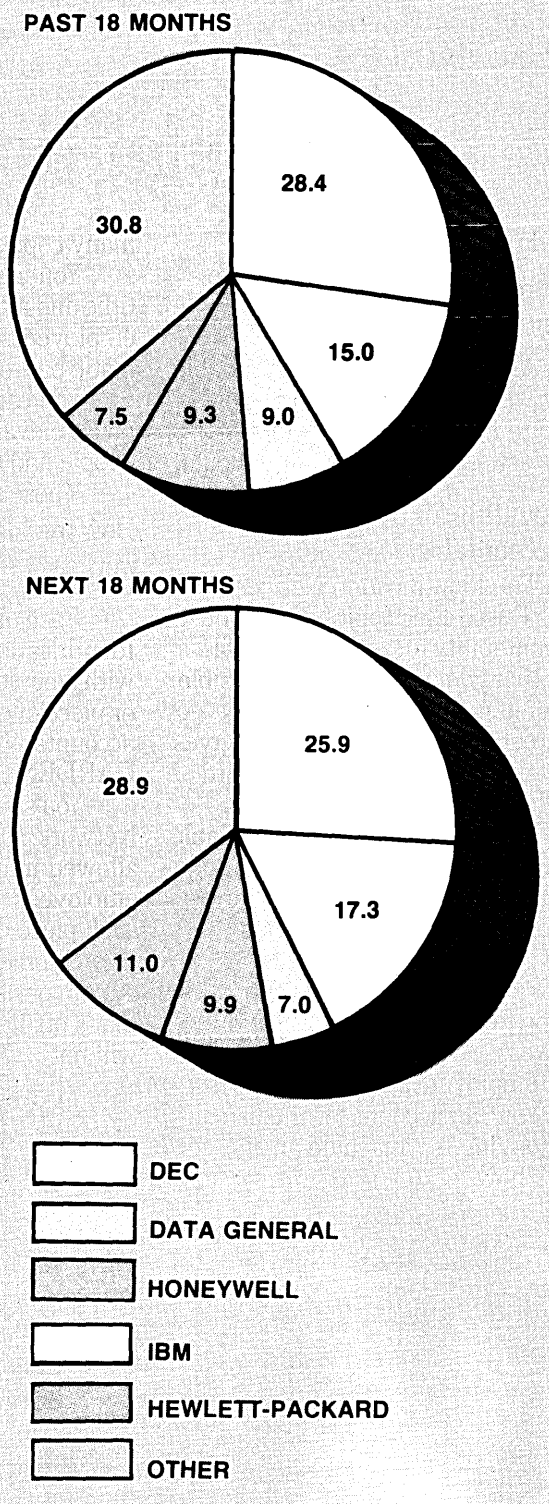


FIG. 3

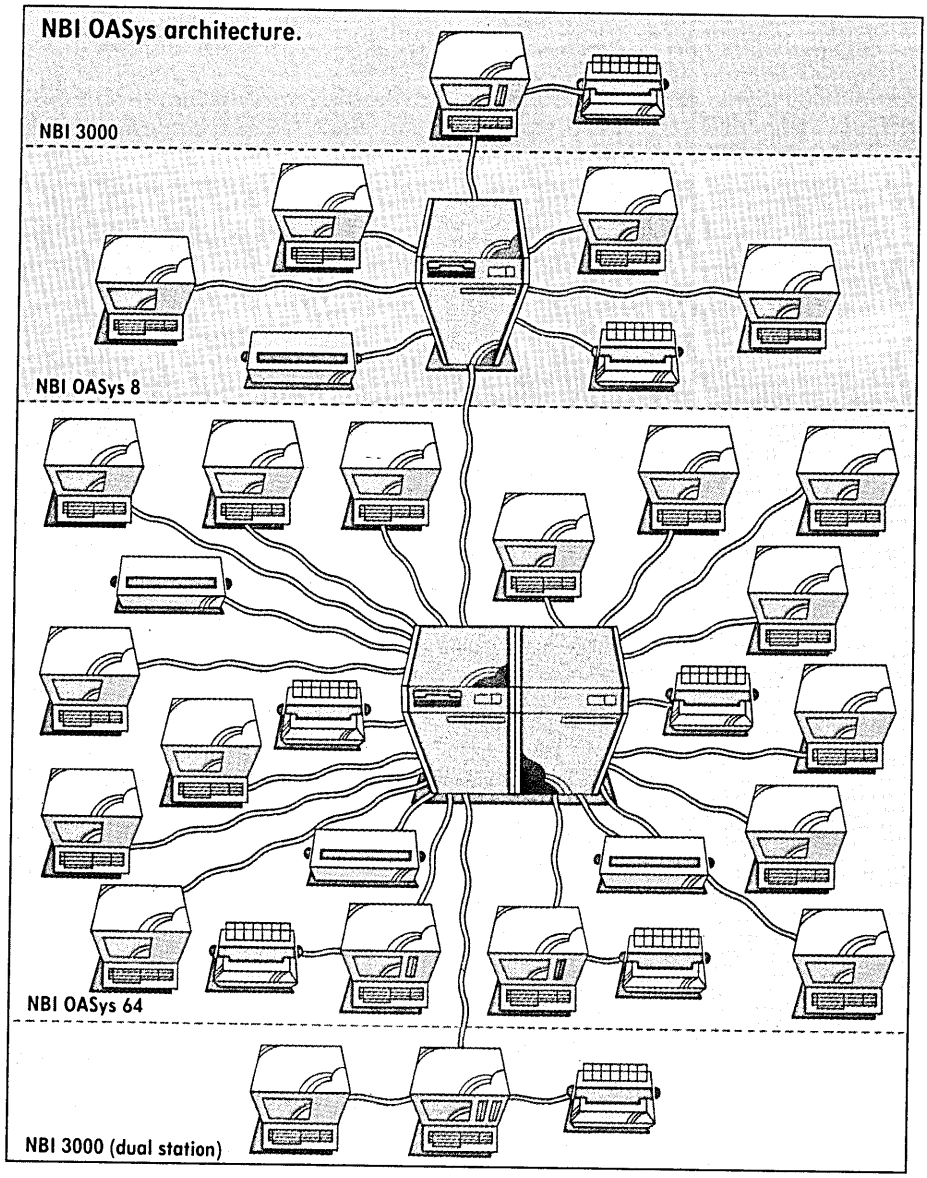
VENDOR SHARE
TOTAL SYSTEMS

PERCENT OF INDICATED SPENDING
(IN DOLLARS)



CHARTS BY CYNTHIA STODDARD

NBI MADE WORD PROCESSING OBSOLETE TODAY.



What the Office Automation System of the future looks like today.

With the advent of the NBI Office Automation System (OASys), the old concepts of word processing are suddenly obsolete.

NBI OASys provides office automation solutions that can't be outgrown. Because it grows as your needs grow, and allows you to spread increased productivity throughout your office. Work-group by work-group, location by location, as needs arise. And as expansion occurs. With systems designed to fit your applications, sharing information and resources as desired.

Easily, simply, economically.

Starting with the NBI System 3000, known as the finest high-performance word processing system in the world, you add the resource sharing capability of the new NBI System 8 and 64, so you can build optimum solutions to your office automation needs. They all use the same powerful operating software, while taking advantage of new breakthroughs in information and text management techniques.

NBI OASys gives you the advantages of stand-alone dedicated systems, plus the benefits of shared resource systems, combined into truly integrated office information networks. Without the high-costs, operational delays, and reliability problems associated with old-fashioned shared logic systems.

It's the perfect combination of capabilities and simplicity.

For more information, call us toll-free at 800/525-0844. In Colorado, call 303/825-8403.

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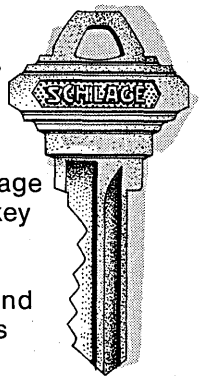
LIFTING AMERICA FROM UNDER THE PAPER WEIGHT.

SCHLAGE

The Name You Know For Access Control

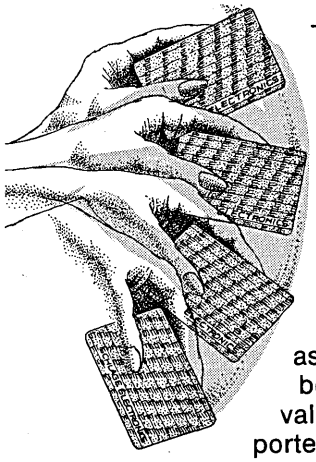
A half century of leadership in security.



For over 50 years the name *Schlage* has been recognized around the world for the highest quality in locks and keys. The Schlage name stamped on the distinctive key has become a symbol of reliability and craftsmanship. The Schlage standards and reputation are behind the world's most advanced access control system.

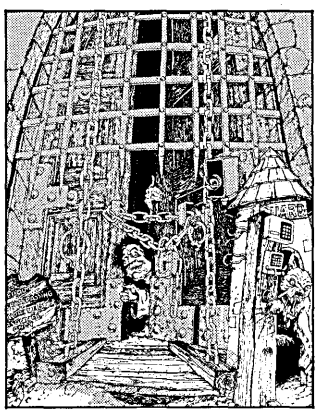
This is another type of "Key"!

Just as the conventional Schlage key unlocks doors, so too does the revolutionary Schlage Electronics "command key." The "command key," however, requires no keyhole. It operates without card slots or push buttons. Simply hold a valid electronically coded card within close proximity to a hidden sensor and the entry point is instantly activated. The command key is almost as personal as your fingerprint and both valid entry and invalid attempts are reported and keys can be programmed for specific access points and time periods. There is a Schlage electronic access control system for from 1 to 32 doors, gates or control points and for up to 8,000 employees! Moreover, the system not only controls critical access areas, but can also monitor and report on fire and burglary alarms, parking and a myriad of other applications.



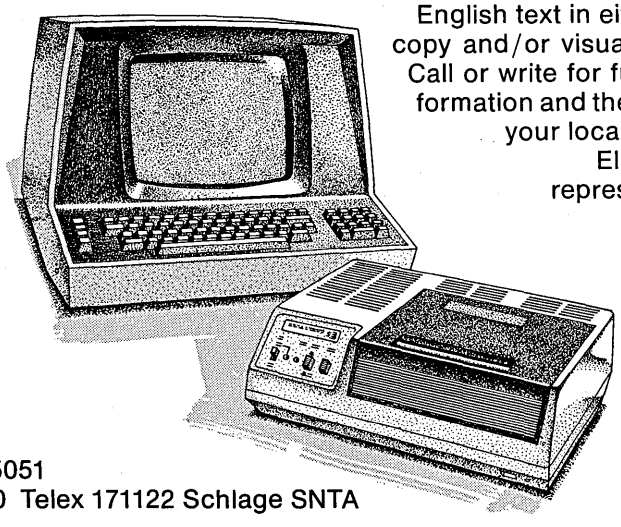
The Schlage "systems" concept takes the nightmares out of access control.

When Schlage introduced the solid-state reliability of the proximity concept, we enabled users to customize an entire security system, rather than resort to a piecemeal purchase of hardware. Thousands of successful installations throughout the world have greatly enhanced security and provided needed operational data. The Schlage system's ease of installation has reduced the monstrous costs, too. A single coaxial cable connects the "vandal-resistant" sensor to the control unit located in an interior secure zone. Sensors may be installed in walls, on plate glass or external surfaces.



Easy to program and change.

The basic system consists of command key, sensor and control unit and can be integrated into existing or planned security and environmental systems. Programming is flexible to the user's needs and reporting is communicated in easy-to-read English text in either hard copy and/or visual display. Call or write for further information and the name of your local Schlage Electronics representative.



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Thanks to the memory

You can forget your labeling problems.

Meet the Weber *Legitronic II,* the newest member of the Weber family of electronic printing systems. The computerized label printing system that does something remarkable. It remembers.

The floppy disk remembers

Floppy disk memory. That's the heart of the *Legitronic II.* It lets you create and store a multitude of label formats and data to use whenever you want. And you only store the data once. It's simple and efficient. No more labeling delays. No more needless waste of labor and money. That's good to remember.

Don't forget, we wrote the program

That means you don't have to. Its question/answer prompting and proportional label format make operator training easy. If they can read and type, they can operate the *Legitronic II.*

Remember the name

The Weber *Legitronic II.* From the people you've trusted for quality and innovation in label printing systems for nearly fifty years.

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The Labeling Specialists

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CIRCLE 204 ON READER CARD

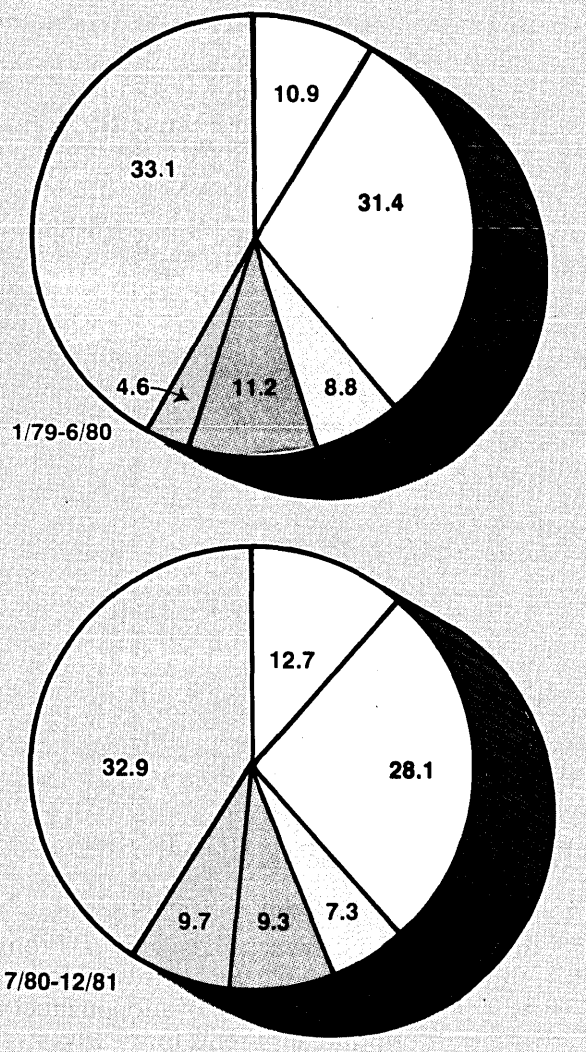
Respondents expected to buy close to 8,000 minicomputers in 1980/81.

FIG. 4

LOYALTY SHARE

SMALL BUSINESS SYSTEMS

PERCENT OF INDICATED PURCHASES (IN DOLLARS)



- DEC and Honeywell gaining share in the small business systems segment of the marketplace, per the survey
- Others gaining share in the context of the survey:

  Wang (3.2% up from 2.9%)

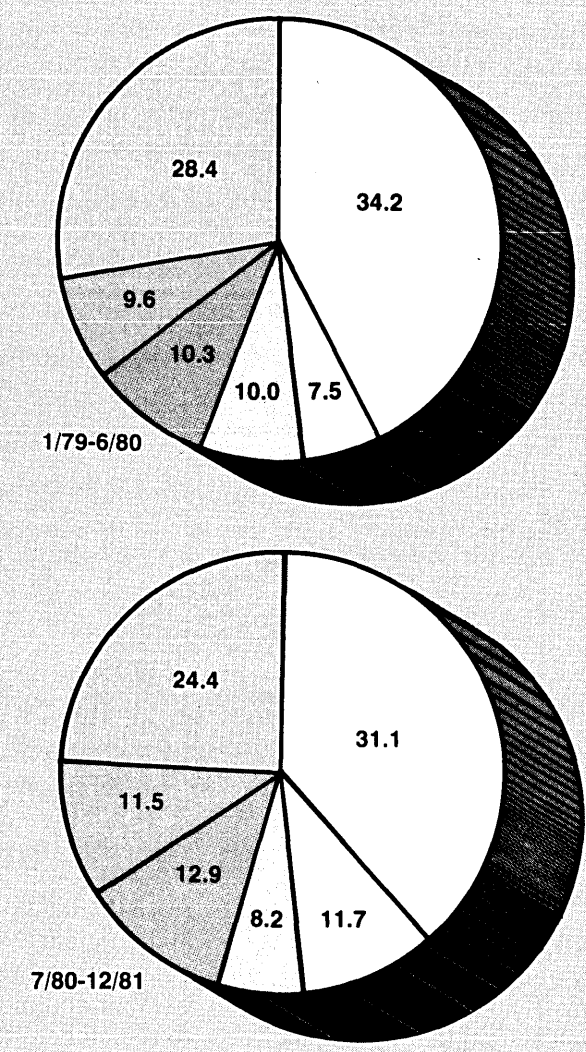
  Texas Instruments (6.4% from 3.1%) reflecting large hotel/motel volume purchase

FIG. 5

LOYALTY SHARE

TRADITIONAL MINIS

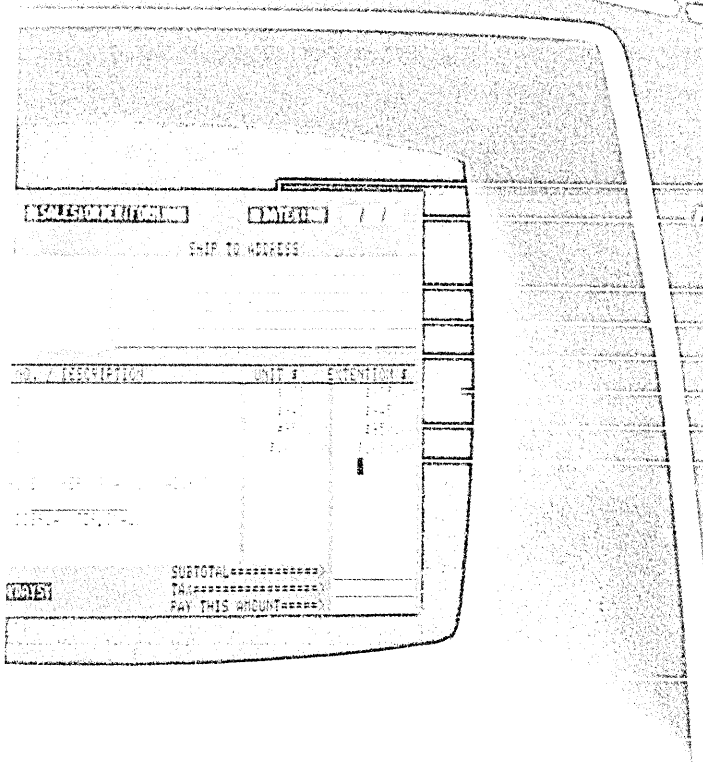
PERCENT OF INDICATED PURCHASES (IN DOLLARS)



- Growing share indicated for IBM and Honeywell parallels trend shown for total systems
- Tandem also gaining share in the context of the survey (3.7% up from 1.7%)

COMPARE SMARTS.

INTEGRAL MODEM NOW AVAILABLE*



Features for features our smart CRT terminals cost less than *their* dumb ones. Much less. Compare smarts. Then compare price. You'll pick TeleVideo.

Four different models to choose from. Data with features you'd expect to pay extra for. But with TeleVideo, they're standard.

We put a lot of engineering savvy into our CRTs. Their modular design means high reliability. It also lets us build in high volume. And sell to you at low prices.

Find out how you can make your next CRT buy a smart one. Contact TeleVideo today for information.

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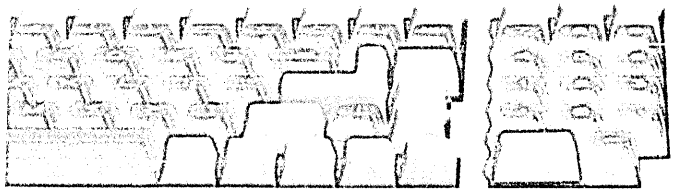
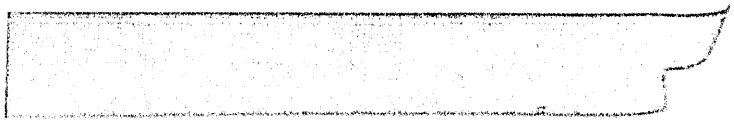
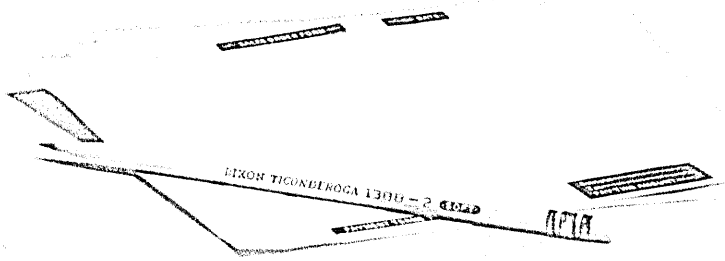






Micro-computer data base management at its best!

Get the most out of your micro-computer. Use our advanced and productive data management system.

HDBS is an extended hierarchical data base system offering
- fixed length records
- file-level read/write protection
- one-to-many set relationships

MDBS is a full network data base system offered as an upgrade from HDBS...or it may be ideal as your initial system. **Unique and versatile,** it adds these features:
- full network CODASYL-oriented data structures
- variable length records
- multiple levels of read/write protection
- one-to-one, many-to-one, and many-to-many sets
- non-redundancy of data, easy updating
- occurrences of a record type may own other occurrences of the same type
- a single set may have multiple owner and member record types

MDBS-DRS. As an add-on to MDBS, the DRS system offers extraordinary flexibility in data base restructuring to meet new needs.
- Item, record, and set types can be added, deleted, or renamed in an existing data base as well as other data base characteristics. You can redesign the data base after it is already on-line!

MDBS-RTL. As an add-on to MDBS, the RTL (Recovery Transaction Logging) logs all data base transactions, so that in the event of a system failure, the data base can be recovered with minimal loss of information.
- The recovery processor permits selective reloading of the data base from the transaction file. Users can log messages, indicate complex transaction sequences, and effect selective control over the recovery process.

MDBS-QRS. An interactive Report-Writer/Query-System for HDBS/MDBS data bases. Features...
- may be customized for non-technical users
- complex retrieval conditions may be specified
- detailed reports can be quickly generated
- wildcard and "match-one" string specifications included

HDBS and MDBS Packages Include:
- DDL data definition language analyzer/editor
- 260-page users manual
- DMS data management routines callable from host language
- Sample application program and DDL files
- Relocator to re-org all routines
- System specific manual for bringing up our software

Both HDBS and MDBS Systems...
- Run under...
  CP/M® with CBASIC; Microsoft BASICs, FORTRAN or COBOL; InterSystem PASCAL/Z; Sorcim PASCAL/M; Micro Focus CIS COBOL; Digital Research PL/I
  OASIS
  TRSDOS and NEWDOS (Models I and II) with Disk BASIC
  North Star DOS with North Star BASIC
  Apple DOS and Applesoft BASIC
  Machine Language Interface available on all above systems.
- Up to 254 record-types definable in the data base; each record-type may contain up to 255 item-types; each item-type may be up to 9,999 bytes in length.
- Names of data items, records, sets, and files are wholly user definable.
- Commands to add, delete, update, search, and traverse the data base.
- Straightforward use of ISAM-like structures.
- Records can be maintained in several sorted orders.
- Written in machine language for maximum execution efficiency and minimal memory usage.
- Independent of types and sizes of disk drives. Support data base spread over several disk drives (max.8); disks may be mini- or full-sized floppies or hard disks.
- Available versions: Z80 (requires approx. 18K), 6502 (approx. 30K), 8080 (approx. 22K)
  Total memory requirement must allow for buffer areas. For Apple users, a language card is recommended.
- 8086 version available. (Call or write for details and prices.)

Ordering information (applicable to Z80, 8080 and 6502 versions):

HDBS (Version 1.04)	$ 300.00
MDBS (Version 1.04)	900.00
DRS	300.00
RTL	300.00
QRS	300.00
HDBS upgrade to MDBS	650.00
MDBS with DRS, RTL, and QRS	1500.00
HDBS/MDBS Manual	35.00
DRS Manual	5.00
RTL Manual	5.00
QRS Manual	5.00
System Specific Manuals (each)	5.00

Within a given operating system, add $125.00 for each additional language selected.

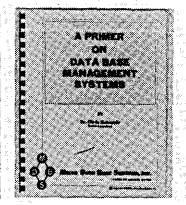
For prices outside the U.S. and Canada, please ask for price lists.

Add $2.50 handling fee for non-cash order ($5.00 outside U.S.).

When ordering, specify intended use with...
1. North Star DOS and BASIC
2. CP/M® - CBASIC
3. CP/M® - Microsoft BASIC 4.XX
4. CP/M® - Microsoft BASIC 5.XX
5. CP/M® - Microsoft BASIC or FORTRAN Compiler
6. CP/M® - Microsoft COBOL-80
7. CP/M® - InterSystem PASCAL/Z
8. CP/M® - Sorcim PASCAL/M
9. CP/M® - Digital Research PL/I
10. CP/M® - Micro Focus CIS COBOL
11. TRSDOS/NEWDOS and TRS Disk BASIC (Models I and II)
12. Apple DOS and Applesoft BASIC
13. OASIS
14. Machine Language Programs (Specify operating system.)

Indiana residents add 4%.

We accept Visa and Master Charge.



54-page "primer" on data base systems for micro-computers — only $10.00 per copy.

Dealer Demo-Package ($60.00) includes Primer, HDBS/MDBS Manuals, Demo-Disk, etc.

Setting standards of excellence for data base software...worldwide.

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The new Phoenix facility is scheduled for completion in early 1981, which means you can be in on the very beginning of a totally new career adventure. Invest in your future now by joining our Northlake, Illinois staff in preparation for the move to Phoenix next year, or by exploring positions immediately available in Phoenix.

At GTE Automatic Electric Laboratories, you'll find a comprehensive salary and benefits package along with tremendous potential for advancement. To find out more about the opportunities in GTE and Phoenix, Call collect at (312) 681-7730 or forward a detailed resume to: Manager, Technical Employment, GTE Automatic Electric Laboratories, 400 North Wolf Road, Northlake, Illinois, 60164.

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CIRCLE 207 ON READER CARD

The primary demand for personal computers continued to come from organizations.

FIG. 6

LOYALTY SHARE

OEM/SYSTEMS HOUSE

PERCENT OF INDICATED PURCHASES (IN DOLLARS)

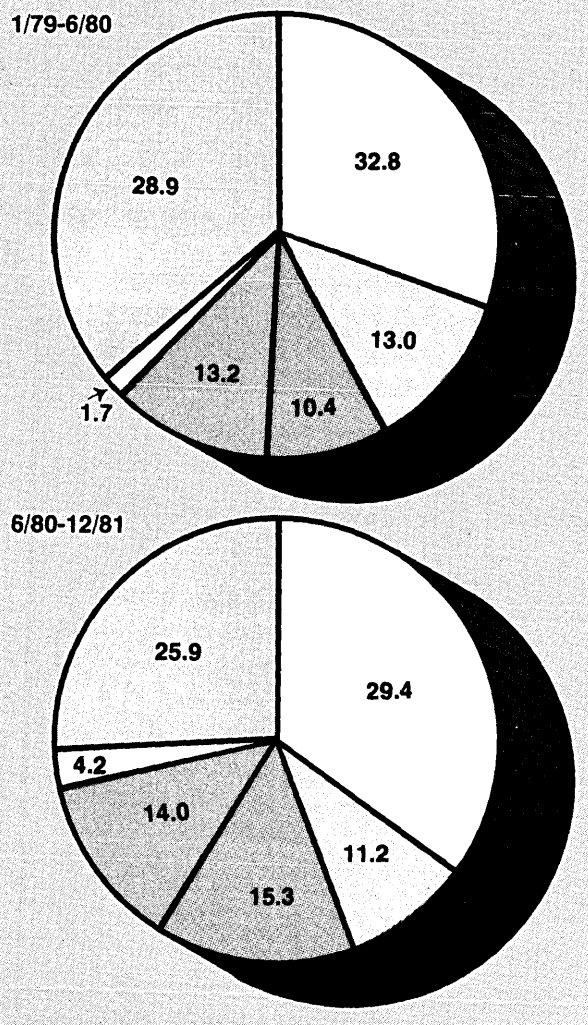


FIG. 7

370/COMPATIBLES AND MINIS

Query: What, if any, consideration has your organization given the use of low price IBM or IBM-compatible systems (e.g., IBM 4300, Magnuson, Two Pi) as a future alternative for your minicomputer applications?

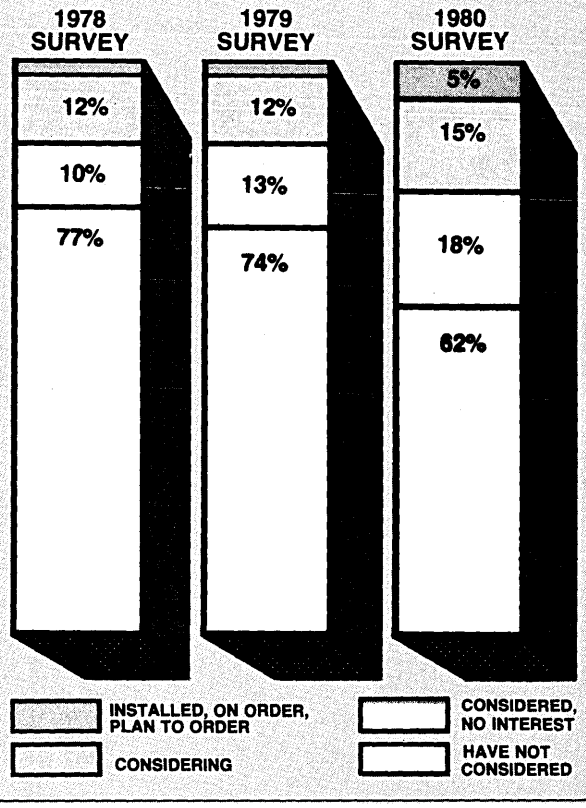
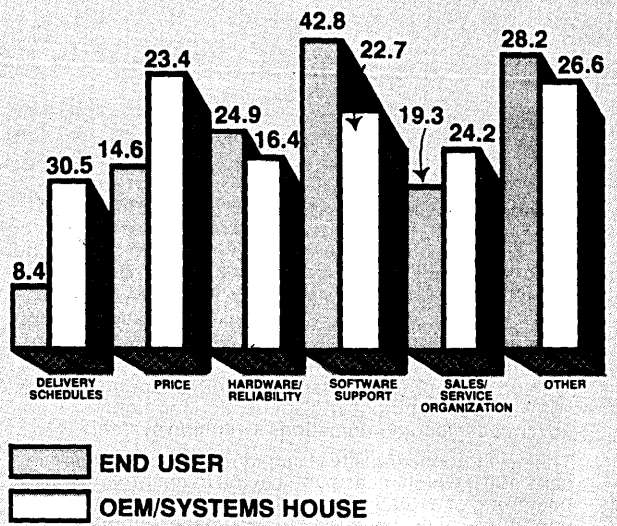
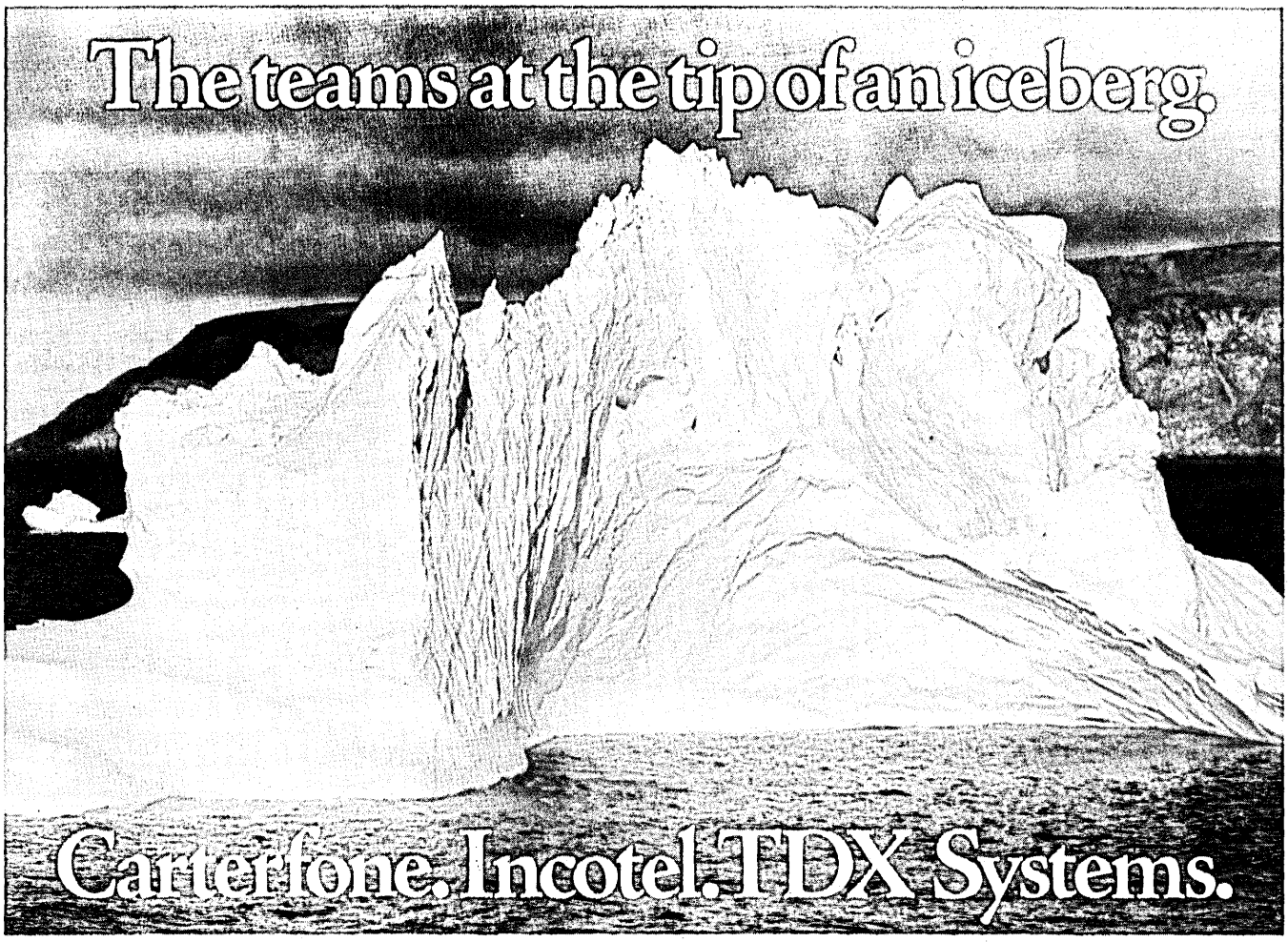


FIG. 8

SWITCHING REASONS





Computer terminals.
Carterfone is a leading supplier of top quality computer terminals. A wide range of versatile products, competitive pricing and a network of 45 sales and service outlets across the nation ensure that Carterfone terminals meet the demands of business and industry.

Message switching.
Incotel designs and installs standard and customized message switching systems. These are supplied to international and domestic carriers and large business corporations. And to meet increasing market needs, a new range of smaller switches is also available.

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Cable & Wireless is one of the world's largest international communications groups, and its expertise spans the entire globe. In over 70 countries, Cable & Wireless has provided all types of specialist communications systems, including the operation of national telephone systems in 13 countries and the public networks in 31 countries.

The Cable & Wireless connection.
What does this mean for you?

Quite simply, it means that when you deal with Carterfone, Incotel and TDX Systems you're not just dealing with specialists in the American telecommunications market.

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Cable & Wireless
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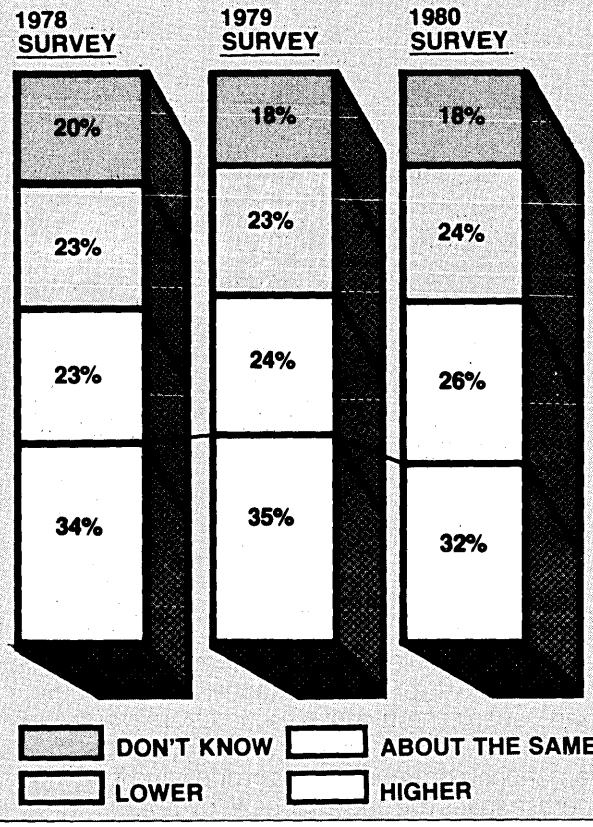
End-user respondents expressing buying intentions for the upcoming 12 months planned to spend 15% more on average per site than they spent the previous year.

FIG. 9

DOWNTICK IN USER SPENDING

Query: As you envision your organization's needs a year from now, how would you expect your minicomputer purchases in the ensuing 12 months (7/81-6/82) to compare with the prior 12 months (7/80- 6/81)?



"I'm going out of my way to be rude. I'll be back tomorrow!"

©DATAMATION

FIG. 10

CANCELLATIONS AND DELAYED DELIVERIES

Query: In view of the weakening U.S. economy, has your oganization delayed or canceled any order(s) for minicomputers previously scheduled for delivery (in 1980)?

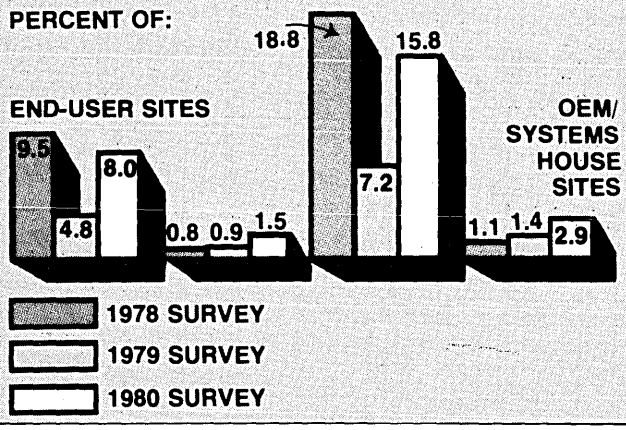
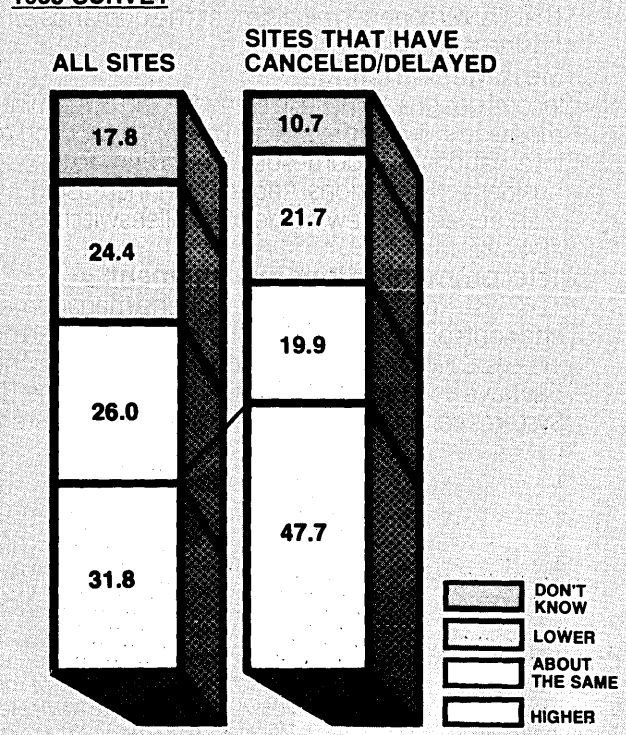


FIG. 11

SEEDS FOR RESURGENCE SOWN IN DELAYS

Query: As you envision your organization's needs a year from now, how would you expect your minicomputer purchases in the ensuing 12 months (7/81-6/82) to compare with the prior 12 months (7/80-6/81)?



CARTOON BY HENRY MARTIN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CIRCLE 212 ON READER CARD

PEOPLE

MAN ON THE RUN

"I'm thankful to have grown up in an industry that is not archaic like the railroad, auto, or steel industries," says Richard J. Schineller, president and ceo of Decision Data Computer Corp. "The computer industry is one of the few frontiers that still exist."

Schineller, who was elected last March to head the Horsham, Pa., supplier of computer peripherals and data communications equipment, is a lean, athletic 45. After a couple of decades in the industry, he still speaks about it with lively enthusiasm.

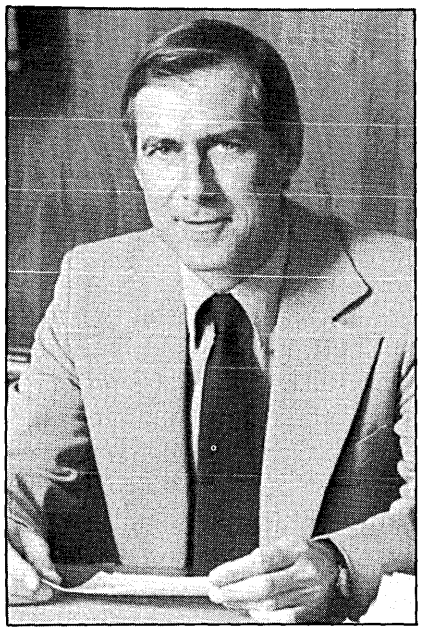
"Computer people are faster, work harder," he asserts. "They have inventive minds and are enamored with the industry. It's the kind of business that should attract young people, people who want to take pride in their jobs."

As a youth, Schineller was attracted to the idea of computers, the reason he joined IBM in 1955. He was studying engineering at the University of Maryland, and "the whole field of electronics intrigued me," he says. "IBM was intriguing, too. They weren't doing much in computers then, but such equipment was talked about. The attractiveness of the work was that it held an aura. It was only an aura, because at that time IBM and other companies had only accounting equipment.

"But," he smiles reminiscently, "there was a promise of things to come. Logically, the field would be growing."

After nearly 10 years with IBM—from salesman to field manager—computer products began to appear. He moved to Management Assistance, Inc. (MAI) in 1965, and in three years with that company went from branch manager to regional manager of new products to vp, customer services. He moved on to Leasco Computer, Inc., as vp, technical marketing; to Potter Instrument Co. as vp, customer services; to Sorbus, Inc., as president; and then back to MAI as executive vp, domestic operations.

With his obvious managerial ability, would he have been a manager in another industry? "Good management," he considers, "is generally transferable, but the computer industry is innovative. To be involved in a stale industry would have been frustrating."



RICHARD J. SCHINELLER—Discipline comes first, then creativity.

But, he says, he worries that the industry will not continue to carry the lead. "I would like to see more opportunity for innovative development. The pressure the industry faces is that significant technological developments are no longer kept proprietary for three or four years—they become general property very quickly."

He explains, "Our economy is short-sighted. Formerly, when the government sponsored research, even though the investment was a huge one over 10 years, the impact of what was developed more than paid back the investment. There was feedback in such things as greater employment, broader use of the initial invention—as in space age technology.

"Nor is this country sole master of mass production techniques," he adds. "Japan is only one year behind us; seven or eight years ago they were three years behind. Their government and industry support research, and they are satisfied with a 4% to 6% return on investment. In another year our imports will be up 50% while our industry exports will grow only 20%. In 8 to 10 years there will be a crossover." He considers, "I'd like to see government more sensitive to industry so that we maintain a very positive export balance."

Schineller, speaking effortlessly, sounds like a teacher. "I did some informal teaching in the Air Force, which I joined after high school. I taught IFF equipment to NATO pilots."

He was born and grew up in Manhattan, but spent his years in the service in such places as Tripoli, the Philippines, and Greenland. His traveling didn't stop, but his enjoyment of it did after those first few years. He has traveled through most of Europe as well as in Morocco, Egypt, and Israel, but he rarely has time to go sightseeing in countries he visits.

"I was in San Francisco eight times before I saw anything of the city," he laughs.

Because he has always worked long hours and traveled "a heck of a lot," Dick Schineller "wasn't always sensitive to the needs of my family." (He and his wife Eileen have five children—the youngest 13, the oldest 20.) "Only in the last five years have I realized the importance of balancing family and work. I used to drive too hard. I first thought I worked hard for my family, but then realized I was doing it for me, too." He reflects momentarily, "Interestingly enough, now that I plan my family involvement, I find I am more productive in both aspects of my life."

Schineller admits to having been a track man—he still looks it—but now runs only a month or so a year, on vacation. But his whole family enjoys swimming and skiing.

When Schineller joined Decision Data, he chose to commute weekly from his home in Bronxville, N.Y. to Pennsylvania rather than break up his family's lives. "I work 12-hour days, and then just go to my apartment. But this makes my weekends at home more meaningful."

Schineller enjoys working with people. "I like to help raw talent develop and find direction, and I also like to free heavily disciplined people. I'm a traditionalist as far as the work ethic goes," he confesses. "I like people to commit themselves to their jobs and do them well. I like being involved with firebrands—I like to support creative minds, provided they do their jobs first and then create."

At Decision Data, Schineller wants to see a broader product spectrum, to encourage development of a greater variety of devices pertaining to new systems. He already has achieved two of his aims: a strong customer service department and third party maintenance.

—Florence Lazar

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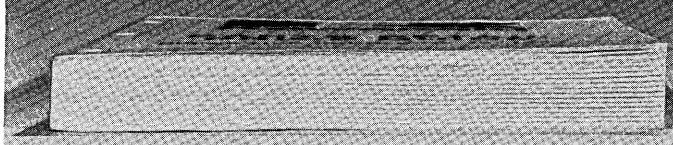

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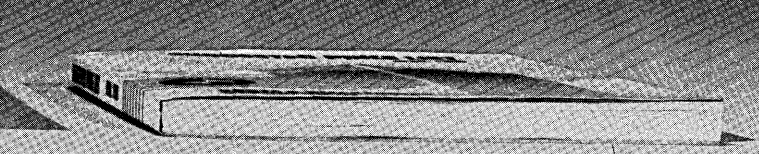

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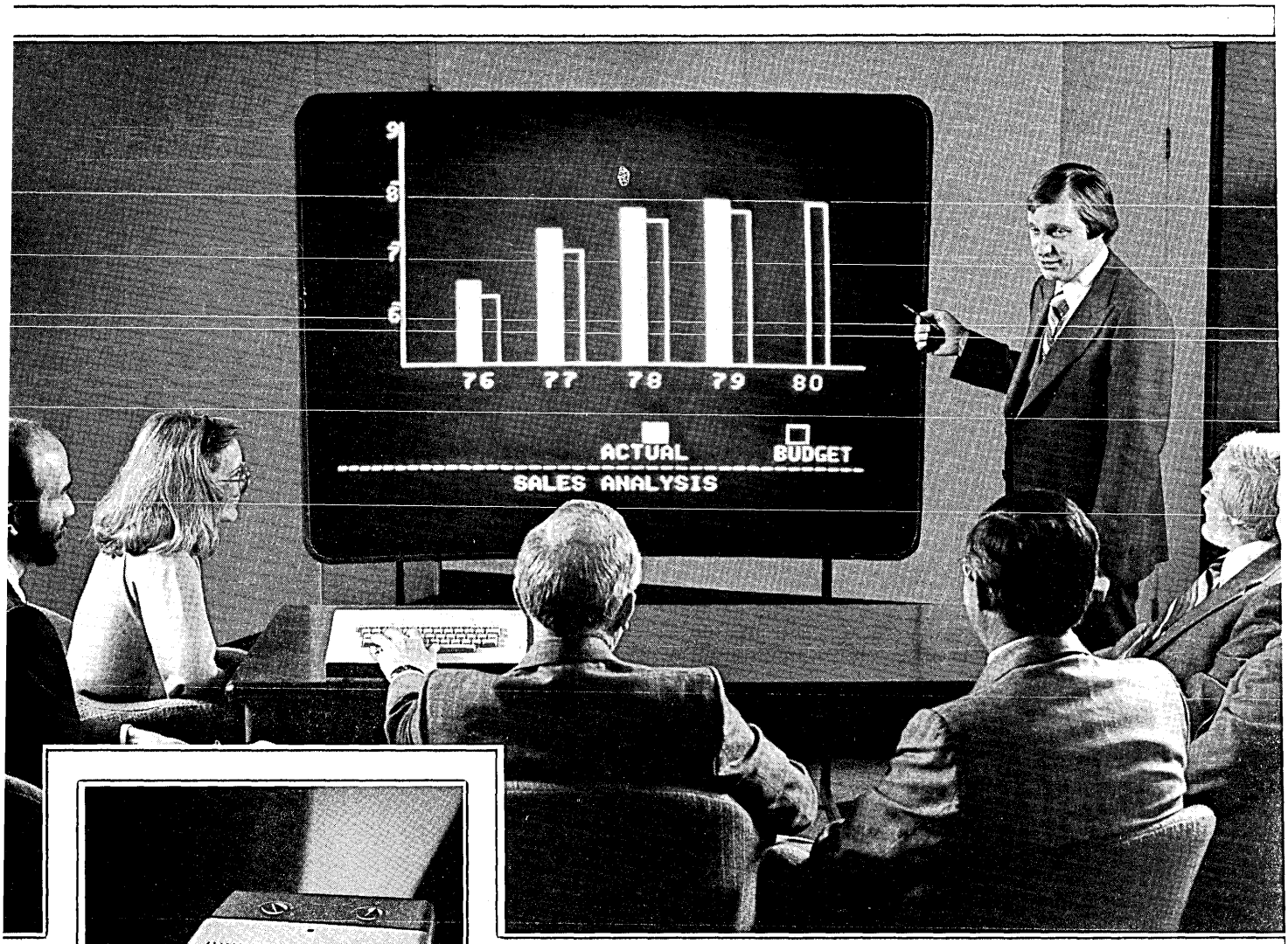

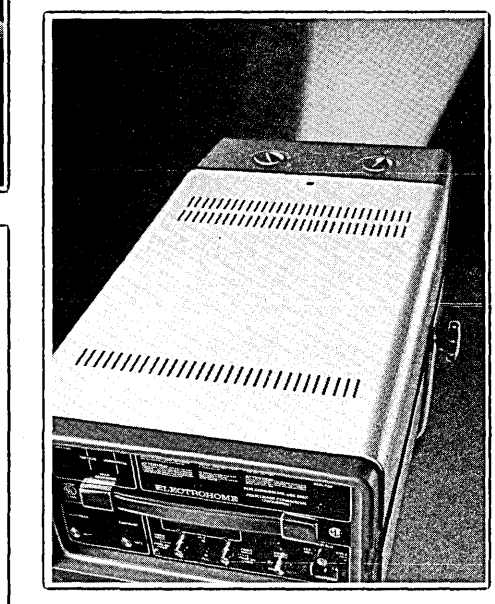

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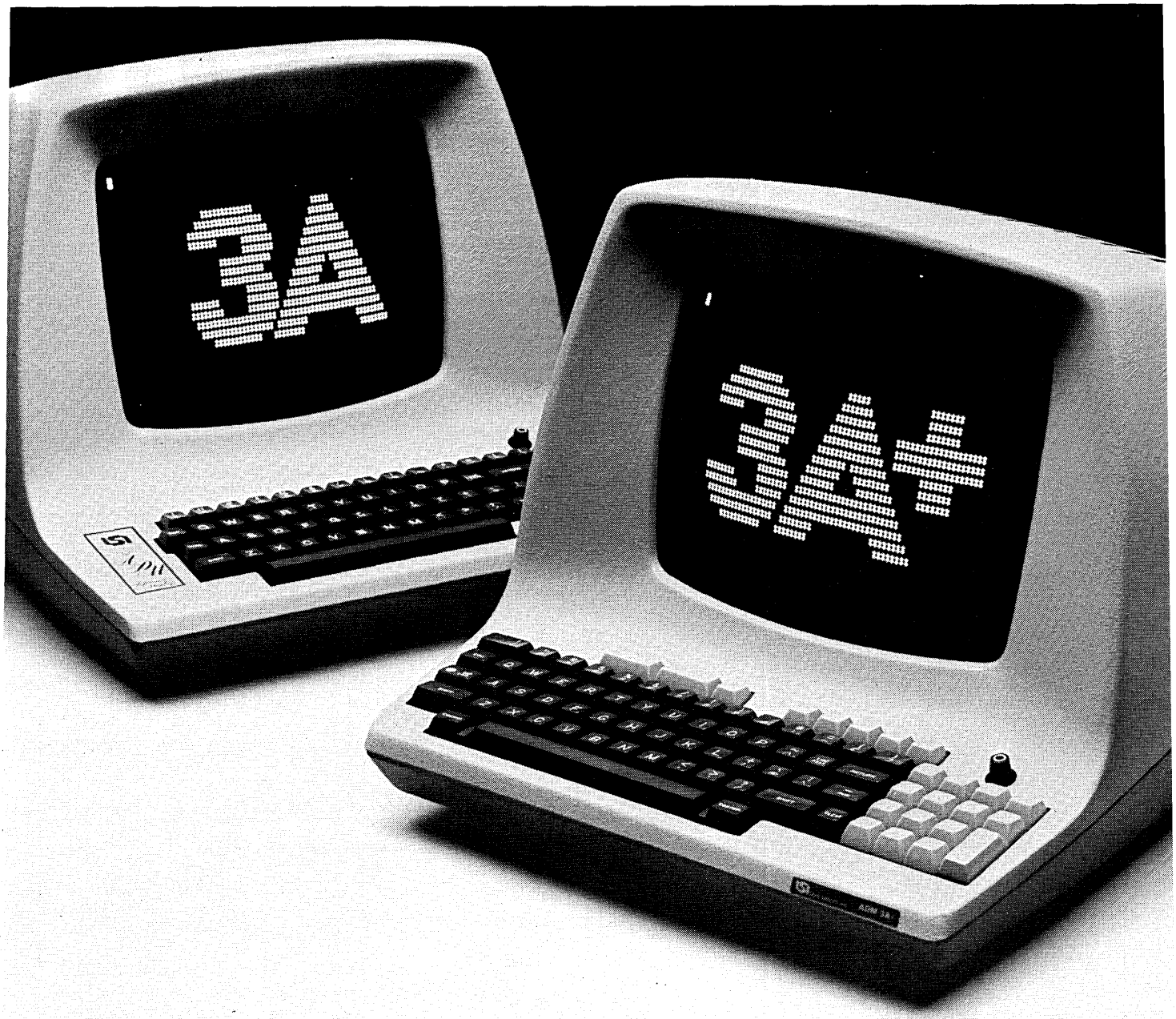

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CIRCLE 215 ON READER CARD

HARDWARE

OFF-LINE

Datapoint, one of the early contenders in the integrated electronic office market, has established an Office Systems Group to pursue that market. Headed by Dan A. Hosage, now vp and group executive, the OSG is chartered to plan, develop, and manufacture voice communications, word processing, and electronic message systems, as well as related peripherals, printers, displays, and graphic equipment.

A study from Venture Development Corp., Bubble Domain Memories II: A Strategic Analysis, concludes that bubble memories are here to stay, unlike some earlier exciting but ill-fated technologies (e.g., plated wire and planar thin film memories). The study points out that prices haven't fallen as originally planned, and identifies the problem as one of production. Manufacturers encountered some unexpected problems that delayed the original time schedule. The study adds that in the field, bubble memories "are performing beautifully in commercial applications."

Propelled by its evolution from mechanical to electronic technology over the past 10 years, NCR seems to have "the most sharply focused expansion strategy" of all the major mainframers, according to International Market Research of Norwalk, Conn. NCR's plans focus entirely on several major data processing markets, in addition to its traditional retail and banking business, says IRD.

VAX ADD-IN MEMORY

Dataram has developed add-in memory for the Digital Equipment VAX-11/780 32-bit computer offering 512KB on a single board (twice the capacity of DEC's M8210); a 256KB module also is offered. Built of 16KB dynamic RAMs, the DR-178S has a read access time of 250nsec (530nsec for the complete read cycle) and a write cycle time of 1,100nsec. The board includes the extra bits needed for error correcting, and it is used in conjunction with DEC's memory controller (M8213), memory data path (M8212), and memory SBI controller (M8214). DR-178S memory modules can coexist with standard DEC memory boards. Due to the handwired memory select circuitry used in the VAX memory backplane, 512KB DR-178S boards must be installed in every other slot, with the vacant intervening slots either occupied

HARDWARE SPOTLIGHT

DIRECT ACCESS STORAGE DEVICES

Storage Technology isn't just sitting off in the Rockies waiting for the snow to fall. The Colorado mass storage peripheral maker has responde00d to IBM's latest DASDs with comparable units that include a couple of features IBM left out; the firm also announced data streaming channel support for its solid state DASD, the 4305.

IBM announced the 3380, STC responded with the 8380. Similar specs: 2.52 billion byte capacities, data streaming transfer rate of 3MBps, and average seek times of 16msec. Both are dual spindle units, with dual actuators on each spindle. But the companies differ in their access paths to the actuators: IBM, with its dynamic path selection, allows access to two actuators at a time, but if a path fails, there goes all the data along the path; STC offers dual port access, again allowing access to two actuators at a time, but with two paths to each actuator, so a single path failure still leaves an access path to the data. And of course, as the rules of the plug-compatible peripheral game dictate, STC offers a price advantage, with prices ranging from $79,380 to $139,630 per drive (compared to IBM's range of $81,000 to $142,200).

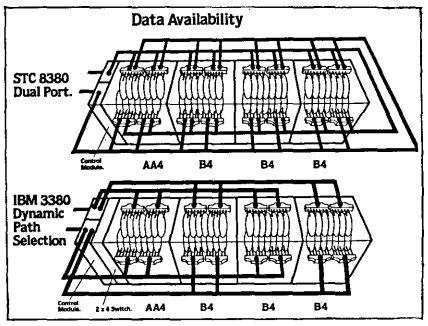
FOR DATA CIRCLE 301 ON READER CARD

To offer an alternative to the IBM 3370, STC released its 8370, a 571.3MB single spindle drive with two independent actuators having separate electronics. A Media Interchange Switch allows the actuators to be switched between either set of electronics. As with the 3370, the 8370 uses fixed block architecture. The 8370's transfer rate is 1.86MBps, with average seek time of 20msec. Available in four models—simple slave drive to master drive with control electronics and dual port feature—the 8370 line carries prices ranging from $25,270 to $46,330.

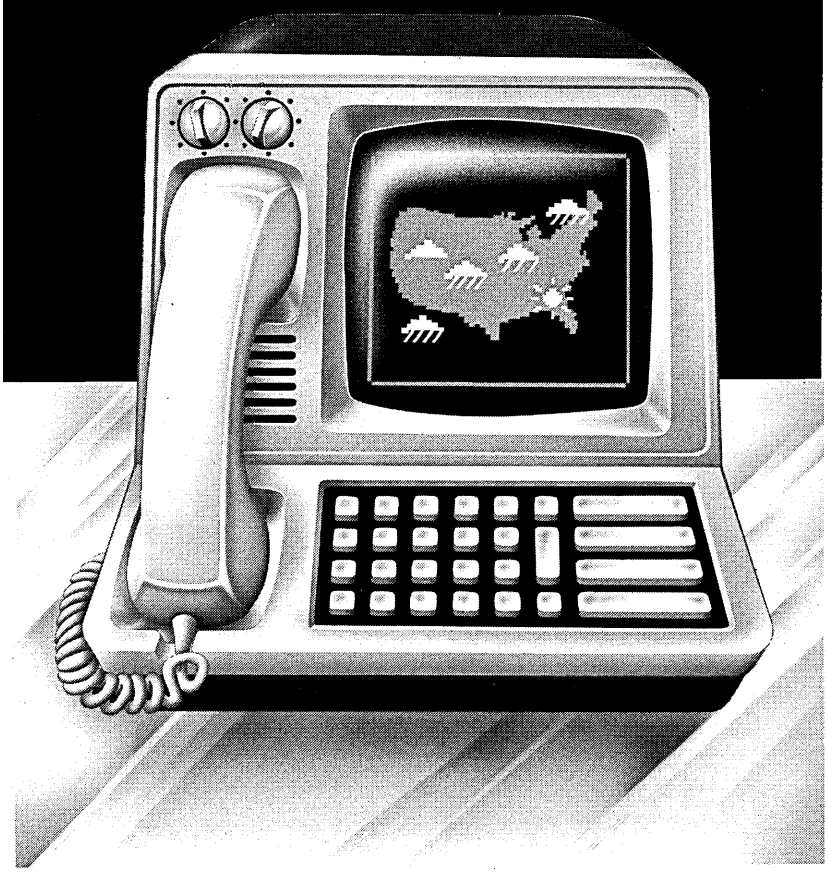
FOR DATA CIRCLE 302 ON READER CARD

Data streaming support for STC's 4305 solid state disk provides channel protocol support for 3MBps data transfers. The field-installable upgrade price is $32,655 to $87,045, depending on the configuration of the installed 4305. There is no additional fee to provide the data streaming support to installed 4305s equipped with the two-byte wide 3MBps transfer feature. STORAGE TECHNOLOGY CORP., Louisville, Colo.

FOR DATA CIRCLE 303 ON READER CARD



FRANCE INTRODUCES A NEW TELEPHONE SYSTEM THAT ISN'T ALL TALK.



As one of the first countries to recognize the future significance of an information based society, France invested some 30 billion dollars in the modernization of its telephone system and the development of a range of products based on the convergence of telecommunications and computers. This is known today as the 'Telematique Programme'.

Using the advanced technology of TDM and packet switching (Transpac), the French telephone line is being transformed into a multifunctional tool, permitting information to be transmitted in all forms: Oral, visual, and by means of the 'Telewriter', even handwritten or drawn.

Once equipped with a video screen, the telephone user will have access to Teletel (the French videotex service), offering services such as armchair shopping, reservations and electronic mail, as well as a wide range of information including entertainment, travel and even electronic directories, which will be given a 250,000 terminal trial in France during 1981. (This system is technically compatible with Antiope broadcast teletext service.)

Recently, the USA's largest computer information service for the home signed a distribution agreement for a quarter of a million of these low cost Teletel terminals over the next three years.

Another Telematique product, the digital fax terminal, will produce hard copies of the information provided by Teletel and will also serve as a low cost copier.

A further major development is the 'smart card', employing a microcomputer. The added security and intelligence this provides will be invaluable for both point of sale and Teletel home based transactions.

For the first time in the USA, the full range of these products will be demonstrated live in the 'French Pavilion' at the Intelcom '80 exhibition, opening on November 10th.

Come and take a look. You'll see that the French 'Telematique Programme' isn't all talk. It's a reality.

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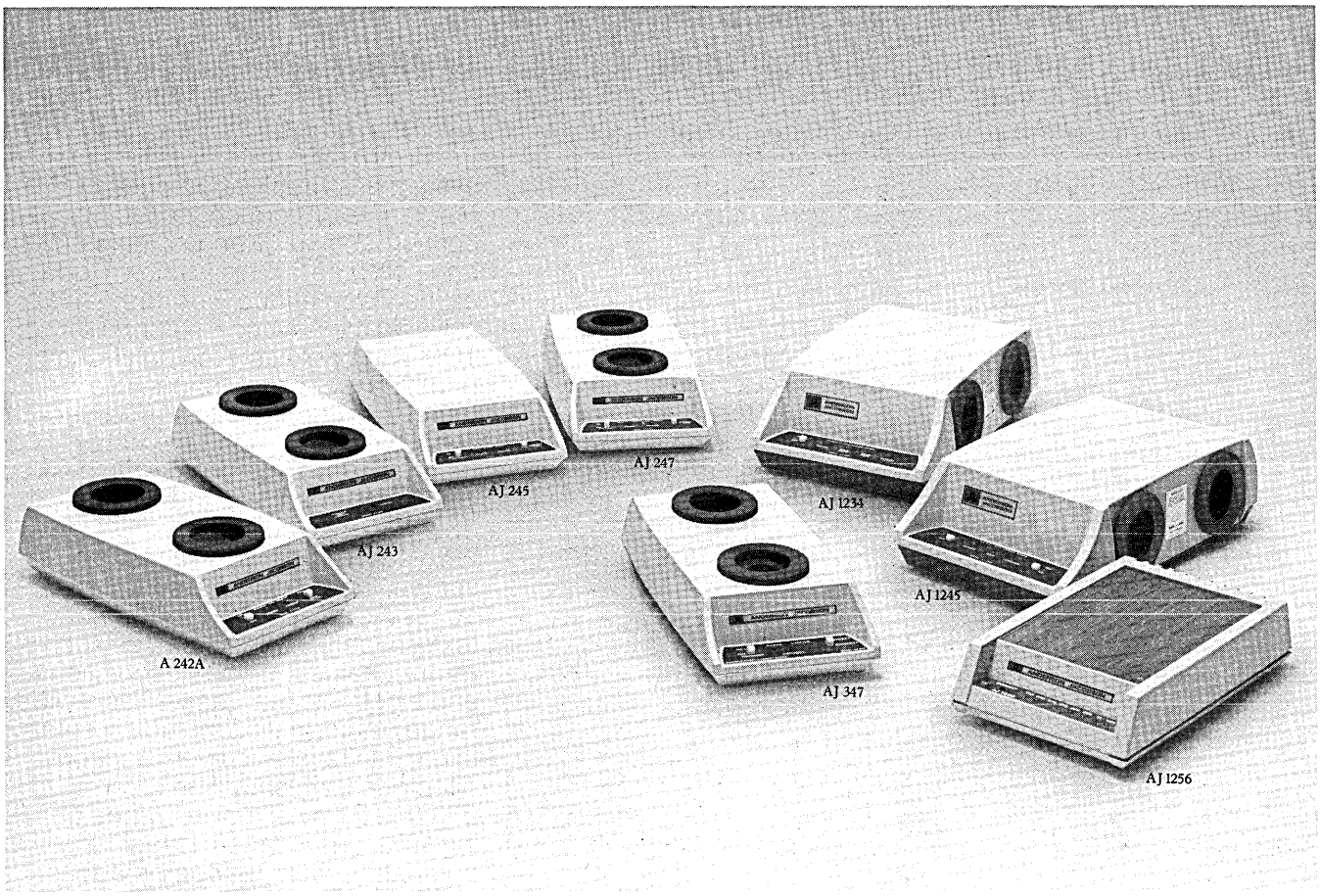

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CIRCLE 217 ON READER CARD

by a Dataram Memory Size Continuity Board (67803) or jumpered to maintain continuity. Optionally, the problem can be avoided by jumpering two pins on the memory size PROMs on DEC's memory controller. A fully populated DR-178S board (512KB) sells for $5,660, and a 256KB version goes for $3,145. DATARAM CORP., Cranbury, N.J.

FOR DATA CIRCLE 304 ON READER CARD

SMALL BUSINESS COMPUTER

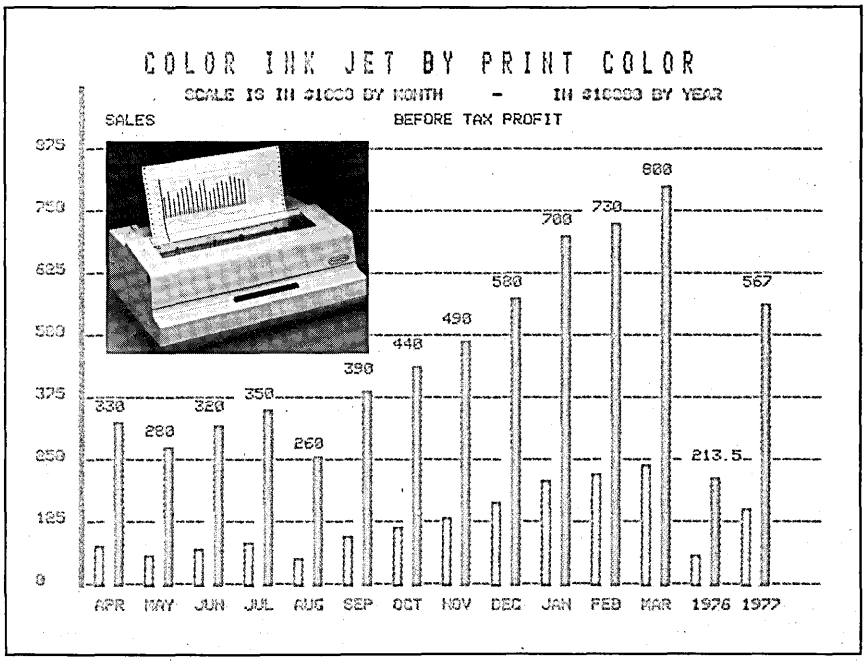
Intended for standalone as well as distributed processing applications, Burroughs' B 920 is a screen-based system built around a multiple-processor, multiprogramming architecture. The system employs from five to eight processor modules, each containing a microprocessor (of proprietary design) and its own memory. The processor modules each handle specific processor functions, and adding additional processors to the base system can result in up to a fourfold performance increase.

In the basic B 920 with five processor modules, one module provides operating control, one handles data communications, another manages data files, and two are multiprogramming task processors that compile and execute application programs. Users wanting more performance can add up to three additional processors, dedicating all three as task processors, or two as task processors and one as an additional communications processor. Each task processor can have from 128KB to 256KB of memory, and the total system memory can range from 640KB to 1.5MB. To keep the system up in the event of a processor module failure, or to tune the system for better performance in specific user environments, up to two task processors can be switched over to act as file management processors or as the system control processor.

As for peripherals, a variety of fixed and removable disks are supported, as well as three types of minidisks (floppies), mag tape units, and line printers. The B 920 can be programmed in RPG and COBOL, and the system operates with Burroughs' Computer Management System software that provides object code compatibility between the B 920 and similarly configured B 80, B 90, B 800, B 900, B 1800, and B 1900 systems. A Network Definition Language (NDL) compiler and a Message Processing Language (MPL II) compiler provide support in configuring networks. The entire system runs under the Computer Management System (CMS) master control program.

An entry-level, five-processor B 920 system, with 640KB of main memory, 44.6MB of disk, operator's console, and a 300 lpm printer sells for $60,500; the same system leases for $1,956 per month on a three-year term. Software is priced separately. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 307 ON READER CARD



COLOR INK-JET PRINTER

Getting hardcopy from a color display can be done in a number of ways. With the proper software, you can drive a color plotter. You can get photographic units from several vendors. With a sizable investment, you can get a Xerox color copier that can interface to your color terminal. And now, if you use an Intelligent Systems Corp. 8001 Series Color crt terminal, you can get a color ink-jet printer designed specifically to dump the screen of your terminal.

A founder and current vp at ISC, Charles A. Muench, has set up a new company, PrintaColor Corp., to make just such an ink-spitter. The PrintaColor IS8001 uses three ink supplies—yellow, cyan, and magenta—and can print any of seven colors by overlaying the inks. The printing head of the IS8001 has 12 ink nozzles, four for each color. Resolution is 100 dots per inch, horizontally and vertically.

An 8080 microprocessor controls bidirectional printing at up to 70cps on standard fanfold paper. The unit has a 16KB buffer, and acts as a page printer, printing only when the buffer is full. A full page represents 48-line by 80-character format of the ISC 8001 terminal. The ASCII character codes are used as in the ISC terminal, and the printer recognizes all ISC 8001 control codes including the plot function.

The printer has an RS232C interface (20mA current loop optional) with seven data rates from 110bps to 9600bps. The PrintaColor IS8001 sells for $6,000. PRINTACOLOR CORP., Norcross, Ga.

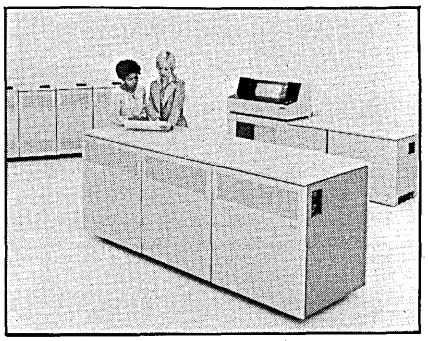
FOR DATA CIRCLE 300 ON READER CARD

MAINFRAME

IBM has come out with the 4341 Model Group 2 processor, spec'd at from 1.5 to 1.8 times the internal operating speed of the original 4341, making the new machine slightly faster than the 3031. But that may not tell the full story. The microcoded 4341 has a cycle time listed as 120nsec-240nsec (with the larger value probably representing operations such as floating point arithmetic), while the hardwired 3031's cycle is listed as a flat 115nsec. And the 3031 has twice the cache, 32KB, so relative performance is most likely application dependent. Only benchmarks will tell.

The new 4341s support up to 8MB of main memory—twice as much as the original—and high-speed channels capable of supporting the recently announced 3380 direct access storage devices with their 3MBps data-streaming transfer rates. IBM also announced that all 4341s (Group 1 and Group 2) can now use the 3279 color display and 3287 color printer as system console devices, allowing operator messages to be displayed in four colors. Operating systems for the 4341 reportedly can exploit this color capability to highlight urgent messages.

Group 2 processors come with one byte and five block multiplexor channels. Two of the block multiplexor channels can operate at 3MBps, while the remaining three can operate at up to 2MBps; the system has a maximum data transfer rate of 12MBps. Cache memory on the Group 2 has been

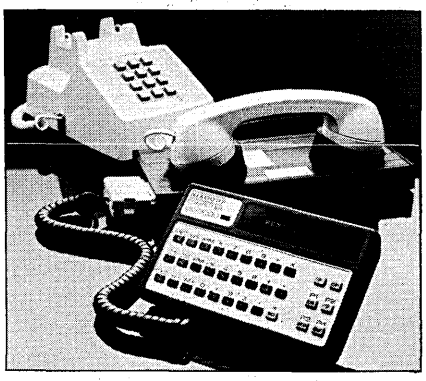


doubled to 16KB. The Group 2 processors can run under DOS/VSE, OS/VS1, VM/370, OS/VS2 MVS with the MVS System Product program products, and the Airline Control Program. Existing Group 1 processors can be upgraded to Group 2 with 15 to 23 hours of labor. Both the new processor and upgrades are to be available in the second quarter of next year. A 2MB Group 2 processor sells for $385,000, and an 8MB processor is $479,200. Two-year lease prices are $10,100 per month, and $12,620 per month, respectively. A 2MB Group 1 processor with six channels can be upgraded to a Group 2 for $110,800. INTERNATIONAL BUSINESS MACHINES CORP., Data Processing Div., White Plains, N.Y.

FOR DATA CIRCLE 308 ON READER CARD

HANDHELD TERMINAL

When Nixdorf bought the Lexicon language translator line, renaming the handheld translator the LK-3000 Personal Computer, one of its publicly avowed intentions was to provide the accessories needed to turn the LK-3000 into a portable terminal. The firm has made good on its promise with the introduction of an RS232 communications module that plugs into the LK-3000 and a companion acoustic coupler. The battery-powered LK-3000 can send and receive ASCII characters asynchronously at either 110bps or 300bps in full- or half-duplex



mode. The unit has an 80-character buffer and a 16-character scrolling LED display; users can enter messages into the buffer, review and edit the message, and then transmit the buffer to a remote computer. The LK-3000 with communications module (LK-2010) and acoustic coupler sells for $525. NIXDORF COMPUTER PERSONAL SYSTEMS, INC., Burlington, Mass.

FOR DATA CIRCLE 309 ON READER CARD

HIGH-SPEED CHANNELS

Amdahl Corp. usually seems able to respond to each IBM announcement in about the time it takes to print a new spec sheet, and the Grey Giant's recent announcement of the 3880 controller and 3380 DASDs with 3MBps transfer rates is no exception. The Sunnyvale PCM now offers high-speed 3MBps channels for all of its 470 mainframes. The V5 and V6 models can now support one high-speed channel in each four-channel group (for a system maximum of four high-speed channels), while V7 and V8 mainframes can have two high-speed channels per four-channel group (eight per system, max). The high-speed channel option adds $40,000 to the price of each four-channel group, regardless of processor. Deliveries are slated for the third quarter (V7 and V8) and the fourth quarter (V5 and V6) of next year.

At the same time, Amdahl announced its intention to support the Extended Facility Instructions in IBM's MVS/SP operating system software. The PCM's MVS/SE Assist program product will provide this support for MVS/SP Release 1 in the second quarter, with support for Release 2 scheduled for the fourth quarter. AMDAHL CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 312 ON READER CARD

OCR PAGE READER

Burroughs OCR Systems has developed an entry-level page reader (intended primarily for word processing applications) that reads 10-pitch OCR-B characters at a rate of 250 pages per hour with a reported error rate of less than one error in 100,000 characters scanned. Attractively priced at $10,900, the Burroughs 1205 features a straight-through

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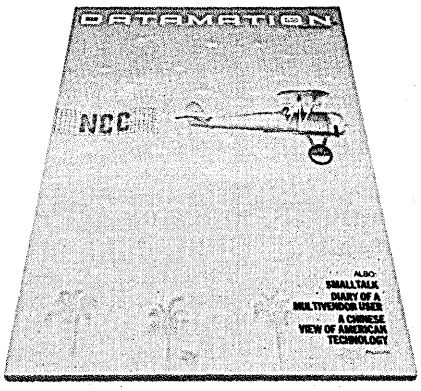

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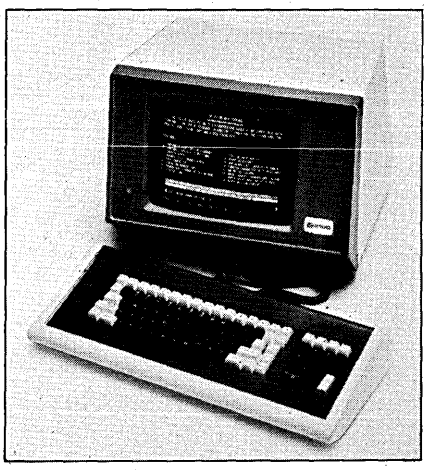
paper path and a stationary scanning head. Instead of moving the head across the page, a drum containing focusing lenses rotates at 1,800rpm, directing a light source onto the page, and redirecting the reflected character image from the page to a light-detecting sensor fixed at the central axis of the rotating drum.

The 1205's automatic sheet feeder has a capacity of 100 sheets of standard weight paper up to 8¾ inches wide and 14 inches long; paper travels through the system at a constant rate of 1.3ips. The reader recognizes both horizontal and vertical text formats, new paragraphs, and tab positions; the 1205 can be reprogrammed either by inserting a header sheet with coded instructions for formatting and editing rules, or by entering the rules from a word processor's keyboard. An error code is issued if a character is unrecognizable. The 1205 outputs scanned copy in an on-line mode, using ASCII characters and asynchronous or bisynchronous protocols. BURROUGHS OCR SYSTEMS, Burlington, Mass.

FOR DATA CIRCLE 306 ON READER CARD

CRT TERMINAL

Canada's Volker-Craig joins the ranks of terminal manufacturers pursuing the DEC VT100-compatible terminal market. The firm's VC2100 offers VT100 compatibility, and a number of additional features including double-size, double-width characters (on a per character basis), key selectable jump or smooth scrolling, bidirectional variable speed smooth scrolling, and a nonglare screen available in green or amber. Options include an RS499 interface, current loop interface, foreign keyboards and character sets, and a buffered serial



peripheral interface. The VC2100 is priced at $1,900 ($2,150 Canadian) and volume discounts are offered. VOLKER-CRAIG, Waterloo, Ontario, Canada.

FOR DATA CIRCLE 310 ON READER CARD

LARGE COMPUTER

To continue its support of the Xerox Data Systems' user base, this vendor has added extensions to its CP-6 operating system (itself an outgrowth of Xerox's CP-V), and added the large-scale DPS 8/70C computer to its line of CP-6 systems. (The DPS 8/70C is reportedly more powerful and more energy-efficient than the Level 66/DPS/B and C

models, which will continue to be sold.)

The DPS 8/70C is said to provide from 60% to 80% more performance (depending on application mix) than fully configured level 66DPS/C3 with 120 users. At the same time, the new system requires no more power or floor space. The new system sports 8K words or cache, in comparison to the 2K word cache available on its predecessors. Remote problem analysis is aided by an integral diagnostic processing unit.

Mass storage can include 1.1 billion byte disk units (two spindles and two access heads per unit) with 1.2MBps transfer rates, as well as 1600/6250bpi tape units operating at up to 200ips. A new 500cpm card reader is available for the DPS 8/70C.

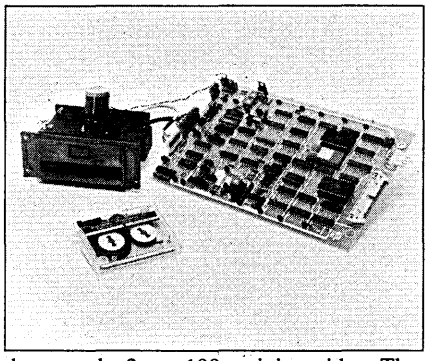
Operating system enhancements include support for the 1.1 billion byte nonremovable disk units, 6250bpi tapes, a remote communications processor, and the new card reader. A transaction processing access mode, integrated within CP-6, makes direct use of the operating system service routines; CP-6 TP does not run as a subexecutive, but rather as part of the operating system, allowing users to access to the full capabilities of CP-6, instead of a limited subset.

A typical 120-user system, with console, communications processor, 3.3 billion bytes of disk, four tape units, card reader, and two line printers, sells for roughly $2,250,000; monthly rental on a five-year contract is $65,900. Deliveries are planned for the third quarter of next year. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass.

FOR DATA CIRCLE 313 ON READER CARD

MINICARTRIDGE RECORDER

For oems needing a compact auxiliary storage device, Electronic Processors, Inc., developed the STR-610, a cartridge tape drive



that uses the 3M DC100A minicartridge. The drive records up to 168KB on each of two tracks and transfers data at a rate of 1.8KBps.

Up to four drives can be connected in a string, with the first drive functioning as a master unit providing the formatting network for the slaves. The drives control their own tape handling and timing functions, and record data at 800bpi using Phase Encoded (PE) recording. In lots of 1,000 or more, the STR-610 sells for $280 a unit, with production quantities slated for availability by year's end. ELECTRONIC PROCESSORS, INC., Englewood, Colo.

FOR DATA CIRCLE 311 ON READER CARD

DISK DRIVE

Harris Corp.'s Computer Systems Div. has more than doubled the disk capacity of its previous offerings with the introduction of a 675MB Winchester drive. The new fixed module disk drive is compatible with the company's Universal Disk Controller (UDC), and can operate along with other members of the firm's storage module drive family (which include 40MB, 80MB, and 300MB units). The drive has an averge seek time of 25msec and an average rotational latency of 8.3msec, yielding an average access time of 33.3msec. Its transfer rate is 1.209MBps. The 675MB drive and UDC sells for $71,250, and additional drives go for $61,860.

A single UCD can control up to eight drives, for a total system capacity of 5.4 billion bytes. Deliveries are scheduled to start in January. HARRIS CORP., Computer Systems Div., Fort Lauderdale, Fla.

FOR DATA CIRCLE 305 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

The optical fibers -- light guides, as Western Electric likes to call them -- that will be used to carry telephone traffic under the automobile traffic of Atlanta's streets, are being produced at Western Electric's new light guide facility in Atlanta. Still under construction, the facility is a "factory within a factory," being part of a huge wire and cable plant. To maintain the critical quality required in hair-thin optical fibers, Western's scientists developed a computerized process control system that uses a laser to optically measure the fibers as they are drawn from solid glass rods called preforms. The computerized system regulates all the factors that contribute to the fiber's diameter, including the speed at which it is drawn from the preform, the temperature that heats it for drawing, and its tension.

Western Electric isn't the only outfit opening up new fiber optic production facilities. Times Fiber Communications, Inc., of Wallingford, Conn., recently inaugurated a $2 million production facility with the commissioning of a $250,000 cabling machine that can combine up to 18 fibers into a reinforced weatherproof cable. The first production run made a three-fiber cable to carry 12 television channels roughly six miles from a satellite ground station to the head end of a CATV station.

Third National Bank and Trust of Dayton and NCR have jointly developed a regional automatic teller machine network to serve a number of client banks. The setup is known as the "Green Machine Network."

GRAPHICS PACKAGE

Hewlett-Packard's Decision Support Graphics/3000 (DSG/3000) allows nontechnical personnel to create and save fully annotated business graphics. DSG/3000 runs on the vendor's 3000 Computer Systems (Series 30, 33, II, and III); charts created with the package can be displayed on either of HP's graphics terminals (HP 2647A or HP 2648A), or can be output to digital plotters, plotter/printers, or graphics printers. Most HP terminals can be used to specify graphs.

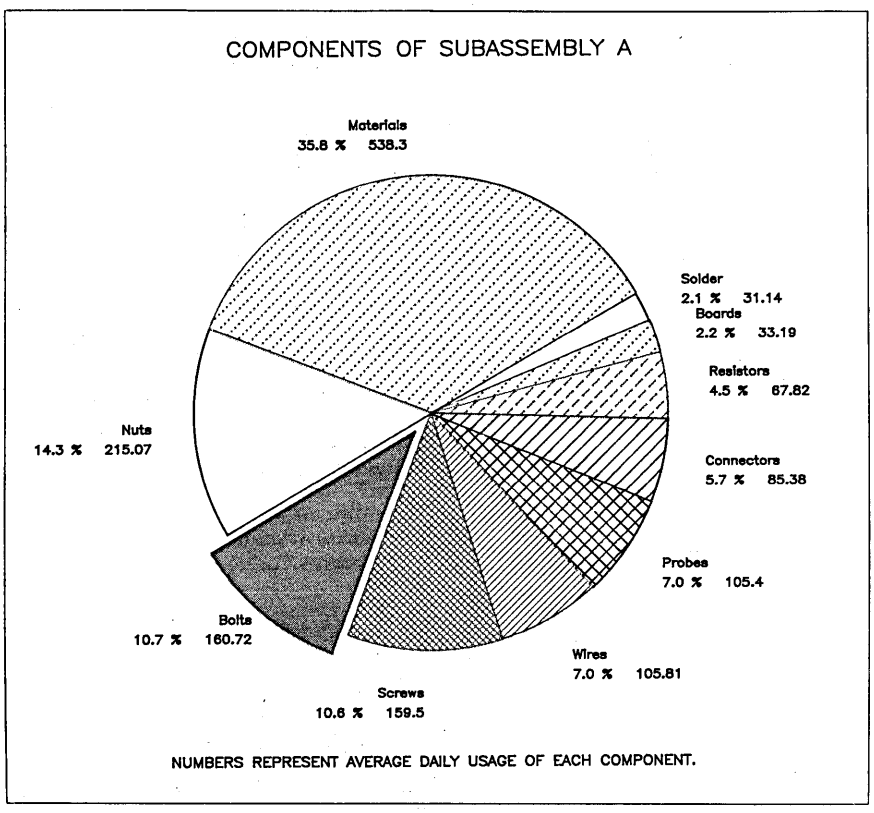
Users create graphics, such as line graphs, horizontal and vertical bar charts, pie charts, and scattergrams, through a menu-driven, fill-in-the-blanks dialogue conducted at a crt. A "help" facility aids nontechnical users; little knowledge of computer graphics is needed, since the user need only respond to a menu of choices at each step (e.g., type of graph, axis scaling, color, and positioning of captions).

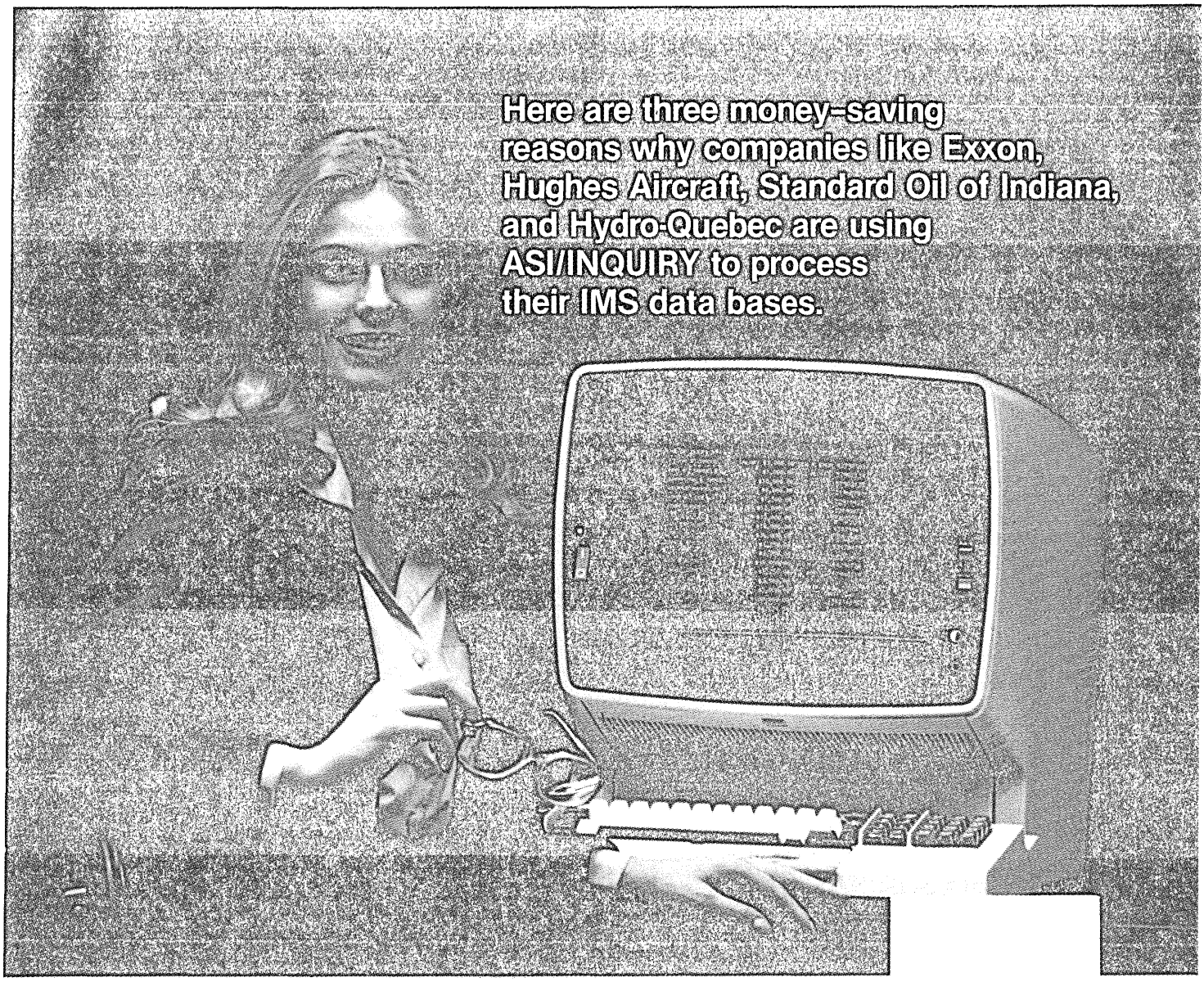
Although DSG/3000 is designed for nontechnical users, professional programmers can also benefit from the package. A set of high-level procedure calls allow programmers working in BASIC, COBOL, FORTRAN, or HP's proprietary SPL to incorporate graphics into their applications programs.

Graphics definitions created by DSG/3000 are separate from the data they depict, so new graphs can be generated from updated information. The system can dynamically alter such parameters as axis scaling and labeling, so the user doesn't have to duplicate earlier efforts when confronted with new data.

DSG/3000 has a list price of $6,000 plus $60 per month for support. A self-paced training package is offered. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 329 ON READER CARD





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SOFTWARE SPOTLIGHT

PERSONAL COMPUTER FORTH

The FORTH programming language has been described as a cross between an operating system and a programming language. Users we've spoken to seem quite enamored with the language, though not as rabid as died-in-the-wool APL fanatics. One personal computing maven praised the language, but warned that—at first glance at least—it seems rather opaque due to its use of reverse Polish notation. We know of applications ranging from astrological forcasting to mechanical device control that have been implemented in various versions of FORTH on various machines—testimony to the language's versatility. For personal computer users, here are two implementations of FORTH, as defined by the FORTH Interest Group, that should bring the language to the users of most popular microcomputers (TRS-80 users may be out in the cold unless they've invested in CP/M.)

For the Apple II

San Francisco's Cap'n Software offers a package called FORTH Version 1.7. The package includes the FORTH Interest Group language, development aids, and a 130-page tutorial manual. Additionally, a telephone hot-line service is offered to system developers. A structured macro assembler and a screen editor are provided as development tools. The system can generate disks that boot directly into the user's application program; software developers can copy and sell their programs on these disks with no legal restrictions or licensing agreements. Cap'n Software's FORTH package runs on Apple II (or II Plus) with 48KB of memory, language card, and one or two disk drives. The package goes for $140, including all documentation; multi-use and educational discount licenses are available. CAP'N SOFTWARE, San Francisco, Calif.

FOR DATA CIRCLE 326 ON READER CARD

For CP/M systems

If you've got an 8080- or Z80-based system running CP/M, Mitchell E. Timin Engineering Co. can supply you with a FORTH package. It requires at least 24KB of memory, and includes a 20-command editor, a virtual memory subsystem for disk I/O, and a Z80/8080 assembler. The assembler includes structured programming constructs (IF . . . ELSE, BEGIN . . . WHILE, etc.) and can be used to create new FORTH definitions. The virtual memory subsystem allows loading program modules from diskette as needed. FIG FORTH, as the package is known, was originally defined by the FORTH Interest Group, and is said to be "very close to the FORTH-79 international standard." The package is supplied on 8-inch single density diskette for $75; other diskette formats are priced at $90. The package includes documentation suitable for beginners as well as experienced programmers. MITCHELL E. TIMIN ENGINEERING CO., San Diego, Calif.

FOR DATA CIRCLE 327 ON READER CARD

S/34 FILE UTILITY

The S/34 VTOC Manager gives the information that your standard VTOC provides, information on the number of blocks used by individual files and libraries, overall disk utilization, and the percent of area used by libraries, files, and the system. Listings can be produced in five sequences: files and libraries alphabetically, by block location, by creation date, decreasing by percent full, or decreasing by size. Partial listings can be selected by file group, creation date, file type, or specified library or file name. The S/34 VTOC Manager is offered for a one-time fee of $100. ASSURANCE ASSOCIATES, Bangor, Maine.

FOR DATA CIRCLE 325 ON READER CARD

TRS-80 BASIC ENHANCEMENT

BLINK, the BASIC Link Facility, fixes several shortcomings of TRS-80 Disk BASIC. It allows chaining programs without losing the values of variables set in the calling program (Radio Shack's stock Disk BASIC doesn't allow passing variables between programs). In addition to simply replacing the program in memory with a program called from disk (something Disk BASIC can do, but at the expense of losing variables), BLINK also allows merging the chained program by statement number (Disk BASIC does have a MERGE command, but it doesn't allow a merged program to continue execution). Finally, BLINK allows the programmer to specify the statement number where execution is to begin. BLINK sells for $25 for Model I, 32KB, single disk systems, or $50 for Model II systems. RACET COMPUTES, Orange, Calif.

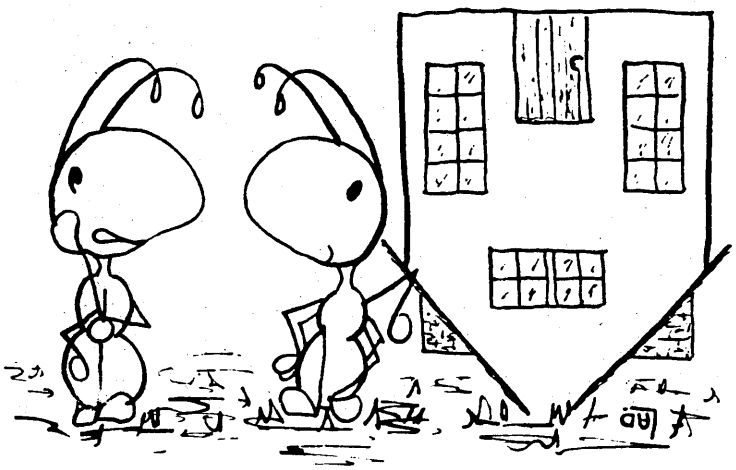
FOR DATA CIRCLE 328 ON READER CARD

PL/I

Digital Equipment has announced its fifth language processor of the year for its 32-bit VAX-11/780 computer. PL/I is the latest programming language developed specifically for use on the VAX. PL/I, as those who date back into the early '60s will recall, combines the scientific features of FORTRAN and ALGOL, with the business-oriented features of COBOL, in an effort to create a block-oriented language for all reasons. While PL/I hasn't supplanted FORTRAN or COBOL, it has found use in scientific, commercial, and systems programming applications.

DEC's implementation is an optimizing extension of the proposed ANSI X3.74 PL/I general purpose subset. It handles a variety of data types, including floating point, binary, and decimal numbers, as well as arrays and structures of data, character strings, and bit strings. The language supports sequential, relative, and indexed file organizations, plus sequential, random, and keyed file access. Program memory can be dynamically allocated for systems programming applications. The VAX implementation allows calls to operating system services and routines written in other VAX languages.

ANTWORTH



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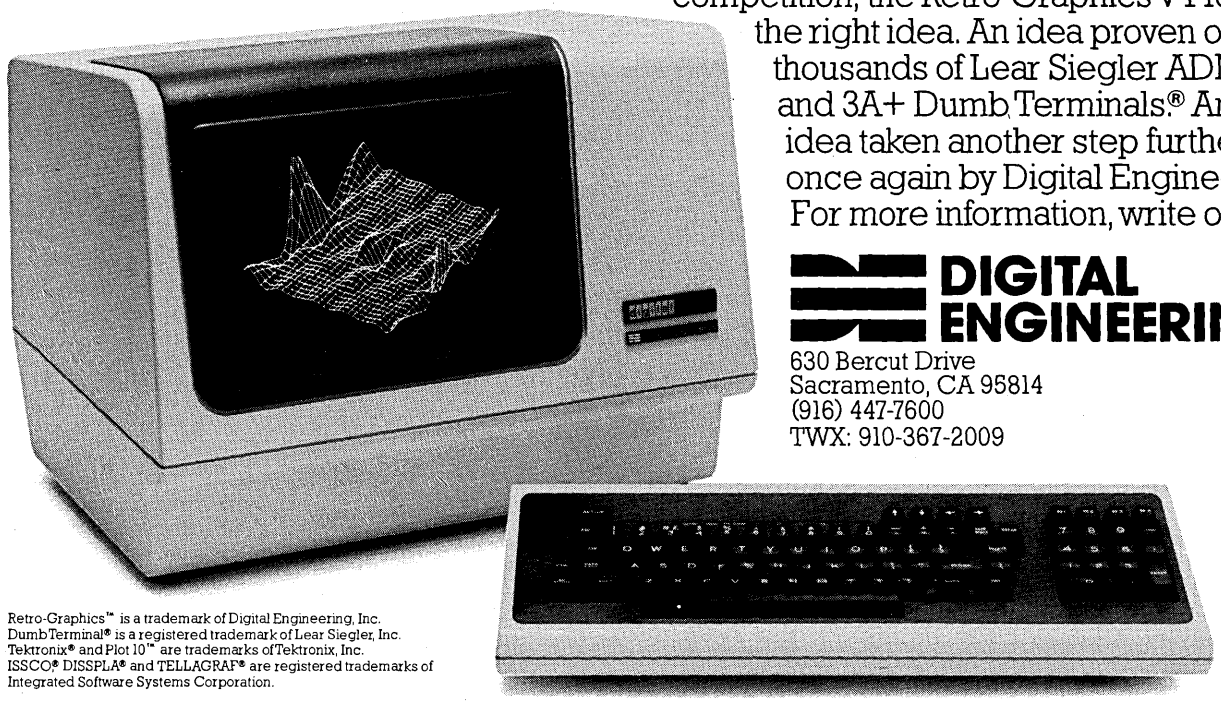

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CIRCLE 219 ON READER CARD

languages. VAX-11/780 PL/I runs on machines with at least 512KB of real memory. A single-use license fee is $12,500. It will be available next month. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 330 ON READER CARD

MANUFACTURING SYSTEM

Sperry Univac's UNIS 80 interactive manufacturing control system runs on the vendor's System 80, 90/30, and 90/40 computers. Noting that better than a third of its domestic sales over the past two years (and slightly less than a third of its worldwide business) has been with manufacturers, the firm developed UNIS 80 as a data base-oriented application package intended to support all phases of manufacturing and production control. Meant for use by manufacturing personnel, UNIS 80 displays data at workstations in a format designed for ease of use by non-edp-trained personnel.

UNIS 80 data base services are provided by the OS/3 CODASYL standard data base management system, DMS (an existing package priced at $184 per month). Based on the experiences of the vendor with its earlier manufacturing offerings, Sperry Univac says that UNIS 80 will satisfy the needs of virtually all manufacturing users without any modifications to the standard package. Since UNIS 80 uses DMS, users should be able to define any extra reports that might not be standard in UNIS 80.

Sperry Univac terms the UNIS 80 package a "load-and-go" set of programs. The vendor's approach is to provide a closed loop system that will allow the user to make use of all or part of the system, depending on user requirements. The system comprises all phases of manufacturing control, from order processing, inventory status and control, master scheduling, and purchase and work order control. Other capabilities include forecasting and analysis, materials requirements planning, and production planning. All transactions are entered through terminals, validated, and processed immediately into the data base.

Minimum hardware requirements for running UNIS 80 are a 1/2MB processor, with two disks, a workstation, and a printer. Expanded control memory is needed on 90/30 and 90/40 systems. A diskette or tape drive also is needed. UNIS 80, which will be available in December, carries a license fee of $500 per month, including maintenance. SPERRY UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 335 ON READER CARD

TEST DATA GENERATOR

Management and Computer Services, Inc. (MACS), developers of the DATAMACS automatic test data generator, has expanded the capabilities of DATAMACS to interface with Cullinane's IDMS data base management system. Capable of running under all IBM operating systems, DATAMACS IDMS interface allows the test data generator to create new data bases, retrieve from data bases, change parts of a data base or extend existing data bases. MACS claims that this is the first time an automatic test data generator has been wed to an IDMS data base, allowing the creation of virtually any structure, including hierarchical multilevel, single owner/multimember, and multimember/single owner structures. Via the MACS-supplied interface, the user has complete control over currency and manual connections. Also, use of DATAMACS/IDMS doesn't impact existing schemas, a user's data dictionary, or Cullinane's IDD (Integrated Data Dictionary). DATAMACS, with the IDMS interface module, carries a $17,500 price tag. MANAGEMENT AND COMPUTER SERVICES, INC., Valley Forge, Pa.

FOR DATA CIRCLE 334 ON READER CARD

PASCAL

Perkin-Elmer's Computer Systems Div. has joined the ranks of computer makers offering PASCAL. The firm's optimizing PASCAL compiler generates true 32-bit object code for any of the firm's 32-bit minis (as opposed to the approach of the ubiquitous UCSD PASCAL that compiles to an intermediate P-code for execution on any machine with a suitable P-code interpreter). Compi-

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lation into machine code, coupled with the compiler's optimization capabilities, allows PASCAL programs to fully exploit the hardware for fast execution.

Perkin-Elmer's implementation of PASCAL is said to conform to the ANSI draft language standards, in addition to including several additional data types (byte, short integer [16 bits], and short real [32 bits]), separate compilation of procedures, and access to system services and external library routines written in PASCAL, FORTRAN, or assembler. PASCAL makes use of Perkin-Elmer's FORTRAN VII run-time library for many arithmetic functions.

During program development, carried out under the vendor's Multi-Terminal Monitor (MTM), compilation proceeds at about 1,200 lines of source code per minute. Once the programmer is ready to commit an application to production status, the compiler can be instructed to optimize, reducing compilation speed to roughly 400 lines per minute while producing fast object code. For time-critical applications, run-time range checking can be suspended; additionally, the FORTRAN VII run-time arithmetic routines are available in microcode for the vendor's 8/32 and 3240 processors. Assembly language listings and cross-reference listings are available as compile time options.

Minimum system requirements for PASCAL are a 32-bit processor running OS/32 version 5.2 (or higher); 128KB of memory above operating system requirements and random access mass storage are also required. PASCAL is priced at $5,250 on mag tape, or $5,550 on a 10MB disk pack. This price includes the first year's maintenance. A right-of-copy fee for the package goes for $525. PERKIN-ELMER, Computer Systems Div., Oceanport, N.J.

FOR DATA CIRCLE 339 ON READER CARD

FORTRAN FILE SYSTEM

FMX is a FORTRAN-callable file management system that provides the FORTRAN programmer with Indexed Sequential Access Method (ISAM) files. The package allows random, sequential, reverse sequential, and mixed access modes. Records are maintained in a doubly linked list structure, eliminating the need for file restructuring when records are added or deleted from the middle of the file. Additionally, FMX provides a set of queue-oriented routines, giving the user the tools for manipulating LIFO anf FIFI queues. A partitioning feature allows the key to be split into major and minor segments, with each partition containing records with the same major key segment. FMX also allows variable length data fields and dynamic disk space allocation, for efficient use of disk storage. FMX runs on PDP-11 computers running under RT-11, RSX-11M, and IAS. A one-time single system license is $1,450. SYSCON DESIGN INC., Manhattan Beach, Calif.

FOR DATA CIRCLE 338 ON READER CARD

SCREEN MAINTENANCE

A tool for TSO programmers, SAINT simplifies screen maintenance and mapping for 3270-based applications. With SAINT, programmers can design, develop, test, and update screen and print images directly for a 3270. The interactive programming tool eliminates screen generation requirements for special macros, separate assemblies, and additional file loads. A "get screen" facility allows retrieving screen and print images by name. SAINT generates copy code for screen or print images, eliminating coding errors. SAINT also allows the applications programmer to test screen images and correct field locations and attributes. A mapping subroutine handles mapping data fields from and to applications programs, without resorting to macros, assemblies, and file loads. Under TSO, all mapping and terminal functions are handled by a single CALL that retrieves screens, binds character areas, and returns control to the application program. Cross-support is coming for CICS and IMS. SAINT carries a single site perpetual license fee of $12,500. DIVERSIFIED PROGRAMMING SERVICES, San Francisco, Calif.

FOR DATA CIRCLE 337 ON READER CARD

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The 5700 can initiate a job at a central computer site and then receive and print the output. It can create and store forms electronically using graphics and company logos, and then print them or send them where they are needed.

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The 5700 is the second product announced by Xerox that will be able to use the Ethernet local data communications network.

To learn more about the Xerox 5700 call collect or write Charles Coffman, Xerox Printing Systems Division, Dept. 5700, 880 Apollo Street, El Segundo, California 90245. (213) 615-6441.

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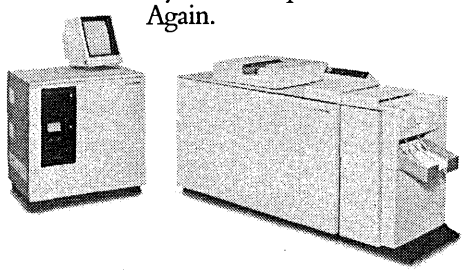

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The Marketplace...

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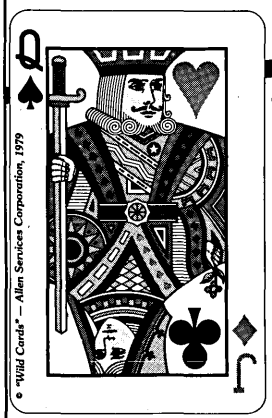

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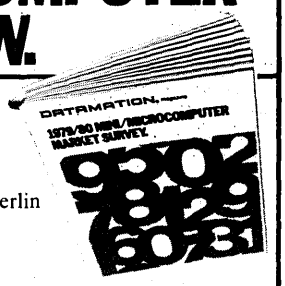

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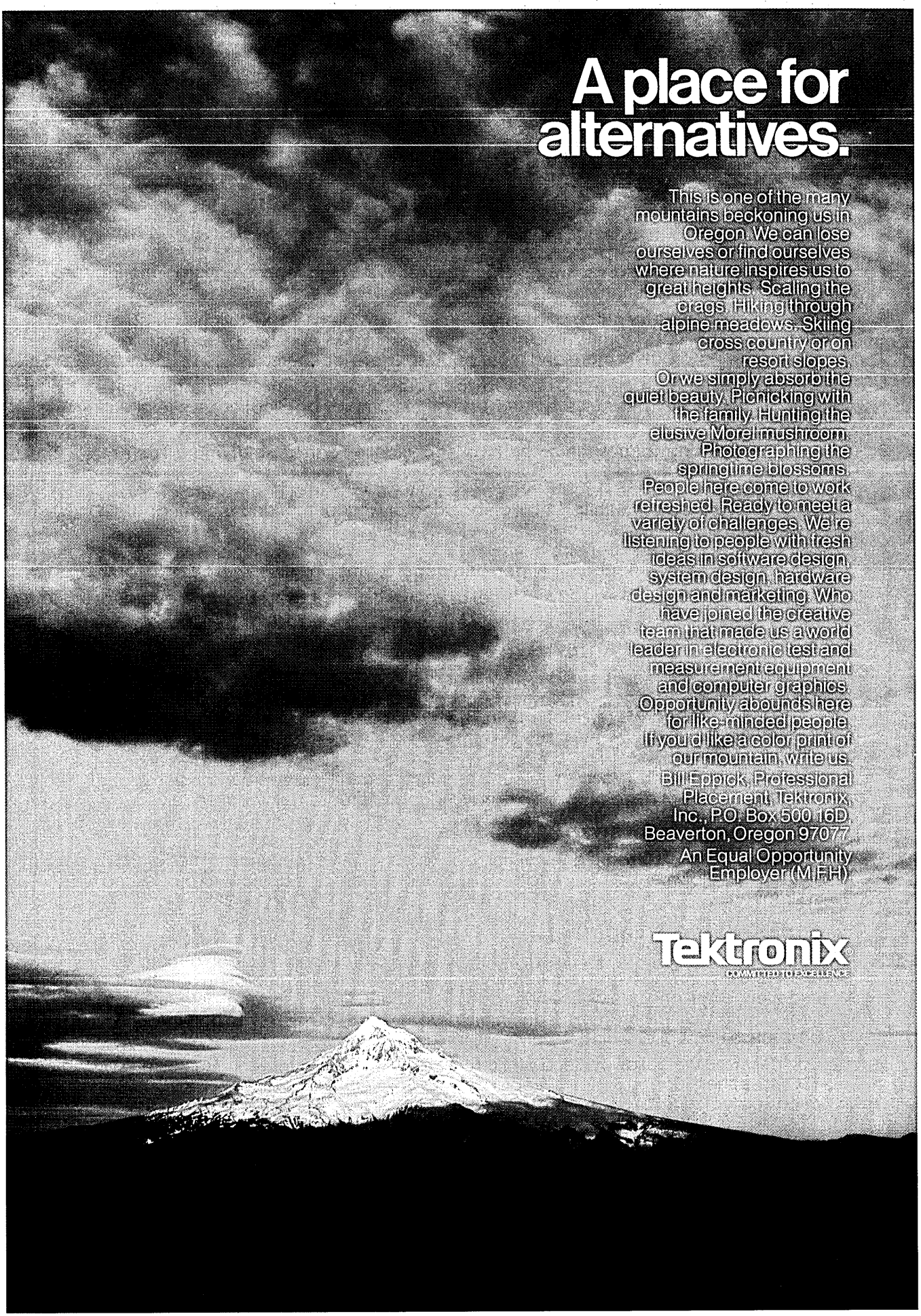

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Several years ago, I was involved in some application program debugging activities that appeared to involve unusual memory fragmentation problems. Not being much of an operating system person, I called the published customer service number for our computer center, hoping that one of the staff consultants would be able to provide me with some insight on how to resolve the problems I was experiencing.

Customer Service: Good morning, Customer Service.
Me: Hello, I need to talk to someone on your consulting staff about a memory fragmentation problem I am experiencing. Can you help me?
CS: One moment please, and I'll connect you.
CS: (Interminable pause, probably lasting only 30 to 45 seconds.)
CS: Customer Service, Don speaking.
Me: Hello, Don, this is Dave Feinberg and I'm having a memory fragmentation problem in an application program. Can you give me some guidance on what is going on if I tell you the symptoms?
CS: Sorry Dave, but that's not my area of expertise; however, if you'll hold just a moment, I'll connect you with someone who can.
Me: Great, I'll hold.
CS: (Another interminable pause; again probably lasting only 30 to 45 seconds.)
CS: Customer Service, Roger here.
Me: Hello, Roger, this is Dave Feinberg. I was just speaking with Don, and he said you could help me with a memory fragmentation problem one of my application programs seems to be having.
CS: Well, Dave, I do know a little bit about the memory management routines, but the guy you really need to talk to is Wendell. He's the one who usually handles these kinds of things.
Me: Great. How do I get in touch with Wendell?
CS: I don't know where he is at the moment, but I'll have him get in touch with you when he comes in.
Me: Do you have any idea when that will be? I'm under a bit of deadline pressure to get my program running.
CS: No, I'm sorry, I don't. While you are waiting, though, you might take a look at the *Programmer's Guide*; maybe that will help you.
Me: I've already tried that, but, if you say so, I guess I'll give it one more read-through. So long.
CS: Bye.

Poor old Wendell, whoever he was, never did call me back. Luckily for me, though, before I again started to pore through the *Programmer's Guide*, I walked down to the snack bar for a little refreshment. While standing in line to pay for my libation, I started chatting about my memory fragmentation problem with a programmer from another section. Mike just happened to be on break, too, and more importantly, he listened to my tale with a rapidly nodding head and a grin. It turns out that he had the same problem about a year earlier, and, moreover, he had a work-around that would allow me to get my application program running properly.

That night, I went home to my wife and hearth with a spring to my step. Mike's work-around had done just what it was supposed to, and my application program was humming along beautifully.

INTO THE CIRCULAR FILE

As the months and years went by, I again tried to take advantage of Customer Service Centers when I thought there might be some expertise that could help me solve my problems. Each time, however, the outcome was pretty much the same as it was on my first attempt. After some years, I was forced (however unfairly) to relegate Customer Service consulting to my mental circular file.

You can imagine my reaction about a year ago when my supervisor called me into his office and informed me that I had a new assignment: running a network management center that had a high visibility consulting function. Not only was the consulting function visible, but a little bit of listening to the grapes on the vine indicated that it was very visibly running just like the consulting functions I had encountered in my earlier years: poorly. To make matters worse, there was no regular consulting staff even assigned to the center. One poor coordinator person had set up a scheme that rotated 10 software development programmer/analysts into the center two at a time, one day each week. That resulted in poor continuity, poor learning, and poor results. In addition, the people being rotated through the center did not give their best efforts to the consulting function even when they were there; after all, consulting wasn't what they had been been hired to do and, in fact, actually detracted from the basic software development jobs in which they were really employed.

The solution to this problem was apparently easy: hire a full-time staff of qualified programmer/analysts and train them in the specific disciplines necessary to provide high quality consultation.

Well, I have to admit I tried. After six months of recruiting, I managed to find and hire one qualified analyst with some appropriate background. The trouble was, while talking with one of our customers, he was offered an interesting software development job and left the network management center after a stay of barely three months. This rapid defection, coupled with several comments received during interviews with prospective consultants, led me to derive what I (somewhat vainly) call Feinberg's Law of Consulting:

It is impossible to happily retain a highly qualified programmer/analyst as a consultant; if he is that good at problem

solving, he won't remain long in a passive, advisory role; and moreover he shouldn't.

Once the implications of this law began to seep into my consciousness, I realized that the standard "hire some programmer/analysts" approach to consulting was just not going to work. A new technique was required.

Following some brainstorming sessions with my supervisor, other managers, and some of the network management center customers, I began to realize two things: (1) a majority of the consulting calls required relatively simple, routine corrective action, once the problem was analyzed, and (2) only a relatively few routine corrective actions could solve a large majority of the problems reported. Oh yes, there were still the complex questions that could only be unraveled by special expertise, but these were only a small percentage of the overall workload.

SOLUTION AT HAND

The solution to the consulting staffing dilemma was at hand at last: staff the consulting center with beginners in the computer field. Train them to listen, analyze, and understand the consulting requests, and, if a request could be solved by one of the simple, routine actions, take that action. If a routine action could not be applied, have the network management center consultant contact predesignated programmer/analysts with the special expertise to unravel a particular complex question.

This solution has three advantages. The bulk of consulting requests can be resolved within a few moments of being understood. It is amazing how many times a question results in a request to reset a communications line or restore an accidentally purged data file.

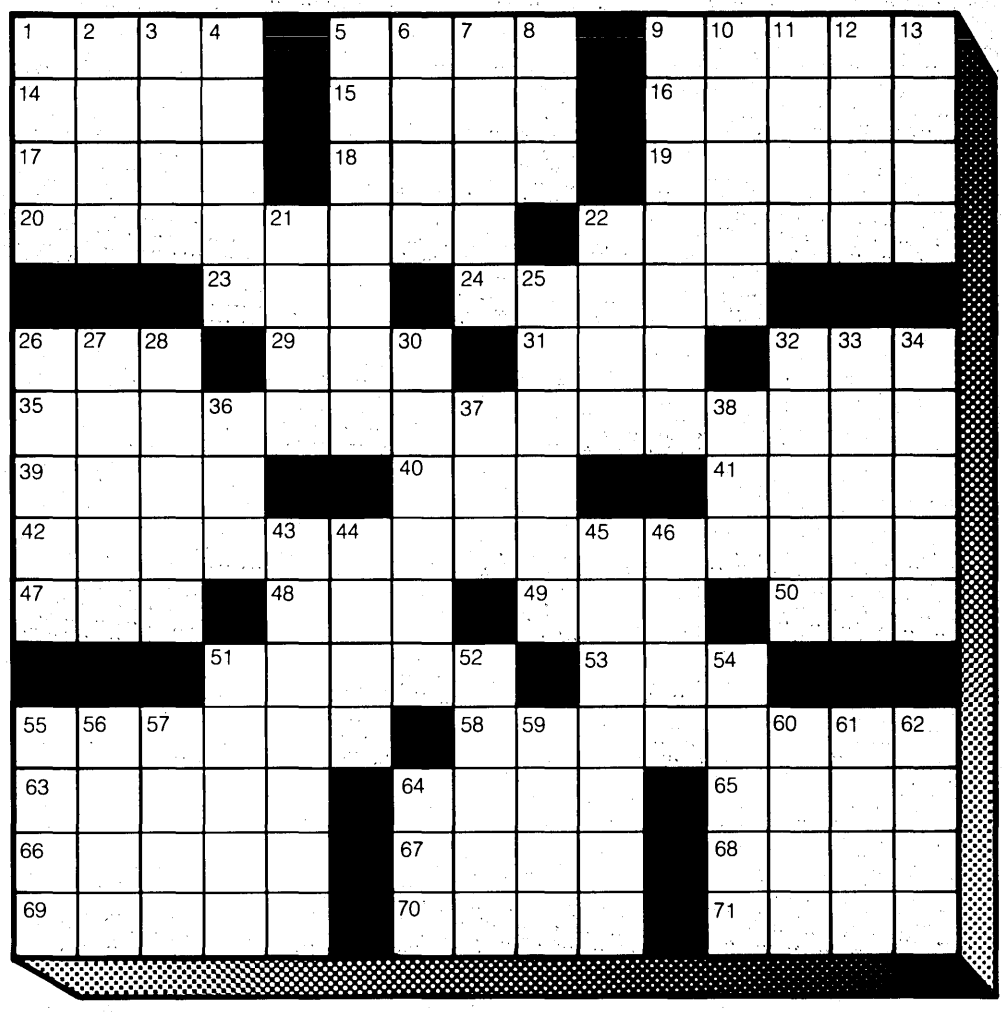
Second, a complex request can be answered accurately

DATAMATION CROSSWORD

THE LAW OF CORE

by

Brian FitzGibbon Burke



ACROSS

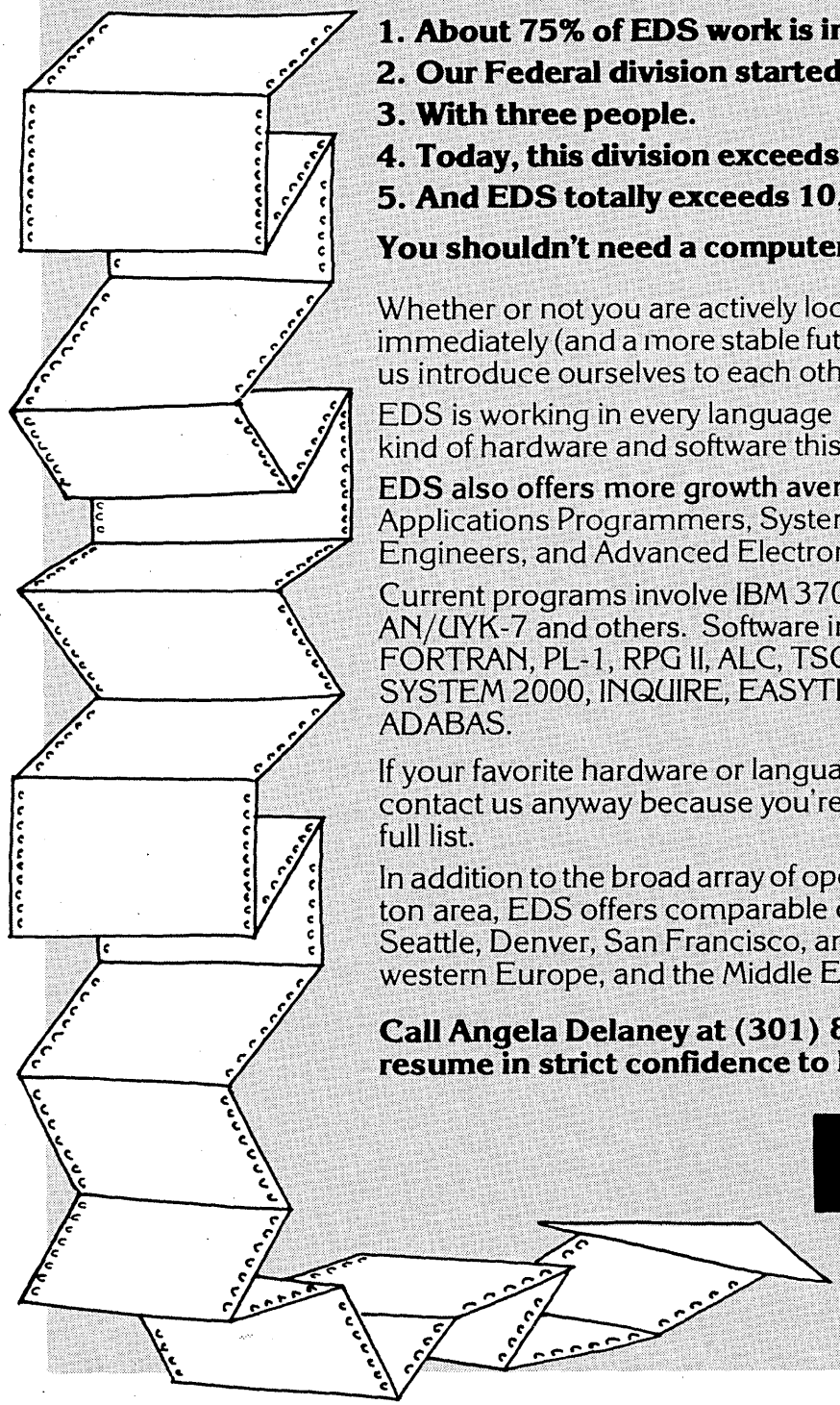
1. Perfect closure
5. Price viewer reaction
9. Hooks like Jabbar
14. Summon
15. Ceremony
16. Enlistment period
17. Study urgently
18. Of the family of: suffix
19. Storied restaurateuse
20. Start of a computer law; with 35, 42, & 58 across
22. Smoothed
23. Dante's first word in D.C.
24. Supports
26. Select
29. Herriot, e.g.
31. Ram mate
32. Louisville slugger wood
35. See 20 across
39. Check
40. Zero
41. Security
42. See 20 across
47. Tool's partner
48. Chaney
49. Compass dir.
50. Dodger all-star
51. Enough, in Trieste
53. Mark Rudd group
55. Quarrel
58. See 20 across
63. Campus denizens
64. S.A. bean
65. Predecessor to action
66. Saw
67. Monty Python's half-bee
68. Word with sun or tone
69. Ancient Persians
70. Put up
71. Indeterminate quantity

DOWN

1. Dog's best friend
2. Western lawman
3. Culture medium
4. First ade
5. Items for barbecues
6. Political sidekick
7. Impress
8. Cue's predecessor
9. Hone
10. Metric measures
11. "Why don't we do —— . . ."
12. ——Homo
13. Word with tool or water
21. Group of quail
22. Twenty-ninth state
25. Map out again
26. Operated, as a boat
27. Kind of glass
28. Ordinal adverb
30. "The ——"; Polansky film
32. Easy ——
33. Step for passing over a wall
34. Adj. for a rub-out victim
36. Saturated carbon compound: suffix
37. Super Bowl 1980
38. Cousin of AKA ——
43. Passes
44. Quantity
45. "Enterprise" locale
46. Swan consort
51. Token of authority
52. Shavers, to Ali
54. Ribonucleic, et al.
55. Three-card monte, e.g.
56. Set of rules
57. Scan
59. Dismounted
60. Distinct; prefix
61. Angels, e.g.
62. Elihu ——: 1642-1721
64. Presidential inflation consultants; abbr.

Solution on page 210

In a world of soft promises, EDS offers five hard facts:



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3. With three people.
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within a few hours with a minimum of hassle for the customer. Network management center consultants can work with one, two, or more highly trained programmer/analysts to obtain complete answers without the customer being involved except when additional information is needed.

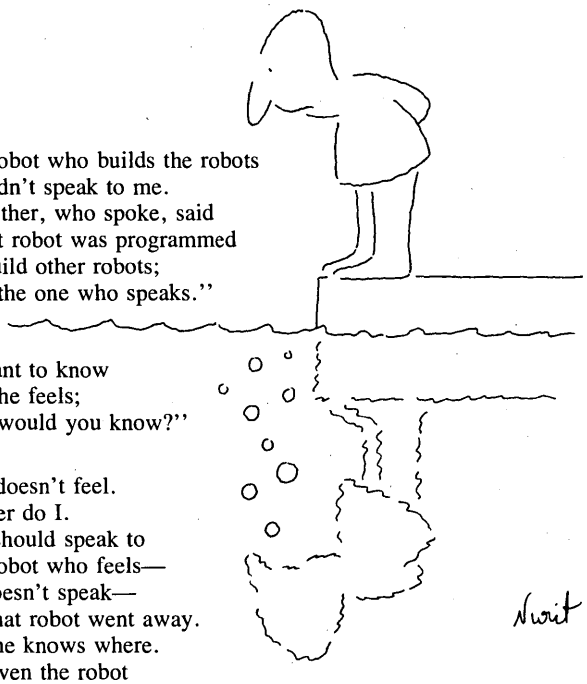
The third advantage is that highly trained programmer/analysts do not have to deal with routine day-to-day consulting. They know that they will only be contacted to assist in complex, nonroutine requests. They also learn that if a complex request occurs often enough, or if a few simple questions can be used to isolate a problem, the network management center consultants will rapidly add a particular request to the "routine" list and assist customers without further recourse to them.

The amazing thing about this approach is that it is working beyond my best expectations. There are now four consultants working in the network management center, all former computer operators or data entry clerks who wanted to get ahead in the computer field. I've sent them to a series of courses dealing with data processing fundamentals and the specifics of our network. They have also spent time in the computer center and at the remote customer sites, getting to know the people, machines, and processes they deal with. They have also established a tradition of "always getting their man." Even if a consulting request takes days to solve (and some of them do), they never quit working on it. If necessary, they call the requesting customer back periodically and provide a status report, even if they can't provide a complete answer.

In all, the consulting function seems to be heading in the right direction. Customer satisfaction, while no means complete, is increasing. The number of calls received by the consultants is also increasing. Additionally, as predicted, the number of "trivial" calls received by development programmer/analysts is decreasing. Best of all, my supervisor is pleased, I am relieved, and the consultants are busy and ecstatic about their work.

—David A. Feinberg
Seattle, Washington

SPECIALIZATION



The robot who builds the robots
Wouldn't speak to me.
The other, who spoke, said
"That robot was programmed
To build other robots;
I am the one who speaks."

"I want to know
How he feels;
How would you know?"

"He doesn't feel.
Neither do I.
You should speak to
The robot who feels—
He doesn't speak—
But that robot went away.
No one knows where.
Not even the robot
Who was programmed to go away."

—Frances B. DeNagy
Wappinger Falls, New York

A PROPHETIC VIEWPOINT?

The future of computing may well be controlled by the ability of computer people to address themselves to several key problems. The problems, presented in a whimsical fashion but to be dealt with seriously, are:

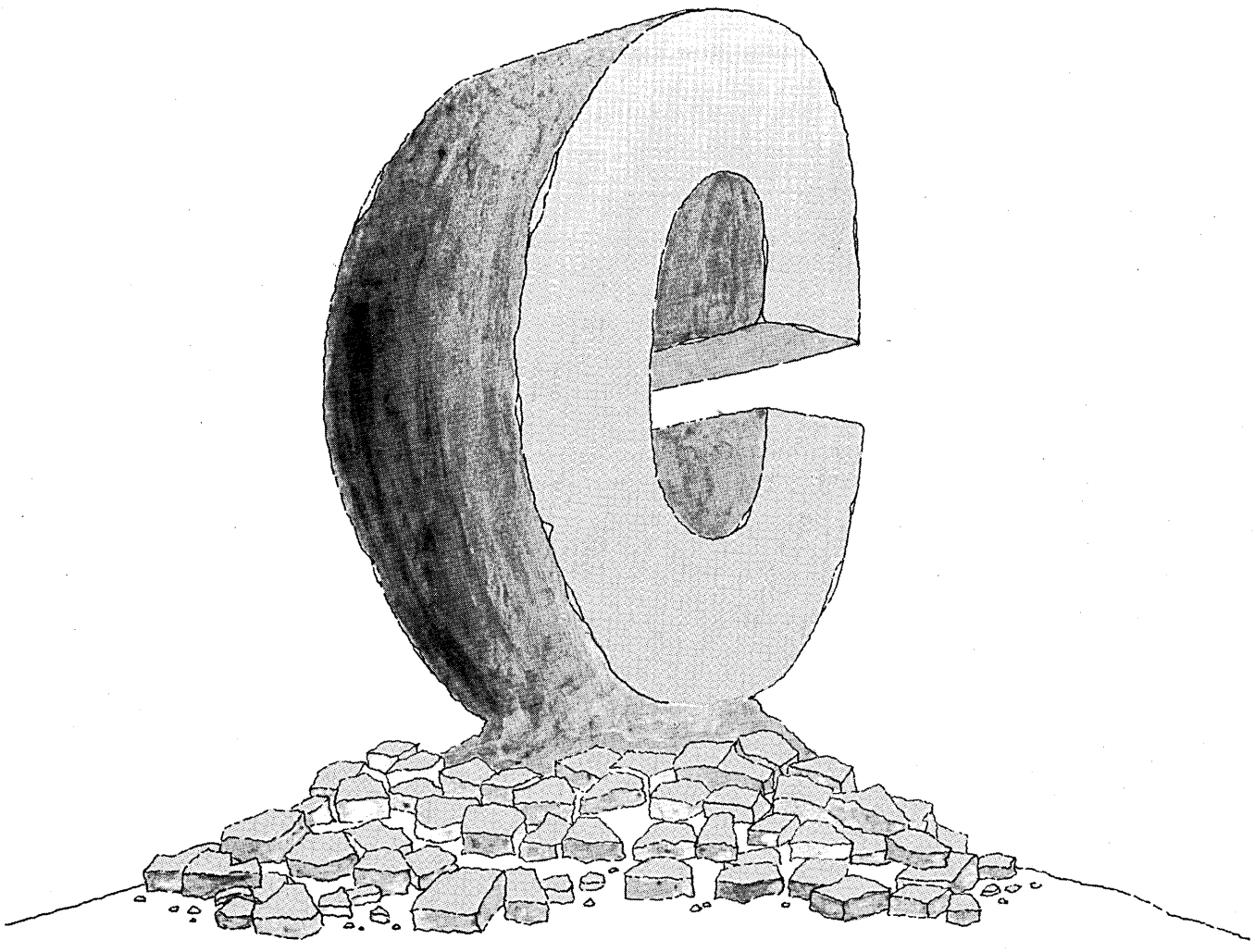
1. The messiah approach to progress (Who was your messiah this time last year?). Symptoms of the problem:
   a. bandwagon jumping (How do you recognize a true messiah?): Computing progress, or pseudo-progress, has taken on a faddish aspect. Nearly everyone leaps aboard new concepts (structured programming, time-sharing, computer-assisted instruction, natural language translation) before anyone has analyzed the concept in pragmatic depth.
   b. deferred standardization (What do you do until the messiah comes?): Areas which should be standardized have not been. Why don't we insist on a minimal set of programming languages and operating system interfaces with computer-independent characteristics, and develop a national data bank of algorithms and modules using that minimum set? Why don't we do the same thing for computer architectures, so that software portability really becomes possible? Why don't we explore, really explore, the notion of good programming practices, and then manage software development to a set of accepted guidelines?
   c. premature standardization (But we thought you were the real thing?): Areas of ignorance are being standardized. What do we really know about top-down coding? Is elimination of the GOTO worth the price of precompilers? Why hasn't JCL improved over the years? Is FORTRAN to be both the first and the last scientific programming language?

It has been up to the articulate and the charismatic to lead the computing industry; the time has come for hardheaded logic to take command.

2. The academic-industrial communication chasm (Would you take a full professor to lunch?). Symptoms of the problem:
   a. jargon barriers (Parlez-vous Computerese?): In the short 25-year history of computing, the industrial and academic experts have managed to find a way to be unable to talk to each other. Can you imagine a *Journal of the ACM* article in DATAMATION? Can you imagine the opposite? If you succeeded, who would really understand what was being said?
   b. physical barriers (On a clear day, you can see to the edge of the campus plant): I've been to academic computing conferences I've been to industrial computing conferences. The sets of attendees are mutually exclusive.
   c. unrealistic understandings (Around the real-time world in 80 days?): The academic picture of the industrial world (and vice versa) is both skewed and disdainful. Academicians don't understand the exponential complexity effect in large problems; industrial folk don't understand the rudiments of what academicians have done for them. Laughable public statements are made by both sides about the other's turf.
   d. working the wrong problems (What have you done for me [with me] lately?): Academic people assume student problems are typical programmer problems, and that the real world can be simulated in one (or two) semester projects. Industrial people reinvent the same ad hoc wheel, and do not even remove any of the flat spots.

The fact is that each faction can gain a lot from the skilled professionals of the other. A bridge is needed between the two

ILLUSTRATION BY NURIT KARLIN



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3. the establishment syndrome (Has success ruined computing?). Symptoms of the problem:

a. fallout (Whatever happened to the seven dwarfs?): The number of computing entrepreneurs is falling rapidly. Do you remember GE? RCA? Xerox? Singer? Survival of the fittest is bringing an alarming fallout rate.

b. the big three—IBM, IBM, IBM (Would you buy a used car from this man?): In the first 25 years of the auto industry, there were names like Marmon and Rockne and Auburn and Cord. But then something happened, and now we have an automotive "big three." Computing's shift to near-sole-source status has been even faster. Is that healthy for the field? Have you tried to buy a turbine-engined car lately? Would you buy stock options on any of the automotive "big three"?)

c. the principle of stuckness (Please submit your breakthrough schedules by Friday at the latest): Change has become an expensive dirty word in computing. As a result, the software interface of hardware is stuck at the 360 level, and software itself is stuck at the FORTRAN level. Dollars talk—and they should. But don't you grow a little wistful, thinking about the computing that was?

Computing is moving headlong into a typical establishment pattern—few vendors, inhibited progess, potential for manipulation of the public via price control. Is that inevitable?

4. the "cottage industry" dilemma (What makes software run?). Symptoms of the problem:

a. the softness of software (Would you buy a used car from this man?): The "badness" of software is about as well known as common human stereotypes: "It's expensive to build. It's not done on time. And it's bug-ridden when you do get it." Even if that's only slightly true, it deserves attention.

b. craftspeople, not assembly lines (nostalgia): Perhaps it's not all bad . . . who's to say? But software is laboriously hand fabricated. And designed. And tested. And maintained. Is egoless programming a good way out? If it is, how about egoless management?

c. lack of SHAREing (Ask not what your [three-letter] Company can do for you . . .): Time was when the SHARE user group lived up to its name. Software from soup (operating systems) to nuts (applications packages) was built by one member firm for all. Then it turned into an organization I choose to call GIMMEE. What is it now? Where are shared algorithm banks, software module banks?

Herb Grosch said it. Software *is* a "cottage industry." The badness of software must be repaired. The goodness must be celebrated.

Presenting a menu of problems says very little about the future, and this is an article about the future. I propose the following solutions, in the hope that these ideas, or other and better ones, will shape the future by moderating or eliminating the impact of today's problems.

1. The messiah approach to progress can be countered by what I would call the National Computing Experiment Institute. The literature of computing echoes with the lack of experimental results. Who has really conducted a cost-benefits study of structured programming? (Answer—no one.) Who really conducted an in-depth tradeoff study of time-sharing vs. batch. (Same answer.) Name your poison. The answer's the same. For a field founded on the application of logic to problems, we sure have avoided taking our own medicine.

The time has come. What is needed is some no-strings-attached funding for some no-strings-attached people to work some no-strings-attached problems.

Where's the money to come from? Well, why not a User Association? An amalgam of SHARE and CUBE and VIM and GUIDE and all the others?

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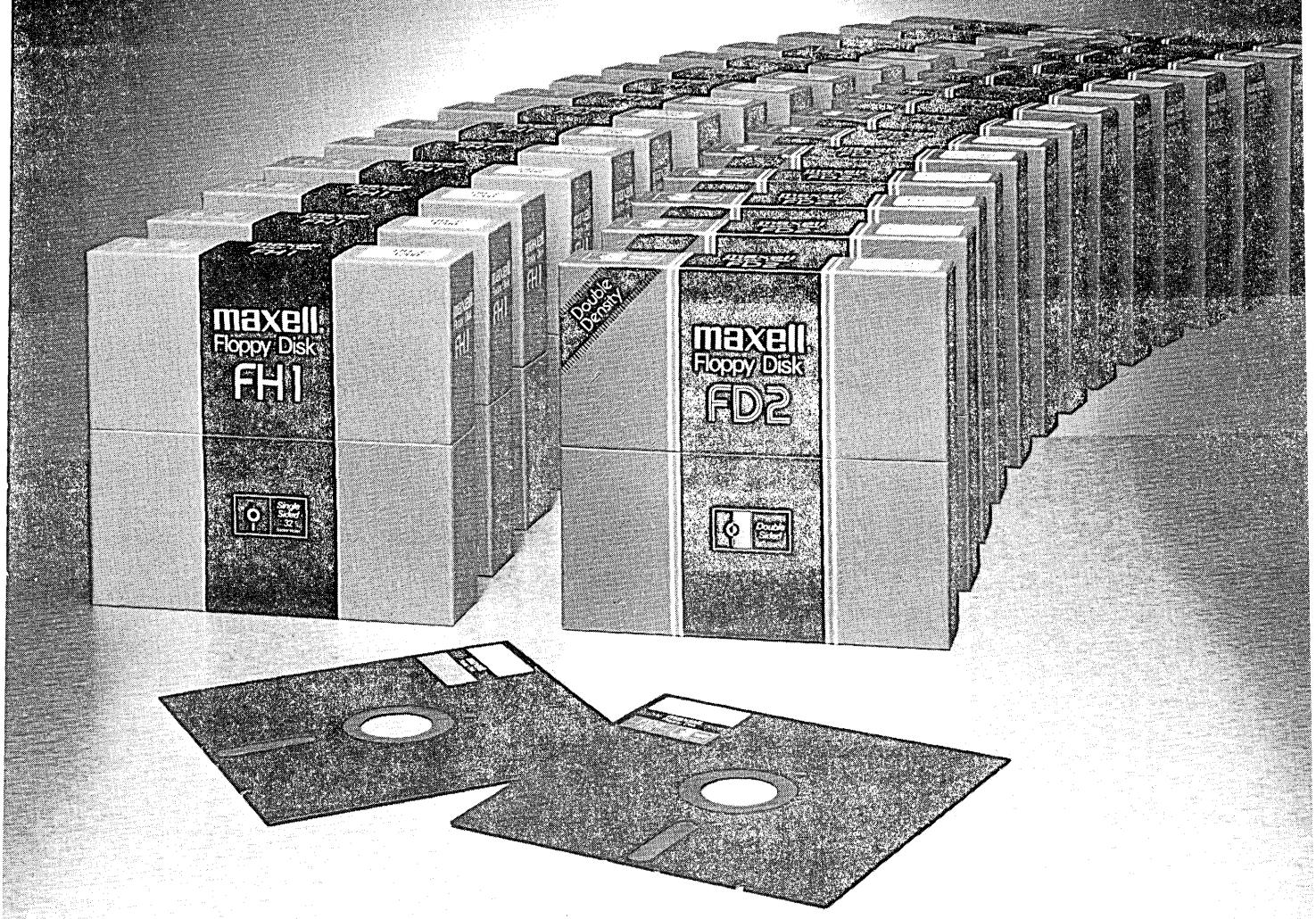

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2. The academic-industrial communication chasm can be countered by some *planned cross-pollination*. Jargon barriers, and physical barriers, and unrealistic understandings, and working the wrong problems can all be overcome if we really care enough to try. At your next seminar or conference, be sure both ghettos are represented and in a position to communicate. Better yet, mix those folk on grants and projects (especially at the National Computing Experiment Institute). Best of all, use the sabbatical system in both academe and industry to move key people from one ghetto into the other. And one other thing. The publish or perish syndrome forces academics to talk to the world at large. The proprietary interest syndrome forces industrial folk in the opposite direction. There are some brilliant people in industry, too. It's time they were unmuzzled. At the very least, a directory of "Computing Key People" in the industrial world should be prepared with the understanding that phone lines are open for academic-industrial cross-pollination.

3. The establishment syndrome looks unsolvable. If Herb Grosch and the Justice Department can't handle the problem, who am I to try? Perhaps a new line of economy computers (with great gas mileage) from Japan . . .?!

4. The "cottage industry" dilemma is a toughie. The messiah problem and the communication chasm are areas where we know what to do, but aren't committed to doing it. We really don't know how good software is built. Or what a good programmer is. Or how to manage it. But we can learn. How about a systems analysis approach to defining good programming practices? Here's another task for the National Computing Experiment Institute. What are the characteristics of a good programmer? If that question is answered, and some good programmers are identified, then we can analyze their work to see what they do. And having learned what they do, the extractable good programming practices can be made into guidelines. And with guidelines, we can begin for the first time to manage software production. To the guidelines. Not slavishly, but with reason and understanding.

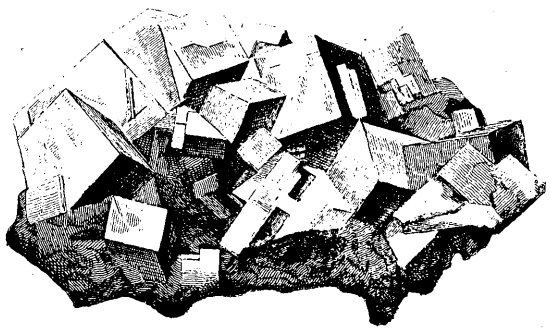
On that naive-sounding note, it's time to end! I believe in the future. I believe computing's problems are in general solvable. I don't necessarily believe they will be solved. But I am content that we have the know-how, and the tools, to do it.

Now if only some messiah would come along . . .!

Author's Note: Do you know what's really *discouraging? This article was originally presented in 1976 at a* SHARE *meeting in San Francisco. Parts of it were presented earlier, in 1970. And except for the microcomputer revolution, little has happened since then to change its thrust. Worse yet, microcomputers are a sort of déjà vu of macrocomputer history. Speaking of fallout, remember Altair and Imsai? Speaking of sharing, remember freely exchanged microsoftware? Speaking of a national algorithm/module bank, how many microcomputer mailing list programs now exist?*

Oh, well, let's float these naive-sounding ideas out once again. And then reexamine them four years from now.

—Robert L. Glass
Seattle, Washington



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DDP— A FUNCTIONAL CONCEPT

Distributed data processing puts computer power and capability where it's needed for cost-effective business functions. In some cases, a minicomputer with its attendant terminals can be installed at the location where the function is performed,. The minicomputer can be tied into a central computer, where data can be processed further or stored in a data base for the information requirements of other business functions. A common example is an order entry/processing system that feeds a sales information system used by senior management to make timely sales or promotional policy decisions.

In other cases, ddp involves the automation of business operations, either by automating previously manual functions or by significantly increasing the productivity of workers by means of electrical tools. There may be no need to tie the distributed system to the central computer because the processed data may be of value only to its immediate users.

This system can be called decentralized in that responsibility for operational decision-making can be assigned to lower levels in the organizational hierarchy. If, however, there is centralized control of data in this type of system, MIS managers can be confident that there are adequate safeguards to protect the system against possible abuse.

Like many innovations, ddp can cause frustration and displacement. However, efforts to deal with these conditions can sharpen managerial insight. Some of these problems managers face include:

Assimilation. Although new technologies can be introduced rapidly, users as well as MIS personnel need time to assimilate them. Launching a ddp system calls for collaboration and support, and it is the responsibility of MIS management to provide leadership. As the MIS staff members are accustomed to helping users interact directly with the computer in a time-sharing or on-line systems environment, this will greatly help the implementation of the ddp system. Roles will undoubtedly alter as MIS staff members become information consultants and not merely providers of programming services.

Change. Fundamental changes will occur in MIS that have already affected time-sharing and central computer on-line systems. In the data center, for example, the data entry function can eventually be eliminated, since data will be entered by the user through intelligent terminals. The data control group, now charged with proving receipt of input and proper processing of output, will also be eliminated, since this function will increasingly be performed by software. Greater attentiveness on the part of MIS and internal dp auditors will be required to ensure that application programs are designed with adequate controls. Like the time-sharing service bureau, the data center will become a utility.

Personnel Shifts. There will continue to be a need for MIS systems analysts and programmers to develop corporate-wide systems, but central staff reductions are likely as end users become more independent and new technologies allow the central staff to be more productive. It is probable that some systems analysts will migrate to user organizations and assume positions of functional responsibility. Some analysts will become broad-based consultants to users, and some will continue to devote themselves to corporate work, but will focus more on data base and data resource control or specialize in technical advice to users.

Technology. The goal of MIS management is to create an environment where the use of technology is easy. Software to achieve such a goal will become more complex. In the next decade, more sophisticated technical skills will be needed in systems programming and telecommunications. MIS personnel will have to be-

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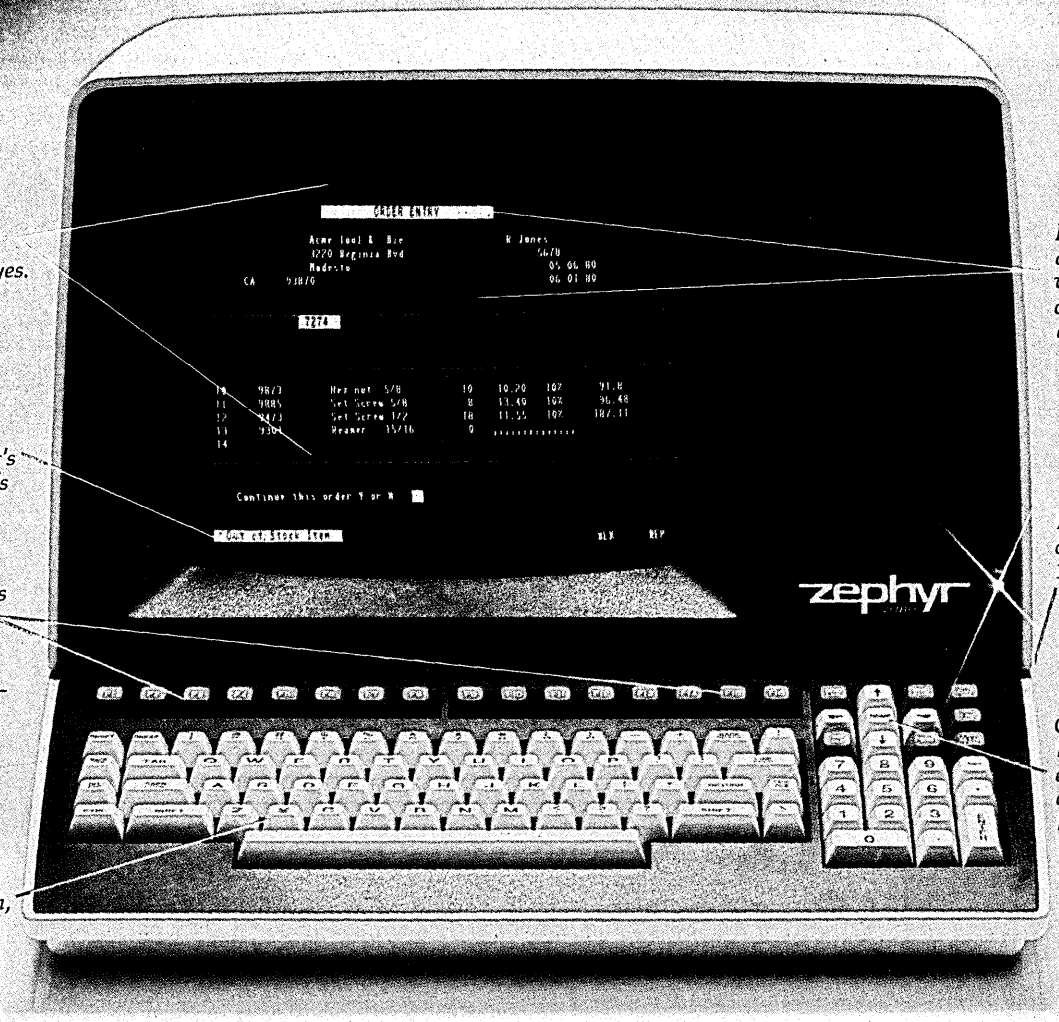

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come more technically self-sufficient to integrate the capabilities of hardware and software supplied by different vendors. Technical staff will have to be proficient with minicomputers, data base and telecommunications software, in addition to the formidable technologies that now must be mastered. Technicians will also have to become more user-oriented since they will be providing technical support to remote users as well as to MIS.

Quality Assurance. Another MIS group that will grow in numbers and importance is the quality assurance staff. At present, this staff concentrates on standards and data administration but is increasingly assuming greater responsibility for control of data. Without such control, the risks of ddp are too great. Locally used data can be managed at local sites, but data destined for use throughout a ddp system must be controlled centrally in order to guarantee validity and integrity. A data dictionary is an essential tool for this type of control. The quality assurance staff will also provide data security and the standards for processing data at all locations, central and remote.

Managerial Responsibility. A new breed of MIS manager will inevitably emerge as organizations become smaller but more technically competent and more knowledgeable about business operations. This pattern is already visible. In recent years, many corporate MIS staffs have stopped growing and some have actually grown smaller. The current tendency is to place less emphasis on line management and more emphasis on coordinating the activities of a complex utility with a staff that includes specialists in office-of-the-future systems and the use of microcomputers in industrial applications. MIS managers will focus with greater frequency on controlling data flows across organizational departments/functions and ensuring the quality of information. They will become more involved with systems planning to make certain that the developed

CARTOON BY CHUCK VADUN

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systems support the company goals. In sum, they will be managers of information, intimately concerned with strategic business issues.

Users. Ddp requires a new breed of users as well. Users will have responsibility for the operation of some hardware, the entry of data input/output control, and scheduling. The user will have to be more knowledgeable about computer-based systems, including controls for data accuracy and security for programs, files, and hardware. In the short run, the user's staff may increase, but as productivity increases through new technologies, lower-level jobs will be eliminated or upgraded. This will balance the expected decline in new entrants to the work force in the 1980s.

In his delineation of six stages of dp growth, Richard L. Nolan* alerts corporate policymakers to a predicted stage three crisis where "the seeds are being sown for a subsequent explosion in dp expenditures." To deal with the "alarming" problems that result when "base-level technologies cannot support higher-level systems," Nolan advises a "shift in orientation from management of the computer to management of the company's data resources." This transition, in his analysis, involves not only restructuring the dp organization, but developing new management techniques.

This is the heart of the ddp problem—MIS managers must concern themselves with control of data, not hardware. They must devise effective controls for the dissemination of information within the company structure. If MIS managers are truly concerned with ensuring that transaction processing systems mesh effectively with information systems, location of hardware is only a secondary issue. The critical questions are:

- Does a distributed system make sense from a data resource management perspective?
- Can it effectively modulate the flow of data and transform it into meaningful and accessible information?

Nolan's guidelines for controlling ddp growth and making it cost-effective can serve admirably to reconcile opposing MIS viewpoints. He urges managers to "recognize the fundamental organizational transition from computer management to data resource management" and to "recognize the importance of the enabling technologies." One of the most promising enabling technologies is ddp.

—John di Targiani
Framingham, Massachusetts

*Richard A. Nolan, "Managing Crises in Data Processing," *Harvard Business Review*, vol. 57 (March-April 1979): pp. 115-126.

Answer to puzzle on page 198

S	E	A	L	■	G	A	S	P	■	S	K	I	E	S
P	A	G	E	■	R	I	T	E	■	H	I	T	C	H
C	R	A	M	■	I	D	A	E	■	A	L	I	C	E
A	P	R	O	B	L	E	M	■	I	R	O	N	E	D
■	■	■	N	E	L	■	P	R	O	P	S	■	■	■
O	P	T	■	V	E	T	■	E	W	E	■	A	S	H
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D	I	E	■	L	O	N	■	N	N	E	■	C	E	Y
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C	O	E	D	S	■	C	O	L	A	■	I	D	E	A
A	D	A	G	E	■	E	R	I	C	■	D	I	A	L
M	E	D	E	S	■	A	N	T	E	■	S	O	M	E

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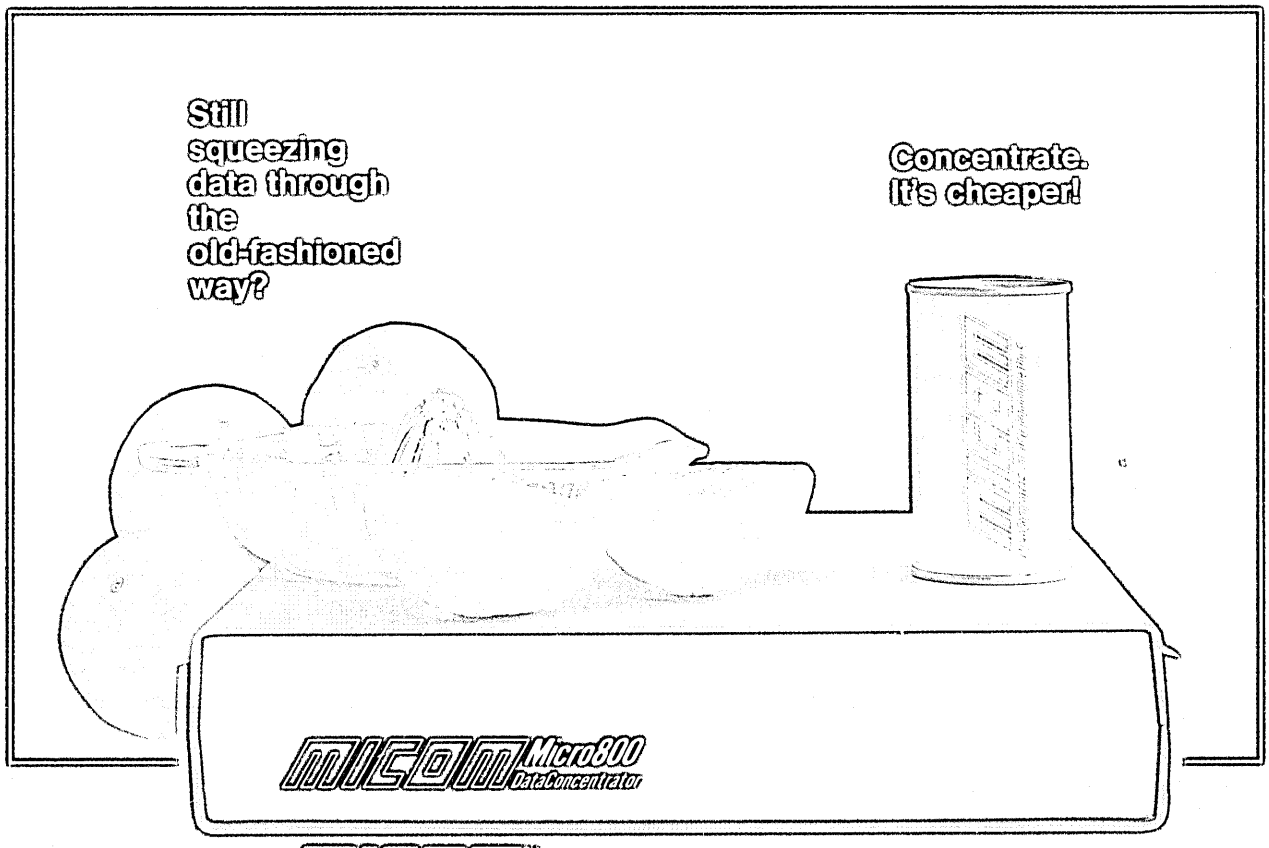

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Like our patented tilt-screen to prevent gl[illegible]e. Brighter, more readable characters to prevent operator fatigue. Keyboards that let you feel actuation. And incredibly reliable printers.

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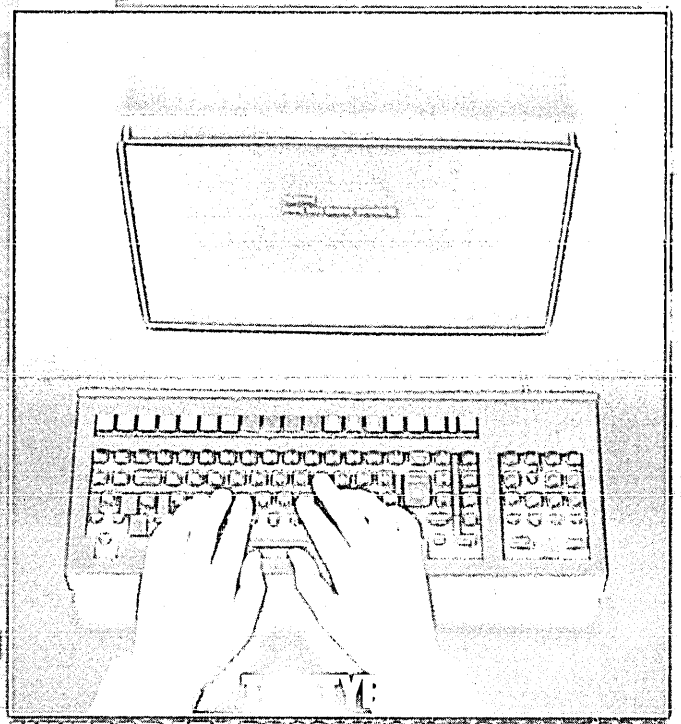
And, in any business, that's worth [illegible]g about.



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