

# DATA MATION 83

OCTOBER/4.00 U.S.A.

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THE AFTERMATH AT EAGLE COMPUTER  
THE HITCH IN HIGH-TECH TRADE  
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CONVERTING TO A PACKAGE

You've concluded that you need the performance and capacity that only an 8 inch Winchester drive can provide. Which one should you buy?

There are 109 different models available.

Of this 109, only 39 are 8 inch floppy form-factor compatible.

28 of these 109 perform an average seek in 30 milliseconds or less.

And of this 109, only 17 offer true SMD compatibility.

Puzzled?

Only one company provides a disk drive with all the features —

## Kennedy and Model 7300

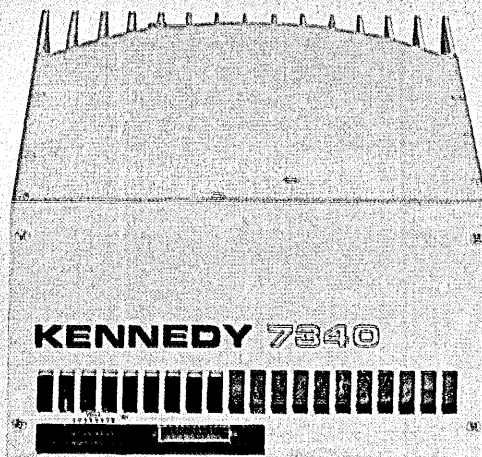
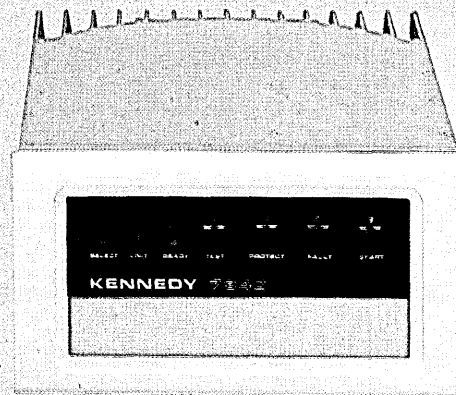
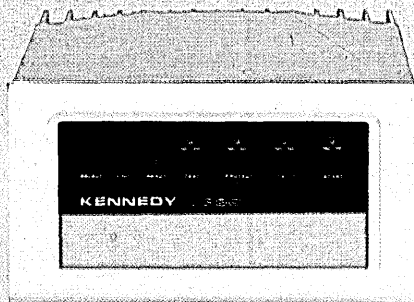
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### SPECIFICATIONS:

- 41 and 82 MB Capacities
- Rotary Voice Call 60 msec average seek
- SMD, ANSI or PICO-BUS Interfaces
- 1209 KByte/sec. transfer rate
- Available 30-45 days ARO
- Q100: \$2,560/\$3,195

**KENNEDY • QUALITY • COUNT ON IT**

CIRCLE 1 ON READER CARD

# STOP!

## Don't put in more lines for your terminals.

Put more on the lines you already have.

Are you installing new terminals faster than you can string new communications lines for them? Don't bother to put in more lines. Chances are that your existing wires can carry several times as much data as they do now—with a little help.

The INSTAMUX 470, one of the components of MICOM's INSTANET™ "instant" local network, can give them the help they need by providing:

### Local Multiplexing

Of up to eight asynchronous terminals on the same double twisted-pairs of wires conventionally used to support only a single terminal or telephone.

### Data Rates to 19,200 bps

Each terminal operates as if it has its own dedicated 19,200 bps line to the computer or data PABX, and all terminals can operate simultaneously—without interference.

### Integral Line Driver

To eliminate the need for modems or line drivers for each individual terminal.

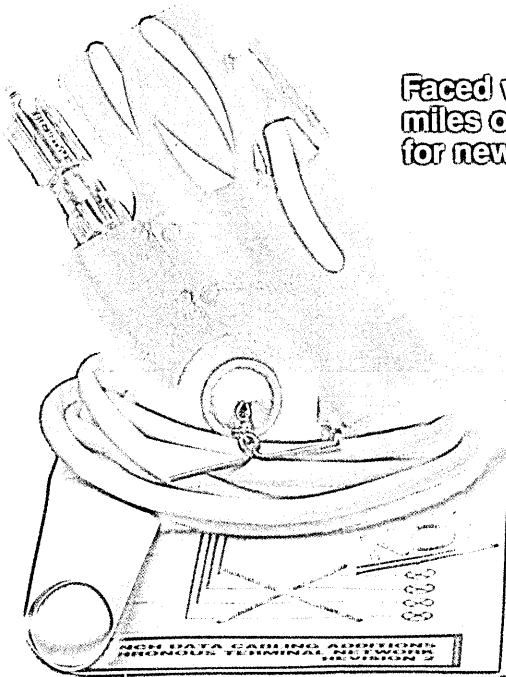
### No Transmission Delay

Unlike regular multiplexors, the INSTAMUX is designed specifically for in-house use. As a result, it doesn't introduce transmission delays of any kind, and the multiplexed system's response "feels" the same to the terminal operator.

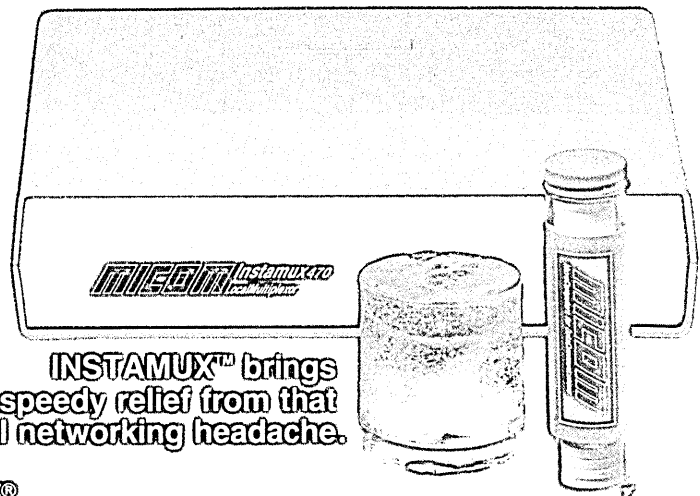
And for users of MICOM's INSTANET Local Networks, there's still another advantage: INSTAMUX is available as an integral plug-in module for the Micro600 Data PABX.

What's more, INSTAMUX costs less—*much* less—than the line drivers you'd need if each terminal had its own set of wires.

Don't get strung out. Call or send today for literature describing the INSTAMUX 470 and its applications.



Faced with stringing miles of wire for new terminal clusters?



INSTAMUX™ brings speedy relief from that local networking headache.

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CIRCLE 4 ON READER CARD

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### Step 1

Discover your problems. Ask EPILOG/MVS to plot TSO response times or batch job run times (yesterday, last week, last month) on your CRT. After analyzing the workload for problems, simply place a "d" next to the problem time period and press enter. In this example, July 12 is the problem day.

DATE	RESPONSE	
7/8	4	→
7/11	5	→
7/12	1.8	→
7/13	4	→
7/14	5	→
7/15	4	→
7/19	3	→
7/20	4	→

Historical TSO plot for the month of July

### Step 2

The result is a display of degradation reasons for that time period. Now you know the major causes of poor response. In this case, paging caused 60% of response time problems. But what is causing the degradation? Place an "r" on the problem line and press enter.

USING CPU	8%	→
PAGE-IN WAIT	60%	→
WAITING FOR CPU	12%	→
DISK SYS 001 ACTIVE	5%	→

Detailed analysis of TSO response time problem for July 12.

### Step 3

EPILOG/MVS will automatically bring you the information needed to help analyze degradation for that time of day. In this example, Step 3 shows an analysis of paging activity where a paging device has contention from another system.

Use EPILOG/MVS for monitoring: trends, capacity, TSO response time problems, batch job run times, effects of changing hardware, and effects of making tuning changes. It's as easy as 1-2-3.

TOTAL PAGES/SEC=160
DEVICE PAGED:
% IN USE=15%
% RESERVE DELAY=60%

Analysis for paging on July 12

- Please send me more information on EPILOG/MVS.  
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CIRCLE 5 ON READER CARD

# DATA MATION®

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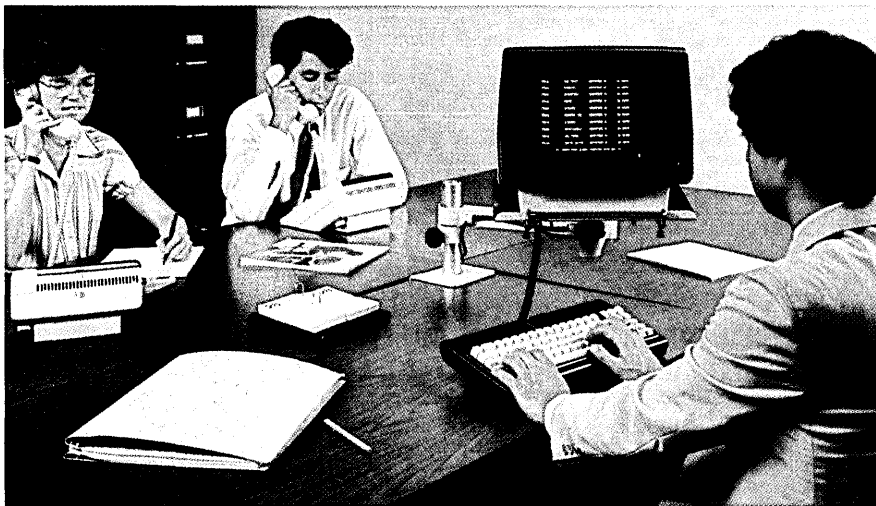
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## the CRT Shuttle™ Lets four people share one computer terminal without leaving their desks or phones.

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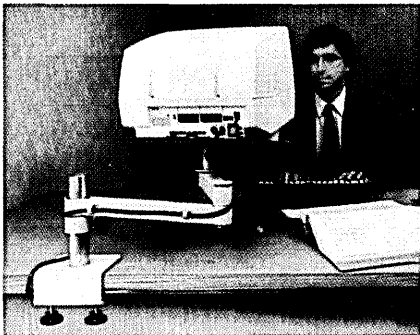
Up until now, you had two ways to supply computer terminals to your personnel. You could buy or lease one for each user...at a very great cost. OR you could place a computer workstation NEAR each cluster of users...inconvenient since everybody has to leave their desks and phones to access the data.

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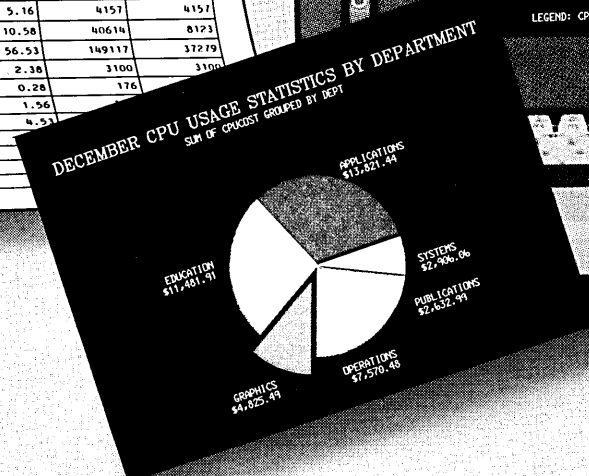
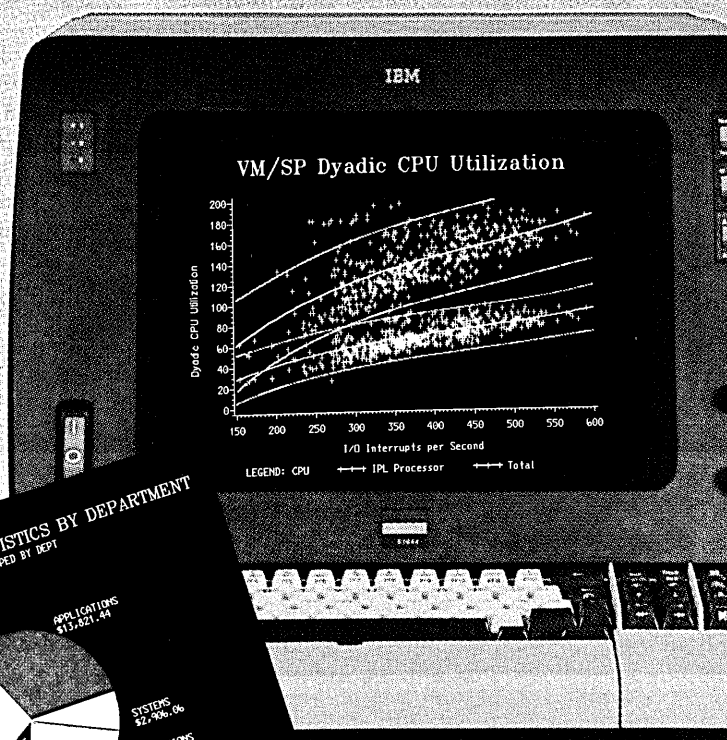
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	RESTORY3	1	0.72	0.72	1499	1499
DTSAMALS	ICGFCICS	9	110.44	12.27	34596	3844
DTSINIT	ICGFCICS	4	364.80	91.20	52773	13193
DTSUTIL	ZAPTOVMS	9	4.49	0.50	3227	359
LNKEDT	LETSFBTR	3	4.15	1.38	1479	493
	LINKDSN	2	0.88	0.44	708	354
	LINKFBRA	1	2.30	2.30	650	650
	LINKMATR	6	10.76	1.79	7072	1179
OBJMAINT	DRRZAPS	1	0.36	0.36	403	403
PDZAP	DRRZAP	1	0.60	0.60	674	674
PLIOPT	BRANKS	1	5.16	5.16	4157	4157
	MATRIX10	5	52.92	10.58	40614	8123
POWERJA	POWER/V5	4	226.12	56.53	149117	37279
RESTORE	RESTORY3	1	2.38	2.38	3100	3100
RSERV	SASLOAD	1	0.28	0.28	176	
	LETSFBTR	4	6.23	1.56		
SASVSE	LINKFBRA	1	4.53	4.53		
	ACCTEST1	3	20.35			
	ACCTEST2	8	81.44			
	ACCTEST3	1	13.81			
	ACCTEST4	4	73.36			



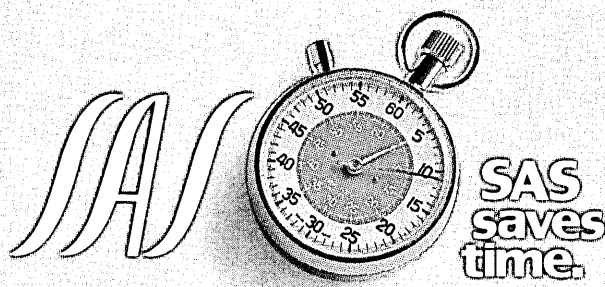
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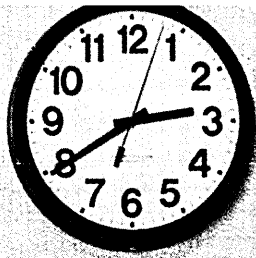
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# LOOKING BACK

## SEYMOUR'S PLACE

*October 1963:* Control Data Corp. was off and running with the debut of its 6600, a large-scale, scientific/engineering computer. The machine had a memory access time of 1 microsecond. The 6600 was refrigeration cooled and had a central memory of 131K (60-bit) words of core in 32 banks of 4K each, connected to a central processor (arithmetic and logical units) and to 10 peripheral-oriented processors, each with an additional 4K (12-bit) words of core. The machine was priced at "seven to eight megabucks."

CDC also planned to unveil the 3200 at the Fall Joint Computer Conference. The 3200 was a 24-bit machine (either 24 bits or four characters) with four parity bits per word, and had a 1.25 microsecond cycle time, which was asynchronous, allowing overlapping of the 8K memory banks. The machine used 3600 hardware and was available in four processor models: basic, scientific (floating point), data processing (bcd adder), and general (both bcd and floating point). The software included compact COBOL and FORTRAN (subsets of 3600 counterparts), a monitor, and comprehensive assembly program.

Seymour Cray, a CDC designer and board member, was in the spotlight along with the 6600. The machine was unveiled at Control Data's Chippewa Falls, Wis., lab, which was built for the pre- and postnatal care of the 6600.

Rumor had it that Cray approached CDC president William Norris with the need for a design lab out of the company's Bloomington, Minn., headquarters, more than an hour's drive away. "Sounds fine," said Norris, "let's give it some thought." "Well, I've already picked a suitable site," Cray is said to have countered. "All right, we'll present it to the board of directors." "Well," Cray admitted, "they might as well know the truth: I've purchased the land." As it turned out, Cray allegedly had the lab laid out in his mind, the land cleared, and straw strewn on the ground to keep it from freezing.

Cray denied the story, but whatever the lab's origins were, it was completed in June of 1962. Soon thereafter a CDC executive, on an inspection tour of the new facility, had trouble finding the place. None

of the locals knew anything about CDC or the new lab. Only after the exec mentioned Cray did he get a response: "Oh, you mean Seymour's place! Sure, that's right down this road." Seems Cray was born and reared in Chippewa Falls.

## OF ILLIAC AND ARPA

*October 1973:* It had been eight years since the conception of the ILLIAC IV parallel processor by Prof. Daniel L. Slotnick at the University of Illinois, and it would be another year and a half before the system would be available to its ARPA network users for some 16 hours a day, reported Ed Yasaki, San Francisco bureau manager.

Mel Pirtle, the man responsible for getting the system on the air, said it was then up and running only about eight hours a day, and that the longest job so far was a 10-minute program. Pirtle did add that test programs of "many hours" had been run.

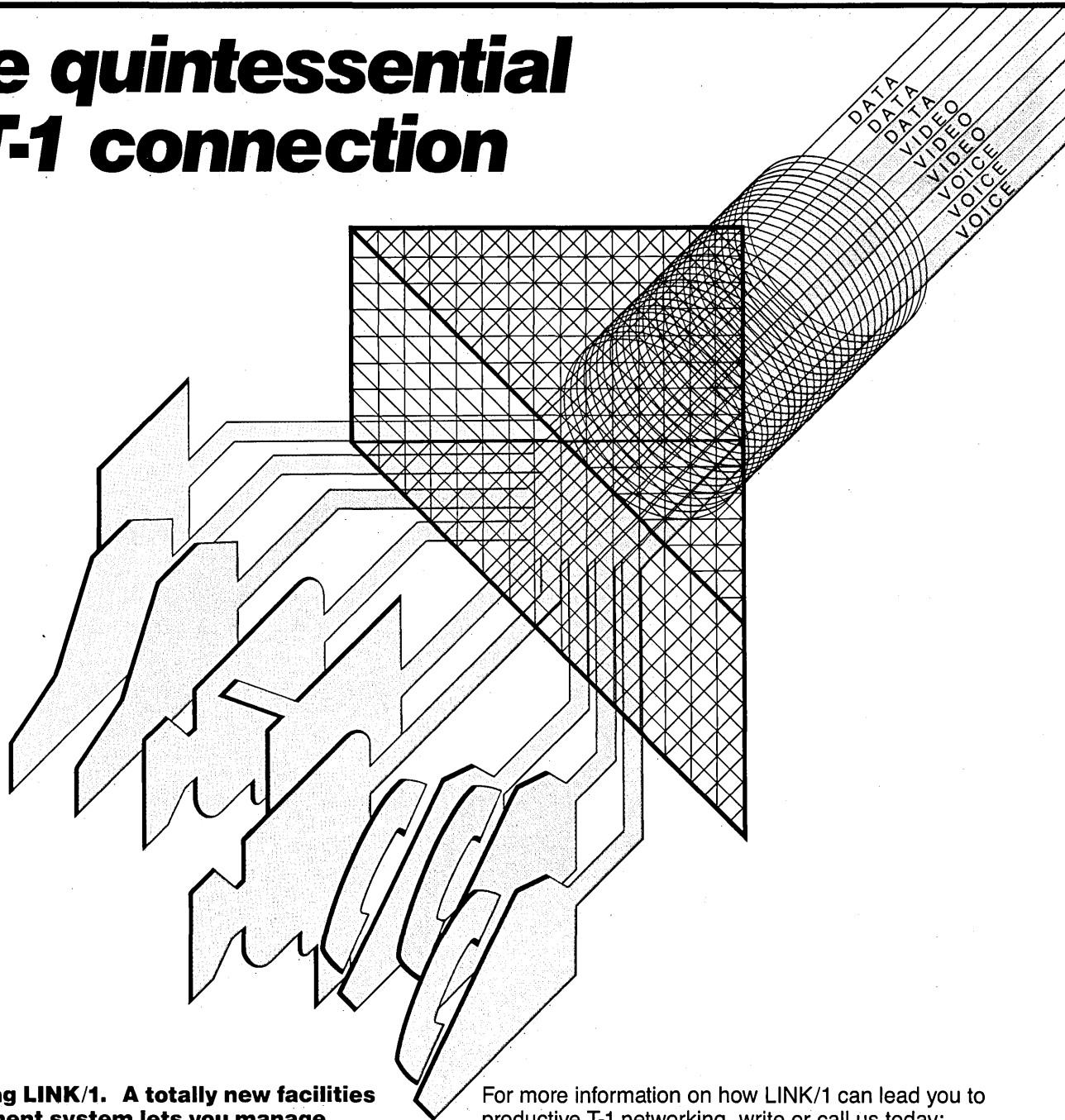
Burroughs Corp. had been given the contract to convert Slotnick's design into hardware in 1967 and had delivered the project to NASA's Ames Research Center, Mountain View, Calif., in 1972. The Institute for Advanced Computation was then formed to pump life into the computer, integrate it into the ARPAnet, and operate it.

Up until this time, the system represented a \$35 million investment, with an operating budget of \$4 million a year. Other applications would include huge dynamic simulation and optimization problems, as in global climate predictions, aircraft and spacecraft design, logistics, economics.

The other elements of the system—PDP-10s and 11s and a laser memory—played important support and control functions. Supplying such utilities as a general purpose text editor, language translators, and an ILLIAC IV simulator, they made it possible to program preparation without tying up the ILLIAC and to submit data in the same off-line mode. They would also store the results of computation for recall by the user. Once a program had been developed, the final testing would involve use of the ILLIAC. Thus, added Yasaki, the ILLIAC IV housed no operating system and performed no utility functions, but was instead dedicated totally to the execution of user code.

—Lauren D'Attilo

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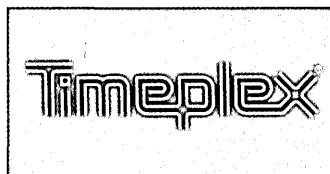


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FIELD REPORT

910 CHOLE CHART LIST

DATE	TIME	LOCATION	DESCRIPTION	STATUS	REMARKS
10/15/78	08:00	1010	CHOLE	OK	
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"Swamped."

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

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## **Fight fire with fire.**

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

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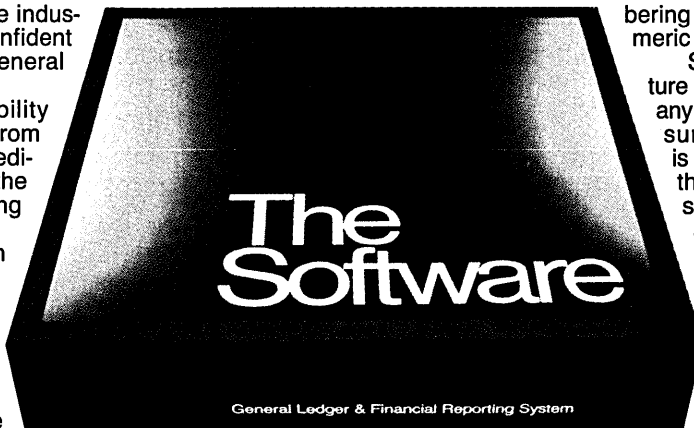
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# LOOK AHEAD

SUPERCOMPUTERS:  
CDC...

No sooner has Control Data spun out its Cyber 2XX supercomputer effort to startup ETA (see p.74) than it is preparing to market another big machine, the Cyber Plus. Plans are to commercialize the Advanced Flexible Processor, developed by CDC's Government Systems Group and used for three years in classified military applications. Delivery of the new supercomputer, which uses several 200-MFLOPS processors running in parallel, is slated for late next year. Its main targets are the large-scale scientific processing jobs handled by Cray Research's X/MP and Denelcor's HEP systems.

...AND IBM

Meanwhile, it has been learned that IBM has a small group at work in Yorktown Heights, N.Y., studying various supercomputer architectures. Those close to the supercomputing scene suspect the company is not very close yet to introducing its own product, despite all the publicity given to Josephson junction logic devices.

370 IN A BOX

Talk abounds of a desktop 370 being readied for introduction by IBM. Timing of such a box would be critical, so as not to take away from sales of larger, 4300-type machines. The company is said to have implemented the 370 instruction set on a Motorola 68000 processor. One report has it that "Popcorn," as the machine is called, won't be introduced until next summer, apparently for fear of further confusing the market that is currently gobbling P.C.s as fast as they come out of the oven. Meanwhile, other reports have it that IBM's upcoming "Peanut" home computer will be exclusively a CP/M machine, giving Digital Research a chance to show off its stuff against Microsoft, whose MS/DOS runs the P.C.

TANDEM GOES  
FOR THREE

Look for Tandem Computers this month to unveil a third fault tolerant processor to its aging line. We hear the new machine (Non-Stop III?) will have three times the performance of its predecessor at only twice the price. Although the Non-stop II machine had limited 32-bit addressing features, the III would be a true 32-bit processor that retains software compatibility with previous hardware.

LAN MEETS VM

IBM's long-awaited ring-passing local network will not be introduced this year after all. Problems with Texas Instruments' interface chips are said to be the primary cause for delay. In the mean-

# LOOK AHEAD

## VAN EXPERT IN A BOX

time, IBM is said to be trying to rewrite its VM/370 operating system to take advantage of local networking when it finally comes. That VM effort, however, is supposedly running into problems in the paging manager area, a piece of code dating back to the operating system's 1967 genesis.

General Research Corp., Santa Barbara, Calif., has developed a knowledge-based expert system that helps VAX users tune their system's performance. TIMM/Tuner is based on an inference mechanism the company developed internally as the basis for other expert systems (April, p. 101). The company plans to offer the VAX advisor as a standalone package and as a service. The firm says it has installed three of its expert systems at test sites, including at a Lear Siegler facility in Grand Rapids, Mich.

## PRIME'S FUNNY NUMBERS

Prime 750 users report microcode troubles with their machines in the area of exponential arithmetic. It seems that multiplying  $2.5 \times 10^{14}$  by  $1.0 \times 10^{15}$  and subtracting  $2.5 \times 10^{29}$  gives a non-zero answer. Prime declined to discuss the matter but users say the firm has answered the problem, which shows up in BASIC and FORTRAN programs, with a software package called Extended Math Option.

## WANG GOES TO BUY THE BOOK

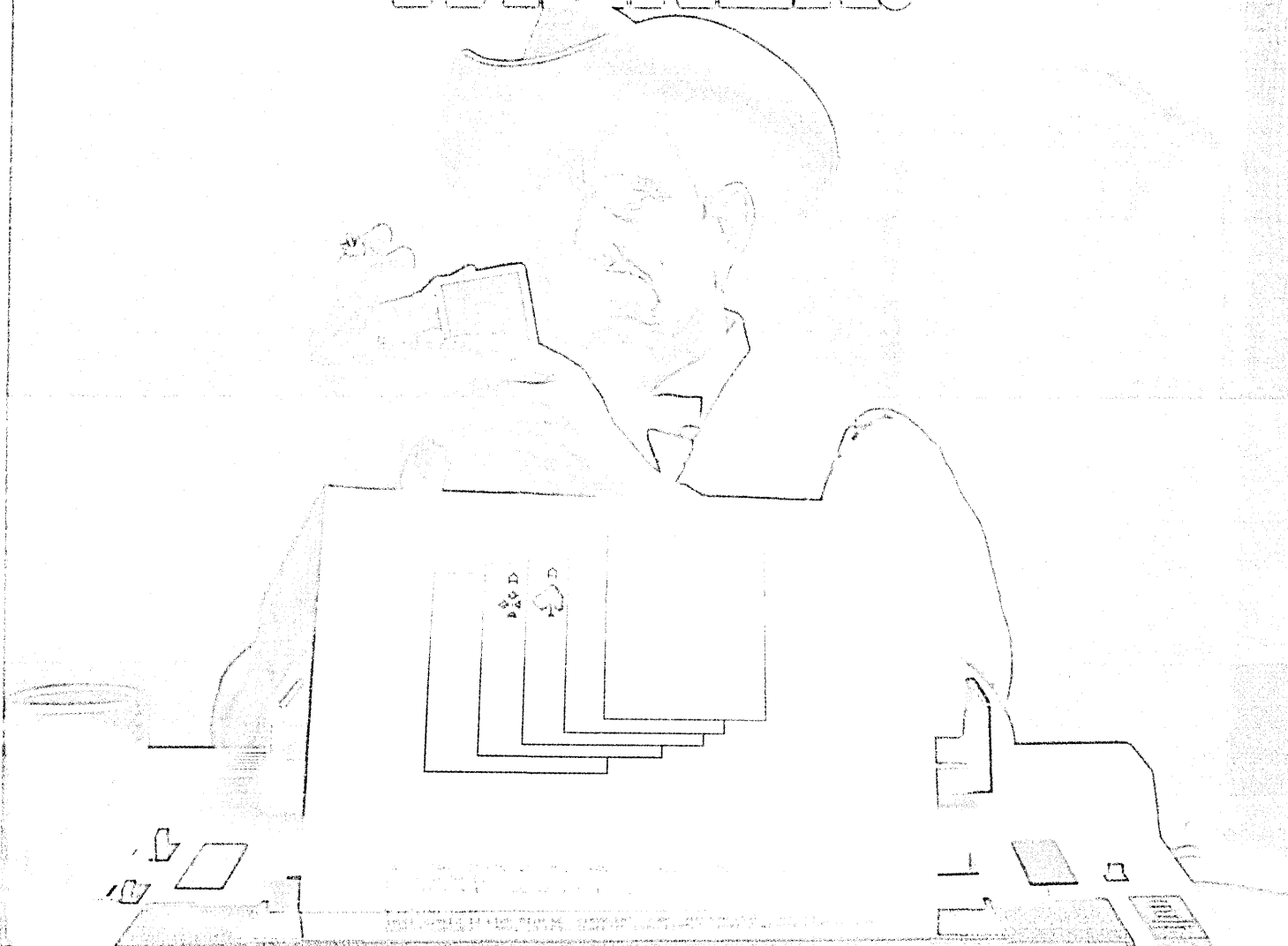
Wang Labs is quietly buying up exclusive electronic publishing rights to various dictionaries and other reference works. The company is assumed to be planning an optical disk implementation of the material, which includes the "Random House Dictionary," "Concise Oxford Dictionary of English," "Roget's International Thesaurus," "Black's Law Dictionary," and the Chicago "Manual of Style." A recently formed division, Wang Electronic Publishing, got into the electronic dictionary business with the purchase of Dictionaries Inc., New York, last July.

## RUMORS AND RAW RANDOM DATA

Watch for Burroughs to introduce X.25 support on its B20 small computer in the first half of next year....IBM is working on a distributed relational database package code-named R-Star.... Advanced Matrix Technology, Newbury Park, Calif., will introduce a letter-quality printer at Comdex next month. The machine prints in four colors and will be enhanced to print on acetate film for 35mm slides....Xerox Corp.'s Corporate Font Center in El Segundo is readying a magnetic ink character recognition typeface for the firm's electronic printing systems.



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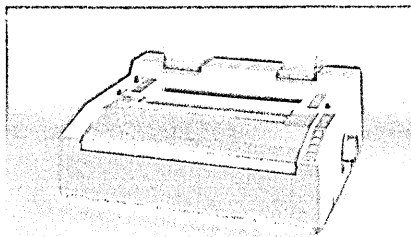
□ 30 cps for final proof with graphics

□ 60 cps for high resolution graphics

□ 120 cps for text

Other features offered standard with the 8600 include automatic vertical/horizontal tabbing and variable forms length with 6-channel electronic vertical formatting.

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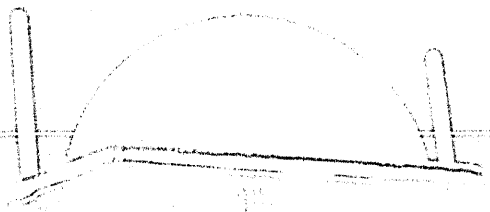
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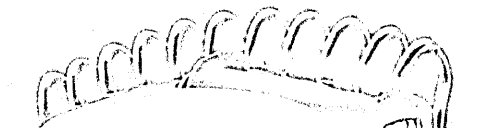
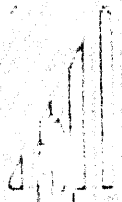
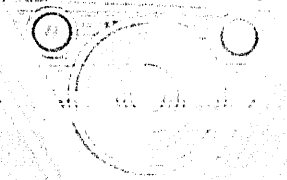
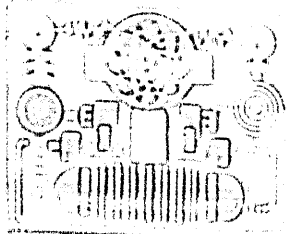
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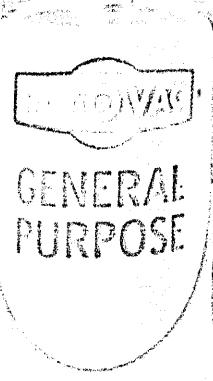
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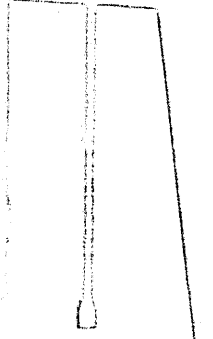


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# CALENDAR

## OCTOBER

### **EduTech/East '83.**

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

### **SYSTEMS '83.**

Oct. 17-21, Munich, Germany, contact: Kallman Associates, 5 Maple Ct., Ridgewood, NJ 07450, (201) 652-7070.

### **The National Software Show.**

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

### **FACTS-83.**

Oct. 23-26, Hilton Head Island, S.C., contact: Michael J. Hoogen-dyk, Association of Information Managers, 111 East Wacker Dr., Chicago, IL 60601, (312) 938-2576, ext. 773.

### **TELEVENT 83.**

Oct. 23-25, Montreux, Switzerland, contact: Marianne Berrigan, Televent USA, 1120 Connecticut Ave. NW, Suite 1128, Washington, DC 20036, (202) 857-4612 or telex 892 415.

### **ACM '83.**

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

### **TELECOM 83.**

Oct. 26 - Nov. 1, Geneva, Switzerland, contact: Madame Rison, International Communications Union, Place des Nations 1211, Geneva 20, Switzerland, tel. Geneva 99 5111.

### **International Conference on Computer Design (ICCD '83).**

Oct. 31-Nov. 3, Port Chester, N.Y., contact: Harry Hayman, ICCD '83, IEEE Computer Society, 1109 Spring St., Suite 300, Silver Spring, MD 20910, (301) 589-8142.

### **Integrated Office Technology Conference and Exposition (INTECH '83).**

Oct. 31-Nov. 3, Chicago, Ill., contact: Jacqueline Voigt, National Trade Productions Inc., 9418 Annapolis Rd., Lanham, MD 20706, (301) 459-8383.

### **Ninth International Conference on Very Large Data Bases.**

Oct. 31 - Nov. 2, Florence, Italy, contact: Mario Schkolnick, K55-281, IBM Research Labs, 5600 Cottle Rd., San Jose, CA 95193, (408) 256-1648.

## NOVEMBER

### **Federal Office Automation Conference.**

Nov. 1-3, Washington, D.C., contact: the National Council for Education on Information Strategies, P.O. Box N, Wayland, MA 01778, (617) 845-5050.

### **10th Annual Computer Security Conference.**

Nov. 7-10, New York, N.Y., contact: Carol Smith, Computer Security Institute, 43 Boston Post Rd., Northboro, MA 01532, (617) 845-5050.

### **Fifth Annual Northeast Computer Show and Software Exposition.**

Nov. 10-12, Boston, Mass., contact: Northeast Expositions, 822 Boylston St., Chestnut Hill, MA 02167, (800) 841-7000.

### **International Information Management Congress (IMC '83).**

Nov. 14-17, San Francisco, Calif., contact: IMC '83, P.O. Box 34404, Bethesda, MD 20817, (301) 983-0604.

### **AUTOFACT 5.**

Nov. 15-17, Detroit, Mich., contact: Gregg Balko, CASA/SME Sr. Administrator at the Society of Manufacturing Engineers, One SME Dr., P.O. Box 930, Dearborn, MI 48121, (313) 271-1080.

### **The Sixth Western Educational Computing Conference.**

Nov. 18-19, San Diego, Calif., contact: Dennie Van Tassel, Computer Center, University of Calif., Santa Cruz, CA, 95064, (408) 429-2434.

### **Global Telecommunication Conference (GLOBE-COM '83).**

Nov. 29 - Dec. 1, San Diego, Calif., contact: Dr. Estil Hoversten, GLOBECOM '83, P.O. Box 81466, San Diego, CA 92138, (619) 457-2340.

## DECEMBER

### **CMG XIV, International Conference on Computer Performance Evaluation.**

Dec. 6-9, Crystal City, Va., contact: Computer Measurement Group, P.O. Box 26063, Phoenix, AZ 85068, (602) 995-0905.

### **Conference on Personal and Small Computers.**

Dec. 8-9, San Diego, Calif., contact: Billy G. Claybrook, Publicity Chairman, The MITRE Corp., MS B332, P.O. Box 208, Bedford, MA 01730, (617) 271-2439.

## JANUARY

### **Seventeenth Hawaii International Conference on System Sciences.**

Jan. 4-6, Honolulu, Hawaii, contact: Emily M. Yano Jorgensen, Center for Executive Development, College of Business Administration, University of Hawaii, 2404 Maile Way C-202, Honolulu, HI 96822, (808) 948-7396.

### **6th Annual Pacific Telecommunications Conference.**

Jan. 8-11, Honolulu, Hawaii, contact: Fred Smith, Pacific Telecommunications Council, 1110 University Ave., Suite 303, Honolulu, HI 96826, (808) 949-5752.

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**How could we build 160,000 line printers and not make an impression?**

We've produced more line printers than all other independent computer printer makers combined.

So why isn't Dataproducts a household word? Because most Dataproducts line printers are delivered to end users with somebody else's name on them.

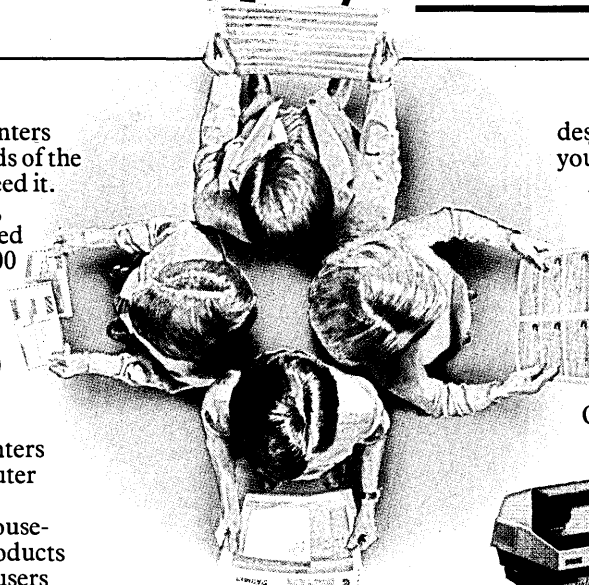
Virtually every major OEM in the business has selected our B-Series printers for the systems they sell. Each has made that selection after months, sometimes a year, of intensive evaluation.

More than anything else, they look for a machine that can perform reliably over a long period of time. Their reputations are at stake.

Which is why the safest choice for your company may be a printer you've never heard of.

**The best printers are the easiest to use.**

Dataproducts probably knows more about the people who use computer printers than anybody. We know how they slam cabinets. How



they jam paper. How they smear ink on their pants.

We conceived the B-Series for the operator. Extensive diagnostics help the operator locate and correct troubles fast. Long-life ribbon cartridges are quick and clean to load. The machines open wide so all controls are easy to see and easy to reach.

In less than a minute, the operator can even change the print band—to a different typeface, a different language.

**The best printers are the least expensive to own.**

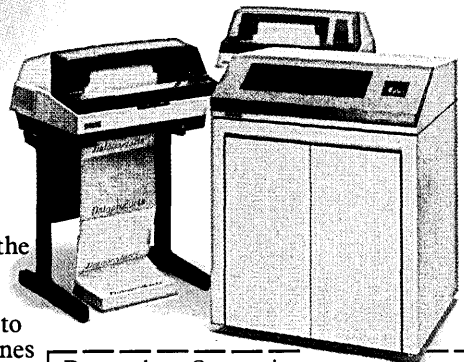
90% parts commonality within the family minimizes spares inventories and training. Power consumption is low.

Operators fix most problems. When they can't, the B-Series is

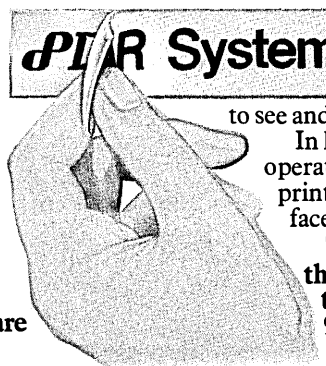
designed to help service people get you back on-line quickly.

And because we make so many of these printers, we don't have to charge a lot of money for yours. You get low initial cost. And low cost of ownership.

If you'd like to know more about our B-Series printers, or the name of our distributor in your area, call (213) 887-3924. Or send the coupon below.



## *PIR* Systems



Dataproducts Corporation,  
6200 Canoga Ave., Woodland Hills, CA 91365

Send details!  Send a sales rep!

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Type of business \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone \_\_\_\_\_ Ext \_\_\_\_\_

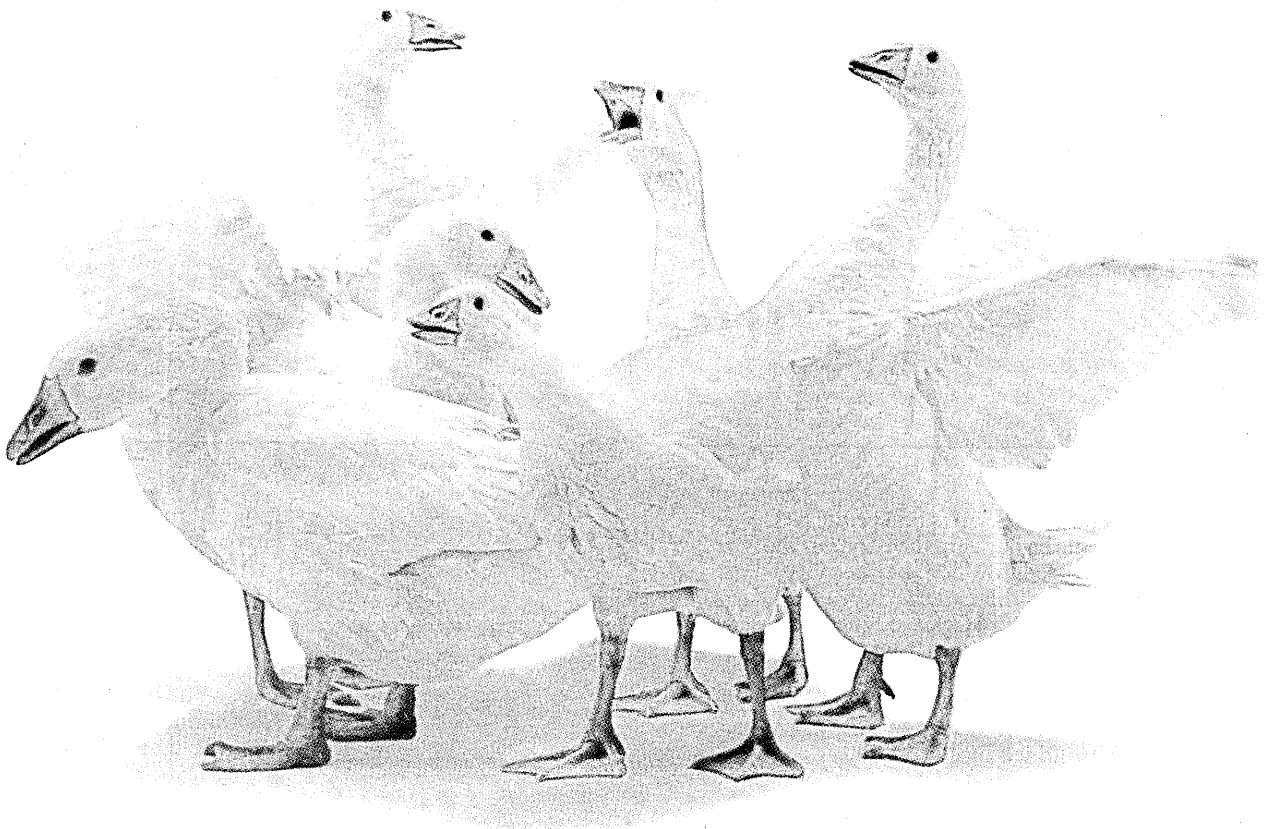
Also send information on:  
 120-200 LPM dot matrix printers  Graphics and label printers  
 35-55 CPS letter quality printers  1500-2000 LPM high performance printers  Printer supplies

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# DATAPRODUCTS

*The Printer Company*





# While everyone else has been squawking about private networks, one company has been quietly building them.

Today, with dozens of new companies and hundreds of unproven products all promising to perform networking miracles, the noise level has become exceedingly loud.

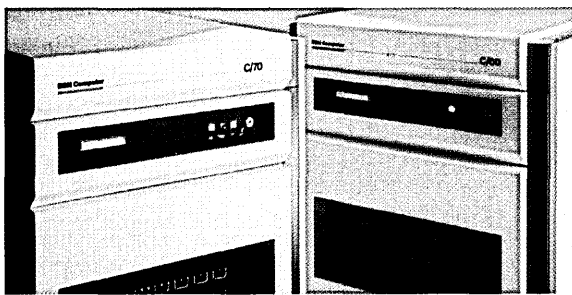
And the job of finding the right company to build your network has become more confusing than ever.

Meet BBN Communications. In the midst of the noise and confusion, we've been quietly building networks for government agencies and major corporations around the world. In fact, we built the world's first packet-switched computer network back in 1969.

But what sets us apart even more than our experience is the way we work. Instead of the usual short-term "fixes," we're committed to providing long-term solutions. So before we design your network, our communications consultants will analyze your specific needs—present and future. And based on them, establish your optimum network configuration. Then we'll build your network. Of course, even after everything is working to your satisfaction, we'll still be around to help with your future needs.

## It takes more than computers to make a computer network.

Another thing that makes us different is that we manufacture a full line of our own proven networking hardware and software, not just a few isolated products. Including packet switches, terminal access

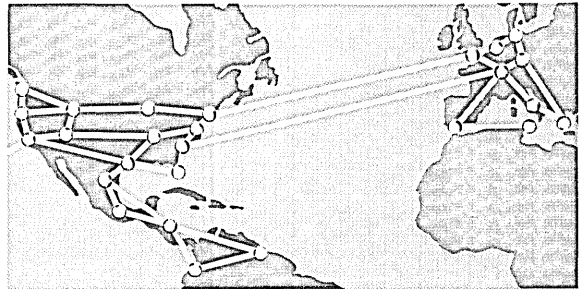


*Our communications processors are the most advanced available today.*

devices, and electronic mail systems. All of which simply means we can supply everything you need.

What's more, our entire product line is fully X.25 compatible and easily interfaces with public data networks.

But state-of-the-art technology is just the beginning. We also provide a network operations center so



*Packet-switched networks built by BBN Communications link companies with offices around the world.*

you can monitor your entire network at a glance and control it almost as easily. We'll even run the center for you if you like. And to ensure maximum network reliability—and uptime—we offer round-the-clock field service by the most experienced communications engineers in the business.

Just because we're the networking leader, don't think for a minute that we're resting on our accomplishments. Our R and D effort is one of the largest in the industry, with major programs in protocol development, network control, and future network applications. And, of course, our customers receive the full benefits of every breakthrough we make.

## We're the networking leader.

Fifteen years ago, we pioneered packet-switching technology to build the Arpanet, the world's first packet-switched computer network. Today, Arpanet supports 10,000 users and over 300 different computers in the United States and Europe, and the technology we invented for it has become a cornerstone of the data communications industry.

As the networking leader, our customers include major financial, manufacturing, and industrial corporations from all over the world. Recently we've even been selected to build and run the U.S. Defense Department's major new computer network, the Defense Data Network.

So if you're tired of all the squawking, consider BBN Communications. We think it's about time you got your network, and some peace and quiet, too.

For a brochure on our complete networking capabilities, contact BBN Communications Corporation, 33 Moulton Street, Cambridge, MA 02238, (617) 497-2800.



**BBN Communications Corporation**

CIRCLE 22 ON READER CARD

# FOUR LITTLE WORDS THAT STRIKE FEAR IN THE HEART IN THE 1980'S.



"The computer is down."

Every day another business goes "on line." Every day the world becomes more dependent on computers. And every day it becomes more important for the world to have a computer that won't even skip a heartbeat.

Over the past decade there have been computers designed to eliminate downtime. However, all previous approaches depend heavily on software techniques to provide fault tolerance. A comparison of these old systems with the new Stratus/32 Continuous Processing™ System will illustrate how far we have come in one leap, by using advanced hardware technology instead of complex software.

#### How the Stratus Hardware Solution Supersedes the Software Solution.

Stratus's hardware design means that fault tolerance is invisible to your application programs and users. In contrast, the software-based systems require complex, performance-stealing software in order to implement fault tolerance. This

means that new programs are more difficult to develop, they run slower, and existing programs can't be run without major changes.

#### Hardware Self-checking Causes a Breakthrough in Service.

Each Stratus/32 tests itself EIGHT MILLION TIMES A SECOND while it executes your programs, so faults are detected BEFORE they corrupt your data. And when there is a failure, there's no need to rush to call your Stratus service technician. For one thing, the failed component has a partner that continues operations as usual (without slowing down the system), so there's NO DOWNTIME. In addition, repairs can be made WITHOUT STOPPING THE SYSTEM. It is so easy to repair a Stratus/32 that our service is provided at about one-half the average price charged by other computer manufacturers.

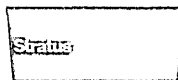
#### \$140,000, Software Included.

\$140,000 buys you a complete four megabyte 32-bit system with 60 megabytes of disk storage, magnetic tape drive, and system SOFTWARE. If you like our hardware, you will be even more impressed with our software. (A common reaction among our users.) Briefly, our software offering includes VOS (a virtual operating system), transaction processing, networking, IBM communications, data management system, interactive forms

builder, symbolic debugger, COBOL, Basic, PL/I, Fortran, Pascal, word processing . . .

For more information, call Keith Johnson, 1-800-255-1515.

The computer you can count on has arrived.



**Stratus**  
CONTINUOUS PROCESSING™

Now that the world relies on computers it needs a computer it can rely on.



# LETTERS

## MYTHUNDERSTOOD

Regarding the Readers' Forum write-up on System Development Mythology (June, p. 272), I would like to make the following points:

1. SDMs vary considerably. Some older systems are many-volumed horror shows we've come to know but not to love. Some are specialized for auditors, some for academics, and a few for developers.

2. SDMs are still evolving. This process must continue to adapt to new techniques as they arise. Prototyping is probably only the best current example of approaches that must be accommodated.

3. SDMs have been oversold as a panacea. They won't prevent bad project management or incompetent design nor can they provide miracle cures to unhealthy environments.

4. SDMs are not the underlying tools; they are a structure within which one can organize the development process. In fact, an SDM should ideally be independent of the tools used, as the tools will vary over the years but the principles of good project development remain relatively constant.

5. SDMs do not avoid the need for skilled practitioners. The only surefire way to prevent damage from incompetence is through absolute paralysis, a technique used by some SDMs.

Having said all this, a structure to project development is still necessary. It ensures all activities are considered and provides a means of communication and professional discipline essential for consistent development success. SDMs that help rather than hinder do exist and ought not to be condemned for the weaknesses of early methodologies.

LINDA HOUNSELL  
IAN REID

Computech Consulting Canada Ltd.  
Vancouver, B.C., Canada

My response to Ian Gilhooley's article on "Systems Development Mythology" could be titled "Methodology Management—

The Real Myth."

It would probably be generally agreed that development methodology could not be considered a panacea. However, neither can prototyping, relational databases, data dictionaries, or any of the other tools provided for systems development and maintenance.

Statements such as "put together a model" and "the purpose of the exercise is to get exact information you need from the user" seem to imply that systems should be developed by data processors with input required from the user on an as-needed basis. Even if that implication is not true, it is very difficult for any user to supply requirements to a data processing analyst without going through the exercise of documenting them in writing.

Development methodologies, whether vendor supplied or homegrown, represent only one of many tools provided for the building of good data processing

systems. It is the people who use them that make the difference. Project managers, whether user or data processing oriented or both, must decide whether they manage the tools provided or are managed by them.

DAVE JOHANSEN

EDP System Development Auditor  
First Interstate Bank of Oregon, N.A.  
Portland, Oregon

## OF MICE AND WOMEN

An item in your "On the Job" department (July, p. 260) contains reference to a survey that showed that only 2% of personal computer users are female. The item contained quotes stating that 1. only a few women have achieved computer literacy, 2. women are more prone than men to "computer phobia," and 3. little girls have grown up to be women who are reluctant to deal with anything mechanical—including computers. The first two points are complete garbage. The third point is partially true—little



CARTOON BY STEVE ATTOE

## LETTERS

girls have grown up to be women. However, many women are very competent computer users but have no need or desire to own a personal computer. I suggest that future surveys question the uses of the male-operated PCs, and I submit that little boys have not grown up. The only difference between men and boys is the price of their toys.

ELAINE BURR  
Pittsburgh, Pennsylvania

### IDIOTS SAVANTS?

"Real Programmers Don't Use Pascal" (July, Readers' Forum, p. 263) is too little too late. Mr. Wirth now admits that Pascal is not a "real" language. His latest fad is Modula, a language that rediscovers modular programming as it was invented by real programmers in the '60s. The question now is: would you buy a programming language from the same man who gave you Pascal?

Like Pascal, Modula lacks the rudiments of input/output, error management, random files, true strings, interactive debugging, and so on. Let's hope that our universities won't bother to retool this time. By allowing someone to publicly say a bad thing about Pascal you may have saved us from raising a generation of structured idiots savants.

STEVE ROSKI  
San Diego, California

"Real programmers" don't write brilliant satires about Pascal for publication in DATAMATION.

BONNER WILSON  
Algorithmics/West  
Mill Valley, California

### LOOPHOLE CLOSED

If Congress moved to "shore up a loophole" (June, p. 130), wouldn't that result in a loophole of *increased* size? Isn't that the *opposite* of the meaning you desired to convey?

TOM SMITH  
Thomas J. Smith Inc.  
Tax Consultants  
San Jose, California

*Thanks for shoring up our error.* —Ed.

### OH, BROTHER!

Larry Harris's article, "Fifth Generation Foundations" (July, p. 148), was interesting. It is worth noting how the set of rules interacts to find new facts, some of which are unexpected. For instance, in the example on page 150, Jack is his own brother:

1. fact: (BROTHER JACK BOBBY)
2. rule: IF (BROTHER X Y) THEN (BROTHER Y X)
3. result (1,2): (BROTHER BOBBY JACK)
4. rule: (AND IF (BROTHER X Y) (BROTHER Y Z)) THEN (BROTHER X Z)

5. result (1,3,4): (BROTHER JACK JACK)

It is not clear to me how the rule base could be fixed to avoid this situation. I doubt that one wants a rule like:  
IF (BROTHER X X) THEN (NOT (BROTHER X X))  
This would introduce an inconsistency of a different and more dangerous sort.

At least the article demonstrates that construction of a rule set requires considerable thought. One can never know all the implications from a large set of facts and rules, and thus the output of such systems must be treated with care. In the article's own example of creating a list of everyone with two brothers, the list would actually be of everyone who has *one* brother (as we commonly use the term). And the list of those with *one* brother:

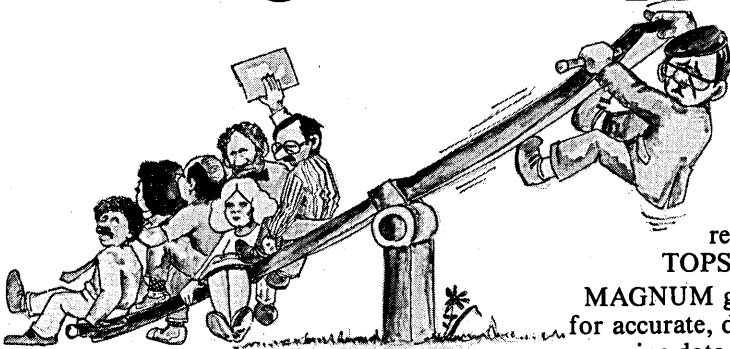
(LIST X (EQ 1 (COUNT (LIST 2 (BROTHER X Z))))))

will always be empty: the rules make it impossible to have only one brother.

Perhaps one should also note that rule 2 is usually false in larger domains. Consider the statement (BROTHER RALPH SUSAN). Even if Ralph is the brother of Susan, it is unlikely that we wish to consider that Susan is the brother of Jack.

MICHAEL W. HAM  
Director  
Program Information Services  
ACT Educational Programs and Services  
Iowa City, Iowa

# Teetering from an applications imbalance?



As DP Manager, you want to make your department as productive as possible.

To design and implement new applications while reducing program maintenance costs.

And not be weighed down by project management problems and a backlog of end user needs.

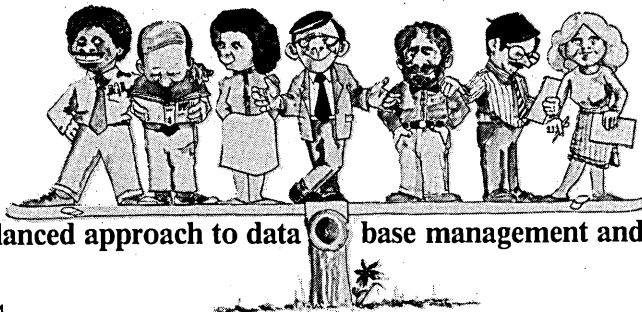
That's why you need MAGNUM®, Tymshare's relational data base management system, for your DEC TOPS-20 or VAX/VMS\* system.

MAGNUM gives your end users the convenience of using screens for accurate, data entry...the ease of producing ad hoc reports and accessing data with a query language...the freedom from worry that

comes with error-checking and updating capabilities...the facility to run both simple and complex programs.

And MAGNUM's high-level procedure language increases programmer productivity—by cutting back on tedious programming details.

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\*VAX/VMS version available in early 1984.  
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**CIRCLE 23 ON READERCARD**

 **TYMSHARE®**

# AST & PCnet™ for IBM® PC



PCnet is the first local area network designed specifically for the IBM Personal Computer. It consists of the necessary hardware and software to set up a powerful, yet cost effective local area network for the IBM PC. While others make claims, PCnet is a local area network proven to be successful by hundreds of installations in IBM Personal Computers.



**AST RESEARCH INC.**

2372 Morse Avenue, Irvine, CA 92714  
 Telephone (714) 540-1333  
 Call or write for immediate response.

**AST & PCnet Hardware:**

- CSMA/CD LAN technique
- 7000 feet max. distance
- Low cost CATV Coaxial cable as medium for transmission
- 1 Megabit per second transmission
- Optional Mainframe connection (e.g., AST-SNA; AST-5251; AST-3780 etc.)

**AST & PCnet Software:**

- Disk Sharing
- Unlike other networks,

PCnet does not demand expansive file server or proprietary hard disk systems for disk sharing. Almost any PC-DOS compatible hard disk including IBM's can be used for disk sharing

- File locking Provides locking to common data files so that common files are only accessed by one user at a time
- PC Sharing (Multi-tasking) Allows user on 1 PC to run command on another PC in the same network

as if the command had been entered on that PC's keyboard

- Printer Sharing Allows PCs to share printers installed in other PCs.

**AST & PCnet Future Products:**

- Universal File Server
- Gateway

**Other AST Products**

- I/O Plus II
- MegaPlus
- ComboPlus
- PlusModem
- Etc....

PCnet is a trademark of Orchid Technology, Inc. IBM is a registered trademark of International Business Machines Corporation.

CIRCLE 24 ON READER CARD



## With 3M diskettes, your computer never forgets.

3M diskettes remember everything, every time. Because at 3M, reliability is built into every diskette. We've been in the computer media business for over 30 years. And we've never settled in. We're constantly improving and perfecting our product line, from computer tape and data cartridges to floppy disks.

3M diskettes are made at 3M. That way, we have complete control over the entire manufacturing process. And you can have complete confidence in the reliability of every 3M diskette you buy.

Look in the Yellow Pages under Computer Supplies and Parts for the 3M distributor nearest you. In Canada, write 3M Canada, Inc., London, Ontario. If it's worth remembering, it's worth 3M diskettes.



3M hears you...

# 3M



# EDITORIAL

## ESTABLISHING MICRO POLICY

### The Big Stick Approach Just Won't Work

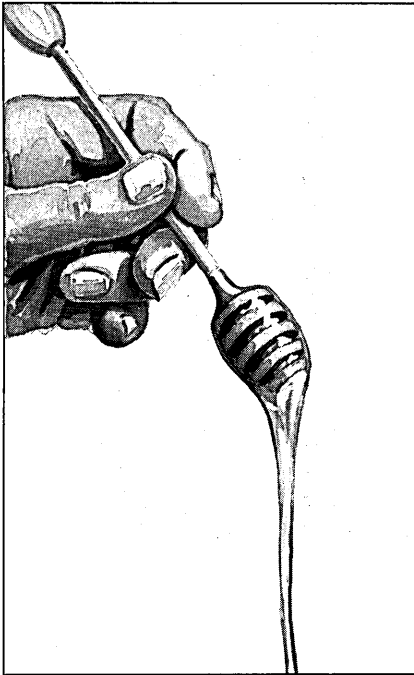


ILLUSTRATION BY DORIS ETTLINGER

By this time you're very aware of the mounting pressure on dp/MIS to manage the influx of personal computers into the corporation. You know they're spreading through your organization like an automated version of the Andromeda strain. Although the situation is unstable, and probably will be for the next several years, your management is asking you to bring some order out of the potential chaos.

Dealing with these insidious invaders is not a matter of imposing rigid controls and procedures. Instead, it's seeing the PC for what it is, a powerful new tool that must be blended into the overall corporate information environment, an environment that is now user-oriented rather than dp department-oriented.

By using the personal computer to find creative solutions to user problems, dp/MIS can build an atmosphere of acceptance and trust. Users will want to work with dp to establish standards and procedures beneficial to both, rather than chafe under what will be perceived as arbitrary restrictions imposed by an insensitive dp department.

The key is creativity. In this issue, for example, Irene Nesbitt (Move It to a Micro'') recommends taking certain old (but still useful) applications off the mainframe and moving them to the user's PC, a creative and interesting approach that stretches the PC's usefulness and benefits both the user and the dp department.

Obviously a huge batch run that has five laser printers going day and night is a mainframe job; so is managing the database that makes that job possible. But for engineering design, for data entry and recovery, and especially for a variety of communications-oriented tasks, the personal computer has enormous potential. Electronic mail, accessing the rapidly growing number of excellent outside databases, and videotex and teletex applications are all candidates.

Of course, there are many applications waiting to be handled right now that are far less exotic, but that can do much to break down the barriers between the user community and dp.

Our data center manager, for instance, found to his surprise that a seemingly trivial application can make scores of users ecstatically happy. His programmers came up with a little routine for the IBM P.C. that allows users to view discounted cash flow in the form of color bar graphs rather than the usual numerical columns. The program was an instant hit and is spreading throughout this Fortune 500 corporation.

Certainly, part of the enthusiastic response was because we humans prefer color graphics to rows of numbers. But equally important is the fact that the program was written by highly skilled applications programmers who made it truly user friendly.

Many of the commercially available programs, the manager observed, often betray the fact that they were written by two guys in a garage. Some are confusing, others have indecipherable documentation, and some are just downright user unfriendly. He heartily recommends enlisting those professional analysts and programmers on your staff to write user programs, programs that are truly user-oriented—simple, foolproof, clear, and helpful.

To press another well-worn cliché into service, you can catch more flies with honey than with vinegar. Control of the personal computer explosion will not come by issuing decrees. The key is helping the user work with these new tools to solve their problems; in turn, they will help you solve yours. \*

With all the clamor about personal computers, a fundamental fact is often overlooked: some simply *work* better than others.

## Consider the COMPAQ Portable.

A computer will make you more productive. A computer will make you more efficient. You hear it everywhere. But you don't hear about which computer actually *works* best.

A computer isn't magic. It's a tool. And just like other tools, some computers work better than others.

The COMPAQ™ Portable is a combination of 20th-century electronics and 19th-century pragmatism. It simply does personal computing better. Here's why.

### Works in more places

You don't do all your thinking in one place. Why have a computer that stays in one place?

The COMPAQ Portable has all the capabilities of a large desktop computer. But now those capabilities can go where you go.

You can move it from office to office to share its resources. You can move it into the conference room to answer questions when and where they come up.

With the COMPAQ Portable, you can be as productive in your hotel room or your lake house as in your own office. It's a reliable companion on a business trip. It's a powerful sales aid in your customer's office.

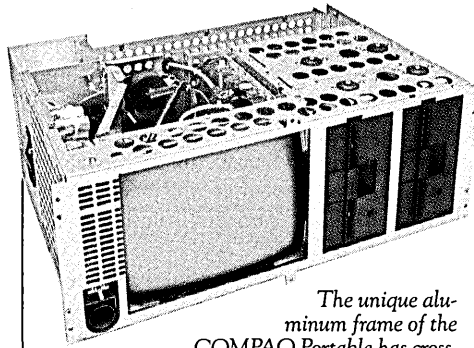
What's more productive than a computer? A computer that works for you in more places.

### Works with the greatest number of programs

The most important consideration when you choose a computer is "what programs will it run?" And that's one more reason for choosing the COMPAQ Portable.

The COMPAQ Portable runs more programs

*The COMPAQ Portable was designed to fit under a standard airline seat so you can take it on business trips.*



*The unique aluminum frame of the COMPAQ Portable has cross-members that strengthen it front-to-back, side-to-side, and top-to-bottom. It's a design practice commonly used in race cars.*

than any other portable. In fact, it runs more than most non-portables. That's because it runs all the popular programs written for the IBM® Personal Computer. There are hundreds of them. They are available in computer stores all over the country, and they run without any modification, right off the shelf.

Imagine the power of a *portable* word processor. There are dozens of different word processing programs available for the COMPAQ Portable.

Planning, problem-solving, and "what-ifs" are a cinch with a variety of popular electronic spreadsheet programs. The COMPAQ Portable runs them all.

There are accounting programs for anything from computerizing your family budget to full-scale professional management of payables, receivables, inventory, and payroll for your company.

There are programs for making charts and programs for communicating with other computers. Or if you want something really specialized, there are even program languages for writing your own programs.

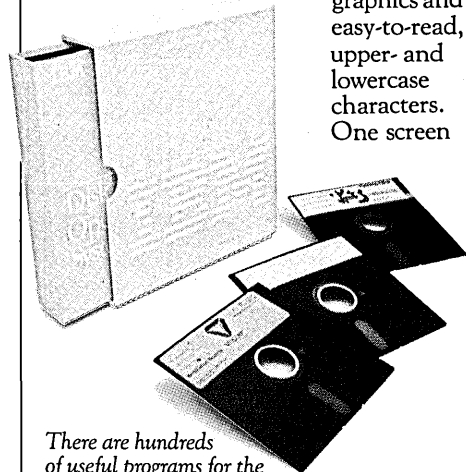
So, you get portability and you don't give

up problem-solving power. The combination adds up to the most useful personal computer on the market today.

### Works better because it's easy to read

The display screen of the COMPAQ Portable measures nine inches diagonally. It shows a full "page width" of 80 characters on a line so tasks like word processing are easier. And those characters are big enough to read even if you're leaning back in your chair.

The display shows both high-resolution graphics and easy-to-read, upper- and lowercase characters. One screen



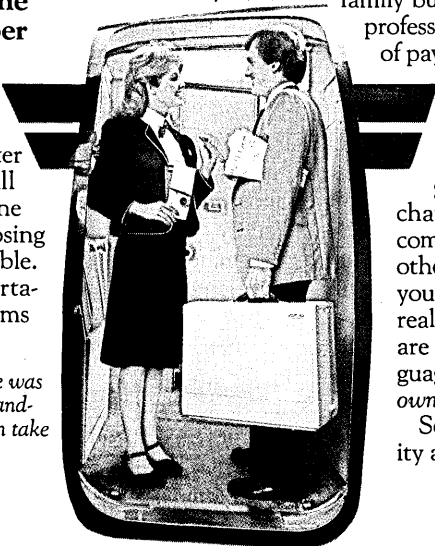
*There are hundreds of useful programs for the COMPAQ Portable because it runs all the popular programs written for the IBM.*

for all the information. With some personal computers, including the IBM, you can have either the graphics or the legible characters, but you can't have both unless you buy two different displays.

Incidentally, computer prices are often quoted without a display. The display of the COMPAQ Portable is built in, of course.

### Add-on options make it work the way you work

Inside the COMPAQ Portable are three open slots. Electronic devices called expansion boards fit those slots and give the COMPAQ Portable new powers.

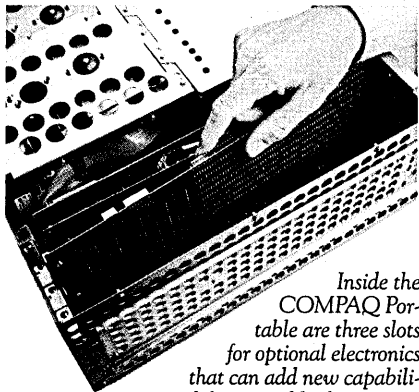


Just like the programs, expansion boards designed for the IBM work with the COMPAQ Portable, so there are dozens available right now. With them, you can make your personal computer more personal.

Want to check a stock price? Or look up something in The New York Times Information Service? One expansion board enables the COMPAQ Portable to handle those communications over ordinary phone lines.

Want to use your company's central computer files while you're on a trip? There are boards that allow the COMPAQ Portable to communicate with a variety of large mainframe computers.

Other boards let you hook up controllers for computer games or increase memory capacity. Still others let you connect personal computers in a network so several people in your office can share the same information.



Inside the COMPAQ Portable are three slots for optional electronics that can add new capabilities. Most portables have none.

### Works better because it's tough enough for the road

Portable doesn't just mean smaller. Portable means tough, too.

The COMPAQ Portable was built to withstand the hard knocks of constant travel. An aluminum frame within the case completely surrounds the computer's working components. Each disk drive is mounted in rubber shock absorbers instead of being bolted directly to the frame.

To test internal components, the COMPAQ Portable was subjected to impacts of 40 G's while running a program. After impacts on each side, there was no internal damage and the program was still running. Without error.

Computers are for getting rid of worries, not giving you new ones.

### Designed to help you work better, too

The COMPAQ Portable was designed to feel good.

## Specifications

### Software

- Runs all the popular programs written for the IBM PC

### Memory

- 128K bytes RAM
- Expandable to 640K bytes

### Storage

- One 320K-byte minifloppy disk drive, second drive optional

### Display

- 9-inch (diagonal) monochrome screen
- 25 lines by 80 characters
- Upper- and lowercase, high-resolution text characters
- High-resolution graphics

### Expansion board slots

- Three IBM PC-compatible slots

### Interfaces

- Parallel printer interface
- RGB color monitor interface
- Composite video monitor interface
- TV RF modulator interface
- Communications interface optional

### Physical specifications

- Totally self-contained and portable
- 20"W x 8 1/2"H x 16"D

The keyboard is detached so it can fit into your most comfortable working position.

The keyboard cable remains connected at all times. So you don't have to unpack it and hook it up every time you use your computer.

Because the display is built in, the COMPAQ Portable makes a neat,

small package on your desk, instead of a big obstacle you have to talk around. The built-in display also avoids the usual cable clutter because there's no need for separate cables for the display.

The COMPAQ Portable even has an electronically synthesized sound to create the familiar keyclick of a typewriter. With a simple keyboard command you can adjust the volume to suit the level of background noise in your office.

### The added usefulness is free

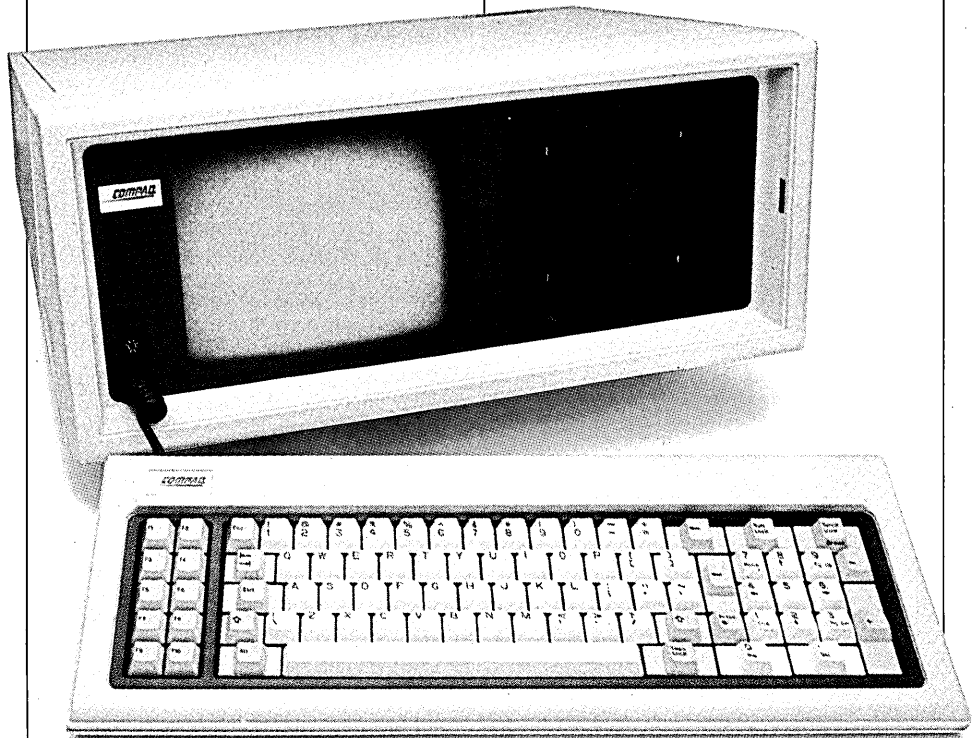
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# IN FOCUS

## AFTER THE FALL

**Here's what happened after the president of Eagle Computer died on the day the company sold \$33 million in stock.**

**by Peter Dworkin**

Bleary-eyed from lack of sleep, the top executives of Eagle Computer Inc., joined by a clutch of investment bankers and lawyers, assembled grim-faced at the offices of Hambrecht & Quist, the investment firm, on a typically foggy San Francisco morning in June.

The previous afternoon, hours after Eagle soared successfully in its first public stock offering, the company's dynamic 40-year-old chief executive and president, Dennis R. Barnhart, was killed when his new red Ferrari spun out of control at an estimated 70 mph only a few hundred yards from Eagle's Los Gatos, Calif., headquarters. In that irretrievable instant, a leader was lost and Eagle's bright future—and the \$33 million raised that day—became tragically imperiled.

"I was stunned," recalls Charles A. Kappenman, 42, Eagle's soft-spoken chairman and founder, of his reaction upon getting the news of the accident at home over the phone from Barnhart's secretary. A few hours earlier, the stock had opened at \$13 and closed at \$15.50 a share, and the Eagle family had toasted its triumph with a champagne and pizza party.

That night was taken up with grief, but there was little time to mourn. The sensational news was spreading like a brushfire across the country, and Eagle's stock was almost sure to crash if it opened the next morning. "There was a big question whether the company would lose everything," Kappenman feared. "We needed this offering to finance our growth." Eagle was to use the \$33 million to build inventories and to pay off bank loans and suppliers, including many to whom payment was overdue.

And so the meeting at Hambrecht & Quist, the company's underwriter, was hastily convened the next morning, a Thursday, and trading in the stock was suspended. Huddled around an oval-shaped wooden conference table, Kappenman and a dozen others thrashed out the company's future. Other parties to the decision, including Shearson/American Express, the co-underwriter, participated on speaker phones from New York, Palo Alto, Los Angeles, and Denver.

Eerie reminders of success and failure surrounded the conferees. The walls of the fifth-floor conference room were covered with framed momentos of Hambrecht's many high-tech public offerings. Across the street, a wrecking ball smashed into the skin of a building in the process of demolition. The situation demanded action that day. "It was all on the line, everything we had worked for," says Kappenman, remembering the emotional debate.

By late afternoon, Eagle and its underwriters decided to rescind the previous day's offering, a rare move that forfeited millions of dollars. A week later, after investors had a chance to make up their minds afresh, they reoffered the stock at \$12 a share, and Eagle rose phoenix-like to \$22 before closing that day at \$17.25.

Months later, that investor enthusiasm appears to have had a solid foundation, though undoubtedly it was fanned by front-page headlines across the country. Thanks to the strong management and well-formulated business plan Barnhart and Kappenman had put in place—and, perversely, thanks to the luck of timing—the president's tragic death left Eagle remarkably unscathed.

"It's almost amazing the way they continued to roll," says Dan Crooks, president of Waybern Corp., a large independent distributor in southern California who carries the Eagle line as well as competitive

**On the day his Ferrari crashed, Barnhart owned \$9 million in Eagle stock and wanted to buy a sailboat.**

products from Columbia Data Products and Altos Computer Systems. "They continued to process orders, deliver product, and most important, develop new products."

Eagle's financial results for the latest available quarter indeed show no fallout from the tragedy, and dealers and distributors say none was apparent through the summer. Sales from April through June increased to \$11.6 million from \$10 million in the prior three months, in line with the stock prospectus forecast. For the fiscal year ending in June, Eagle's sales of \$28.7 million were four times last year's. The dealer network has grown from 600 in April to more than 1,000.

"We didn't even get a hiccup," says Bob Arata, co-owner of Sysprint Inc. in Dallas, Eagle's largest distributor. "They all dug in and went right to the job."

Eagle's tenacity derives in large part from the fact that the company was never a one-man band. It began in 1981 as a division of Audio Visual Laboratories, a small company Kappenman controls that makes multi-image presentation systems. Looking for growth markets, AVL's technical guru, Charles's brother, Gerard Kappenman, developed the Eagle IIE, an 8-bit microcom-

ILLUSTRATION BY LINDA THOMAS AFTER AN EAGLE COMPUTER POSTER





## IN FOCUS

puter with a Z-80A running 64K bytes of RAM.

Barnhart, formerly marketing and sales vice president of Commodore Business Machines, was hired to assemble the division's management and build a product distribution network. In May 1982 the Eagle division was spun off from AVL and incorporated as a separate company.

From the start, Eagle's approach was to build a base of talented managers at the vice presidential level, various company officers and key outside investors say. "We were coming in late and we had to get up to substantial volumes quickly and bring in experienced people," recalls Kappenman. "We were trying to attract people who had run \$50 million to \$100 million operations."

This was particularly important because Eagle's chairman saw marketing as the key to survival in the crowded micro-computer field. One result was that in the nine months ending last April, Eagle's marketing, general, and administrative expenses were 20.3% of net sales, a figure Kappenman considers substantially higher than average for companies Eagle's size, and profits—Eagle's first—were a puny one penny a share.

Still, had Barnhart's accident come early in 1983, "it would have been a disaster for the business," in the opinion of Bob Arata, the Dallas distributor who is also an investor in the company. Within a few months, Barnhart positioned the company for the long-term marketing battle in the desktop computer industry with new products and efficient production facilities.

Eagle's first 16-bit microcomputer system, the high performance 1600 line, was shipped in volume quantities only in February; its hot-selling PC, an IBM personal computer clone with a smaller footprint and a better keyboard, reached dealer shelves in May; and in the spring, assembly operations were moved into a much larger plant in southern California.

The Eagle PC-2, which uses the Intel 8088 and has 128K bytes of expandable memory, became Eagle's most popular machine. It sells for \$3,495 and comes with two disk drives and word processing and spreadsheet software packages. The 1630, which retails for \$6,995, includes hard disk and floppy disk drives, uses the Intel 8086 micro, and has 128 bytes of memory, expandable to 512K bytes. After Eagle introduced its PC, it cut the price of its best-selling 8-bit machine to \$1,995 from \$2,995.

Luckily for Eagle, in April the company recruited a chief operating officer to back up Barnhart. The immediate reason was that the company had decided to go public while the new issues market was still hot. That meant Barney, as the ceo was universally known, would be largely out of the office, headlining, along with Charles



BARNEY BARNHART: a quick decision leader who could fire up the troops.

and Gerard Kappenman, Eagle's show for potential investors in the U.S. and in Europe. Someone, in short, had to run the store back home.

But there was a second reason for bringing in Ronald N. Mickwee, 38, who immediately after Barnhart's death became president and since August has also been ceo. Barnhart, a Navy flier in the Vietnam war, was a quick-decision leader who could fire up the troops and get things done rapidly. He liked the thrill of launching Eagle and converting his 624,438 shares into bankable currency. But associates in and

### **"It was all on the line, everything we'd worked for."**

outside the company suggest that Barnhart was less interested in managing the day-to-day affairs of a big concern and might later have moved into a lower-profile role.

The day of Eagle's simultaneous triumph and tragedy, Barnhart arrived at his office in Eagle's single-story California-modern headquarters to a floorful of congratulatory balloons—courtesy of the secretarial staff. The offering had gone even better than expected. By midday, a party was in progress, and Barnhart, who had an ulcer and rarely drank, shared in the champagne and hors d'oeuvres. Later he left to see a yachtbroker about buying a big sailboat he was going to splurge on with some of the \$9 million in paper profits he'd made from the offering. Barnhart's wife, Joanie, and one of his three children remained at the party.

At about 4:30 in the afternoon, a neighborhood boy on a bicycle rode up and reported that a red Ferrari with license plates reading "Eagle B" had overturned

down the road. An hour later Barnhart died at a local hospital of multiple injuries. The yachtbroker, a passenger in the car, was seriously injured. An autopsy later showed that Barnhart had enough alcohol in his bloodstream to be considered legally intoxicated.

"We were all sick but there was so much to do," recalls Debbie Doyle, Barnhart's secretary, months later still dazed by the incident. Kappenman was called, as were Eagle's manufacturing and engineering executives in Southern California. Mickwee and the vice presidents of sales and marketing were at a computer trade show in New York and were finally located late in the evening at their hotels. Kappenman called Eagle's venture capital investor, its attorneys, and underwriters, and the group caucused in grief and confusion that night at Eagle's offices and by phone, essentially agreeing to the next morning's meeting at Hambrecht & Quist.

Before the last lights at Eagle were turned out around 2 a.m., a staff memo announcing the death and calling a 9 a.m. meeting was distributed to every desk. Employees were asked to refer all inquiries about the day's events to one of the vice presidents.

Eagle's executives believed the loss, though a personal tragedy and major management blow, was not a mortal wound to the company. But if the public offering were scuttled and the company were deprived of capital for long, it might do fatal damage. The issue, as William Glynn, Eagle's 35-year-old vice president of finance put it, was, "We believed we were the same company, but would investors believe it?"

The talks at Hambrecht & Quist were filled "with a whole lot of peaks and valleys and heavy discussions," recalls Larry Sonsini of Wilson, Sonsini, Goodrich & Rosati, Eagle's law firm, whose voice was beamed in from Denver. Robert Loarie, of Lawrence WPG Partners Inc., a San Francisco venture capital firm that owned 7.9% of Eagle, was present and says the options discussed included "everything from stuffing it [the offering] down people's throats to letting things proceed to unwinding the deal and going back several months later."

Understandably, Eagle wanted money as fast as possible; the previous day's offering was to bring in \$26.6 million for the underwriters, to pay down bank loans and finance inventory, and another \$6.6 million was due to Kappenman, Barnhart, and other selling shareholders. Eagle also wanted to be a public company to enhance its reputation, and it was concerned that by cancelling or postponing the offering, the new issues window might slam shut. Not to rescind the deal "was certainly a bias" of theirs as the session opened, says David Claridge, Hambrecht & Quist's se-

## IN FOCUS

nior man on the deal.

The investment bankers, on the other hand, "felt it was not fair to the investors not to rescind," Claridge concedes. Among other things, it didn't take an Eagle computer to calculate that the odds of panic selling of the stock, if it reopened, were high. That would have hurt Eagle's reputation and laid all the parties open to litigation from angry investors. Buyers would have had a reasonable claim that what they got was different from what they had contracted for before the ceo's death.

Also, there was a big question of who would eat the losses if the offering were not revoked and the stock price were to collapse. Legally, initial purchasers in a public offering have five days to make payment and take title to the securities. Some, presumably, would have backed out, forcing the underwriters to pay Eagle out of their own pockets. Under normal circumstances, the underwriters would still have owed Eagle and the selling shareholders their \$33.2 million, as provided by their contract with the company. But these were abnormal conditions without precedent, and the law was unclear.

Before sandwiches were brought in for lunch, the group settled on the outlines of the action that was ultimately taken. The clincher was primarily a business consideration, not a legal one: Eagle wanted institutional and retail investors to feel good about it because the young company knew it would have to return sometime later to Wall Street's equity well to square off against bigger microcomputer firms.

"What tried to guide us was credibility," says Mickwee, who had caught an early morning flight from the East Coast to attend the powwow. Upon his arrival from the airport, Eagle's directors adjourned briefly to an empty office and elected Mickwee president. Chairman Kappenman, who likes to direct long-term strategy and delegate daily management, took over as ceo, but the title was largely for continuity's sake. Mickwee, a mustachioed Alabamian who had been a vice president of chipmaker Synertek and general manager of National Semiconductor's consumer products division, was the new leader.

As the day's deliberations progressed, the Securities and Exchange Commission was consulted to make sure Eagle's new plan would fly legally. At the same time, the underwriters got a little feedback from some key institutional buyers, and stories on the Dow Jones news wire were passed around the table. "It was an eerie feeling, but the reports were positive," says Bill Glynn. "The meeting gathered momentum. It looked more and more doable."

By late afternoon in California, newspapers were going to press for Friday's editions and reporters clamored to learn what Eagle was going to do. The businessmen, attorneys, and underwriters were still

drafting their new agreement. "The lawyers didn't want us to release information about what we'd do until it was absolutely decided. Also we were in the [SEC's post-registration 90-day] quiet period," recalls Kappenman. "But if we didn't give them the information it would have come out wrong." So against the lawyers' advice, Mickwee talked to a few reporters and the following day's papers told of Eagle's plan to rescind-and-remarket within the two weeks.

### **The odds of panic selling of the stock, if it reopened, were high. That would have hurt Eagle's reputation and laid all parties open to litigation from angry investors.**

The forthright approach toward the press paid off. "President Nixon may not like the press but I love them," he exulted recently. "It could have been terrible," he says of the sensational possibilities of the drama. "The press really tried to get the true story."

The next morning, Mickwee and Kappenman returned to Eagle's offices, which never closed down and were trying to retain the semblance of order. "It was certainly a difficult time emotionally to keep going but it was imperative to instill confi-

dence" in distributors, vendors, creditors, and competitors, perhaps even Eagle's employees, says Kappenman.

Key constituencies like the company's banker had been notified of Barnhart's death Thursday morning and were kept informed of the company's developing plans. But there wasn't time to reach Eagle's wider public—distributors, vendors, and others—before phone calls began flooding the switchboard.

Starting Friday, callers were told about the plan to go public again within two weeks. Distributors were reassured that production was uninterrupted and shipments would be normal (none of Eagle's 28 distributors dropped out); vendors who were to be paid with some of the offering's proceeds agreed to wait, even though Eagle was already past due to many of them. "We had taken a lot of small companies and made them into bigger ones," says Glynn, the finance man, of their forbearance. "Given faith in the company, two weeks' delay wasn't significant, though the risk of not getting funded was."

What became a one-week cash squeeze was manageable for them and for Eagle too. The company simply drew down a bit more on its \$10 million line of credit with the Bank of America. Although his degree of confidence is hard to believe, Eagle's lead banker there, Rory MacLean,

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**CIRCLE 27 ON READER CARD**

## IN FOCUS

says that since sales were strong and the 16-bit product introductions had gone smoothly, "we weren't too concerned or more involved than usual except to express our condolences."

Eagle's 70-odd employees in Los Gatos began to resume their chores on Friday after spending Thursday staring blankly and milling around. All Eagle employees were invited to a weekend rosary service and funeral. Many attended. "We buried a former leader," Mickwee says. "There was respect to be paid."

At the rosary, an eagle made of white, yellow, and maroon carnations hovered in flight over the open casket. At the church funeral the next day, Eagle's entire top management were among the many pallbearers. After two and a half days in which Barnhart's friends and colleagues at Eagle had tried to make intelligent business decisions, "the real emotions came out," recalls Glynn. Many eyes were moist with tears.

A more mixed emotion greeted Eagle the following Wednesday, the day the company went back to the capital markets. Ron Mickwee called all the Los Gatos employees into the company's conference room and announced that the stock had opened and immediately had soared well above the new \$12 a share offering price. There was applause, but there was no champagne or pizza this time.

One clerical employee remembers the scene well. "At first it was a pep talk. Ron began talking about what was going to happen to the company, of how proud he was of all of us," she says. "Then he got choked up and said we hadn't really had a chance to acknowledge what had happened last week and that Barney would be real proud of all of us."

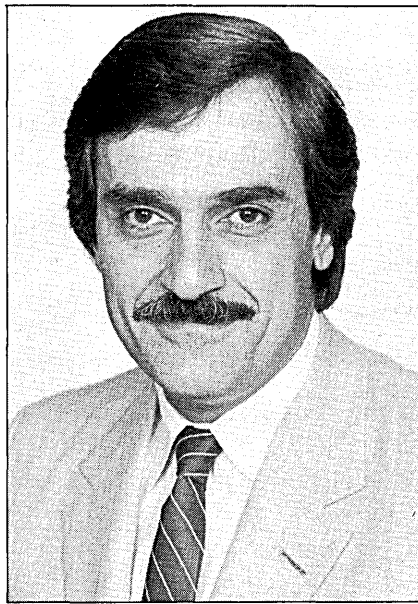
The display broke the ice for employees for whom Mickwee was still a new arrival at Eagle and made it easier to get

### **"Seeing Mickwee break down brought us a little closer."**

back to work, says the employee. "Seeing him break down brought all of us a little closer."

Eagle and its underwriters expected all the publicity might attract new retail investors. The Gatsbyesque story of the young computer tycoon who died on his big day was big news, from the Sioux Falls (South Dakota) *Argos Leader*, Charles Kappenman's hometown paper, to the *New York Times*. But for less emotional institutional investors, Eagle thought, the loss of one of the company's key men made it a somewhat riskier proposition, so the same 2.75 million shares were repriced at \$12, a dollar off the original.

Thus, the \$22-a-share peak that Eagle hit the day of the second offering surprised everyone. "Certainly it was not a



RON MICKWEE: Recruited to eventually take over day-to-day operations, he was suddenly in charge.

rational response to the event," says Hambrecht & Quist's David Claridge. But the second-time offering price, which was designed to be conservative and give investors who bought the offering a small profit, has proved sensible. Eagle's stock has settled back into the low to mid-teens.

Thanks to the firm business strategy that Eagle had long ago developed, the crucial job of selling Eagle computers also continued apace.

In late June, Mickwee and his sales and marketing team called on Businessland, a budding western chain of micro-computer stores, in its San Jose offices. Mickwee wanted to expand Eagle's direct sales to major dealers. Businessland, which was started by Dataquest Inc. founder David Norman and has powerful venture capital backing, was an important sell. Eagle's presentation overcame fears the Businessland buyers had about Barnhart's loss, and Eagle is now one of five micro manufacturers the chain carries. "We want to make sure a manufacturer knows where it's going," says Phil Reed, Businessland's vice president of operations. "They had obviously thought through the issues and their answers."

For a company that was looking ahead, it is perhaps surprising that Eagle had no key-man life insurance policy on any of its officers. Charles Kappenman says, "It was in the works to get one but never finished." Immediately after the tragedy, Eagle did take one out with Lloyds of London. It provided for a whopping \$10 million insurance on Kappenman and Mickwee and \$5 million on each of the other officers. The extraordinary policy was only for 90 days, to make sure that fate did not strike twice, and was followed by more

normal coverage.

How useful key-man insurance on Barnhart would have been is questionable. The payout would have been negligible compared to what Eagle gave up in the first offering, and of course no amount of money could bring back Barnhart. In Silicon Valley, often the insurance is really reinsurance for venture capital investors, says Larry Sonsini, Eagle's attorney. According to that logic, if a key man dies, at least the moneymen can recover their investment. Sonsini advises his clients to have a key-man policy, but in Eagle's case, venture capital partners came in late in the company's development and insurance was less of a concern.

A key-man policy is a prudent precaution, however, particularly for small companies that, unlike Eagle, might face uncooperative suppliers and customers and a real cash crunch. But Eagle's lesson is a more basic one: even small entrepreneurial companies should be broad-based in their management as well as clear-thinking in their plans. A chain of management talent stretching across sales and marketing, engineering, and manufacturing is the best safeguard against the damage or the loss of any one link.

Curiously, no picture or plaque or memento of Dennis Barnhart hangs today in Eagle's offices. One vice president says it was agreed that would not be tasteful, and

### **An eagle made of white, yellow, and maroon carnations hovered over the open casket.**

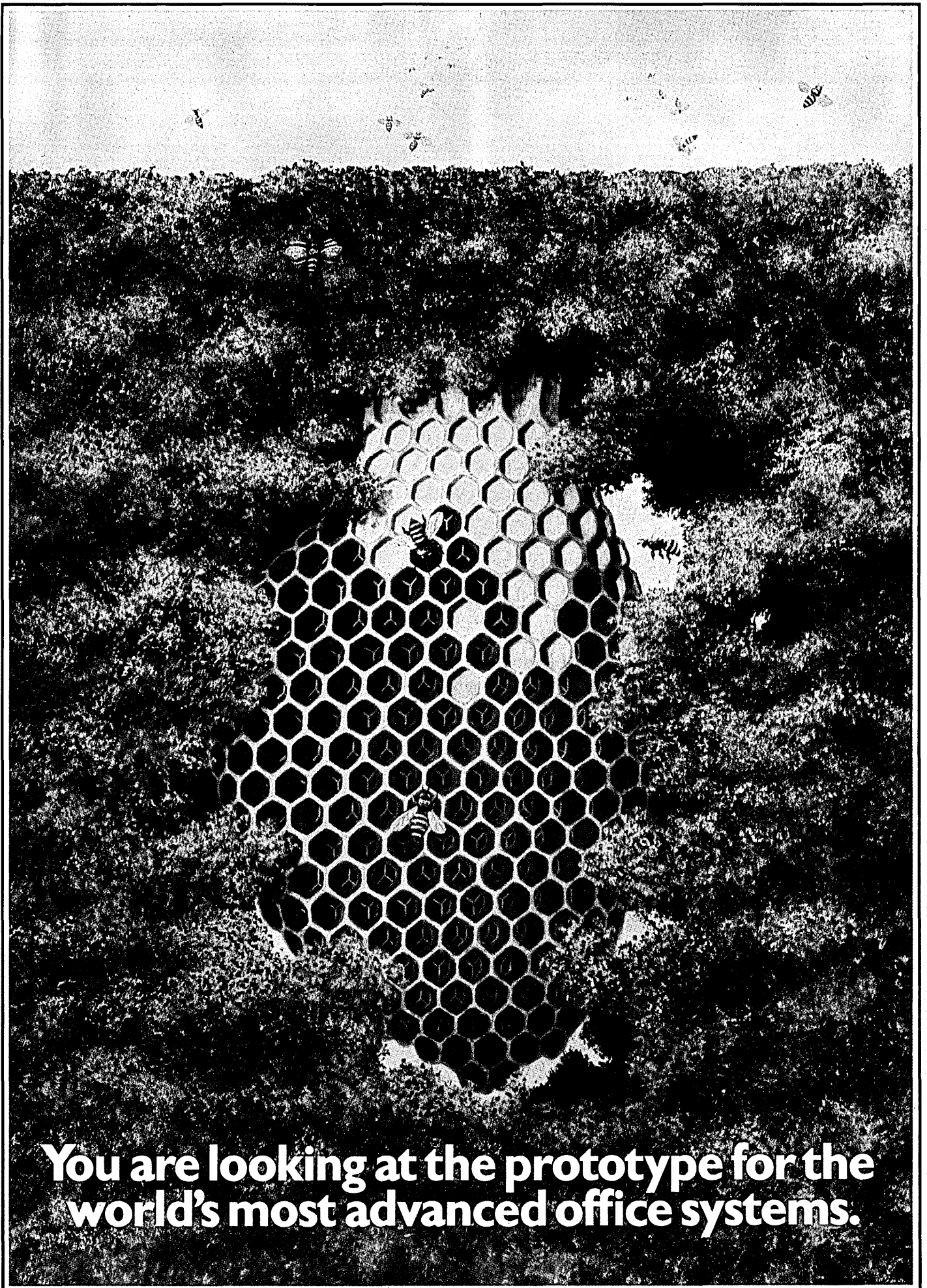
no decision on some other company-sponsored memorial has been made.

In the rough-and-tumble micro-computer industry, Eagle has still to earn its wings. But so far, its smooth recovery from near disaster is perhaps its best tribute to Barnhart, by all accounts an intensely competitive, demanding, self-confident and yet compassionate man.

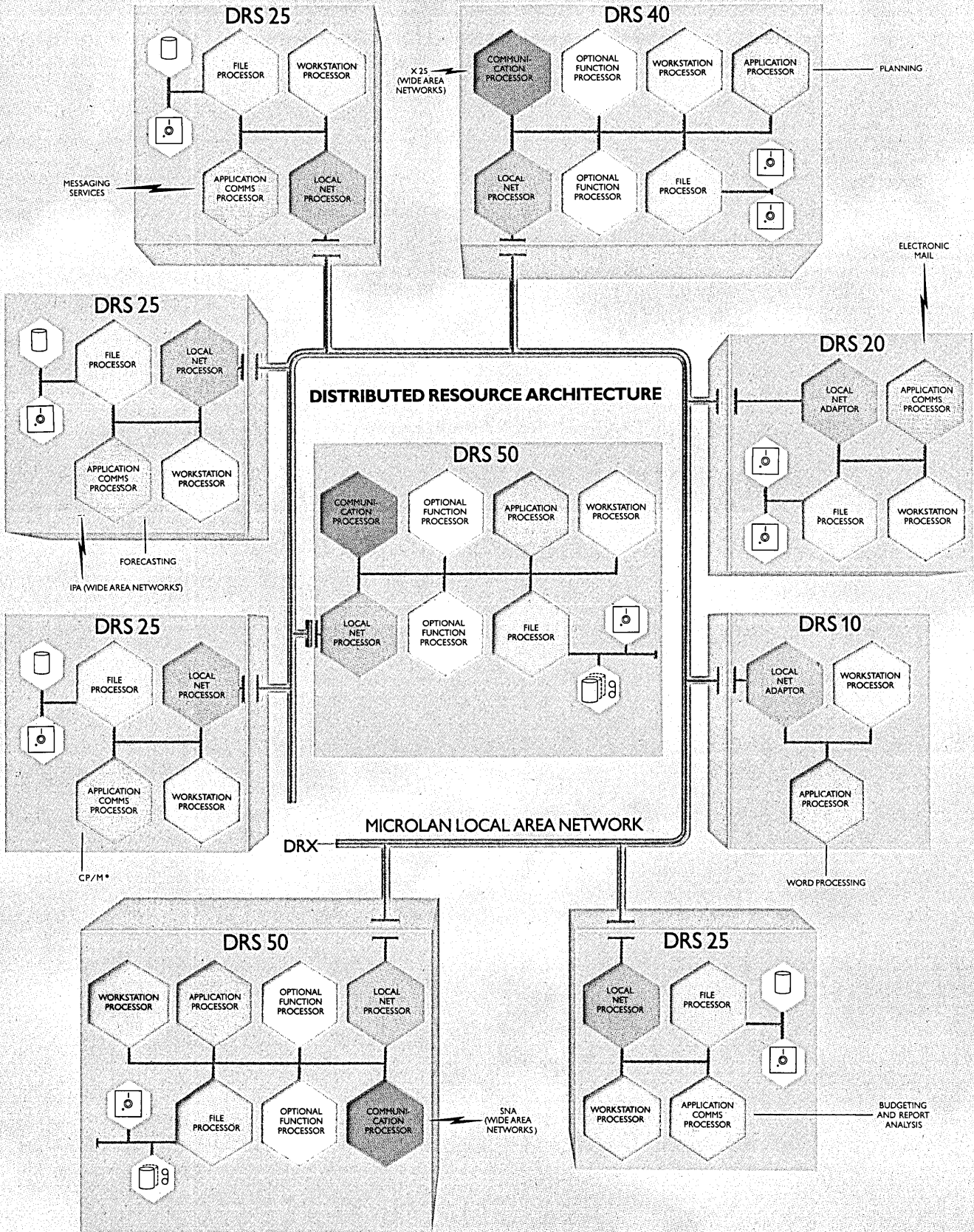
Bob Loarie, Eagle's venture capitalist, defines a ceo's key role as continuously trying to work himself out of a job by building a solid organization. He says that Barnhart, despite the kind of big ego common to people of talent and drive, did that.

A related point was unintentionally made in a promotional poster that was developed shortly before Barnhart's fatal accident: beneath a striking, sharp-beaked Eagle, it says "Strictly business." Unexpressed in that message is an emotional commitment. As Ron Mickwee, Barnhart's successor, says, "Without any disrespect to Barney, this whole thing is bigger than any one person's ambitions and dreams." \*

Peter Dworkin writes on economics and business for the *San Francisco Chronicle*. He was previously a reporter at *Fortune* magazine.



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The management of resources necessary to provide the controlled distribution of functions within the system is achieved by a unique architecture – DRA (Distributed Resource Architecture) – which delivers a wide range of services to workstations within a network of DRS systems.

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Distributed Resource Architecture is a natural networking structure. Not only does it handle multiple microprocessors within a single DRS node, it also allows multiple nodes, wherever they are located, to communicate via the MICROLAN local area network.

This means that files can be retrieved and processed from any workstation or server in the whole network, providing total flexibility of systems design and operations.

Flexibility is the keynote. The basic structure of DRA has been designed to accommodate a mixed microprocessor architecture which enables systems to be expanded and enhanced by the replacement/addition of microprocessors.

#### **The management of resources.**

By selective configuring of function processors, a range of DRS nodes can be

designed to provide a range of capabilities within a DRS network: intelligent multi-function workstations, data-base servers, electronic filing servers, communications controllers, and personal computing systems.

This inter-dependent network is managed by the Distributed Resource Executive (DRX), one of the first truly distributed operating systems.

This network management system enables all the resources of the network to be shared by all the nodes within the system.

A key feature of DRX is the ability to manage functions, independent of where they are physically located, within a node or between nodes within the network. So an application processor in one workstation can access files controlled by the file processor in another, elsewhere in the network, providing all the control and security necessary to manage the system.

#### **Planning for the future.**

Many industry standard languages are embraced by DRX, including Microfocus CIS COBOL, Microsoft Basic, and PASCAL.

Concurrent communication and wide area networking are facilitated by ICL's Information Processing Architecture (IPA), which supports the ISO model for open systems interconnection, IBM's Systems Network Architecture, and X25 packet switching services.

ICL's Distributed Resource System is already being used for a wide variety of applications in organisations which operate both locally and remotely networked intelligent workstations for distributed computing, personal computing, and terminal systems, utilising mixed data and word processing facilities.

The manner in which DRS builds entire intercommunicating networks from simple nodes and clusters may indeed be reminiscent of nature's oldest structural principles.

But seldom has architecture been designed with the future held so firmly in mind.

**We should be talking to each other.**

The ICL logo consists of the letters 'ICL' in a bold, sans-serif font. The letter 'I' is slightly taller than the 'C' and 'L'. The 'C' and 'L' are connected at the bottom.

CIRCLE 28 ON READER CARD

# NEWS

## IN PERSPECTIVE

### STRATEGIES

# SILVER LININGS AT STC?

**The Colorado PCM hopes that a spate of new hardware—including its first mainframe—can reverse a precipitous earnings plunge.**

by Michael Tyler

To the superficial observer, the numbers look rather bleak: after a decade of phenomenal growth, Storage Technology Corp.'s earnings dropped from \$2.61 per share in 1981 to \$1.84 in 1982, and then to 4¢ (that's right, four cents) through the first six months of 1983. Chairman Jesse Aweida openly admits that the third quarter, ended Sept. 30, was about as flat as the first two, and that any improvement through the first half of 1984 will be minimal. In short, it would seem that the company has taken a nose dive of epic proportions and has little chance of recovering in the near future.

"I attribute our problems to a classic trough in product transitions," says Carl R. Vertuca Jr., vice president for budgets and planning. Put more bluntly, all of STC's product lines got very old, very fast, and the company had nothing by way of new technology up its sleeve. The company's chief hope for an earnings rebound, the 8380 disk subsystem for IBM mainframes, was running over a year behind schedule, and is only starting to ship in volume this month.

"The prime reason they haven't been able to pull out of their slide is that they lag IBM in the thin-film disk technology by 18 months instead of the usual six or so months," says First Boston Corp. analyst Harry Edelson. "When they started initial shipments, IBM was far enough down the learning curve [with its 3380 disk subsystem] to cut prices 15%."

Hence the pessimism on Wall Street. Says Salomon Brothers analyst Stephen McClellan, "Instead of getting a third or at least 25% of the market like they used to get with disk products, now they may get half of that [with the 8380]. Their earnings prospects are never going to be quite as attractive as they have been in past years."

But the numbers can be deceptive, and therein lies the reason that the folks from the foothills of the Rockies—and some analysts—believe that the company will survive its current famine and come out with renewed strength. "Our life blood is new products," says Aweida, and STC is in

the midst of a spate of new product announcements that will continue through the end of the year.

In addition to full-volume shipments on the 8380 beginning this month, the company has just unveiled an optical disk storage system, enhanced its solid-state disk accelerator products, introduced a laser printer, and added a new tape drive. Next month STC will add its first IBM-compatible mainframe processor. "These new products will chart the course for our company for the next four or five years," says Jack Scott, vice president for worldwide marketing.

"Our future is bright," Aweida claims. "There will continue to be some pressure on our earnings as we begin moving these products out the door, since revenues from them are at the moment nonexistent. By the second half of 1984, the pressure will disappear as revenues come in from these new products."

The new products signify a change in direction for the Louisville, Colo., manufacturer. While Aweida argues that "we are in the narrow area of large system storage peripherals," the company has extended its grasp in two directions. First, beginning with its acquisition of Documation in 1980, it has moved beyond storage into other peripheral areas, including printers and communications devices; it will soon go beyond peripheral gear into central processors. Second, within the storage area, the company has stepped out of IBM's umbrella by offering what it calls "go faster" products that enhance the performance of its storage subsystems; IBM offers no competition for these products.

"If we stayed with disk and tape products only, we'd be perpetually a billion dollar company," Scott says. "We wouldn't grow relative to the market, and I don't think the market rate of growth is enough to please our shareholders."

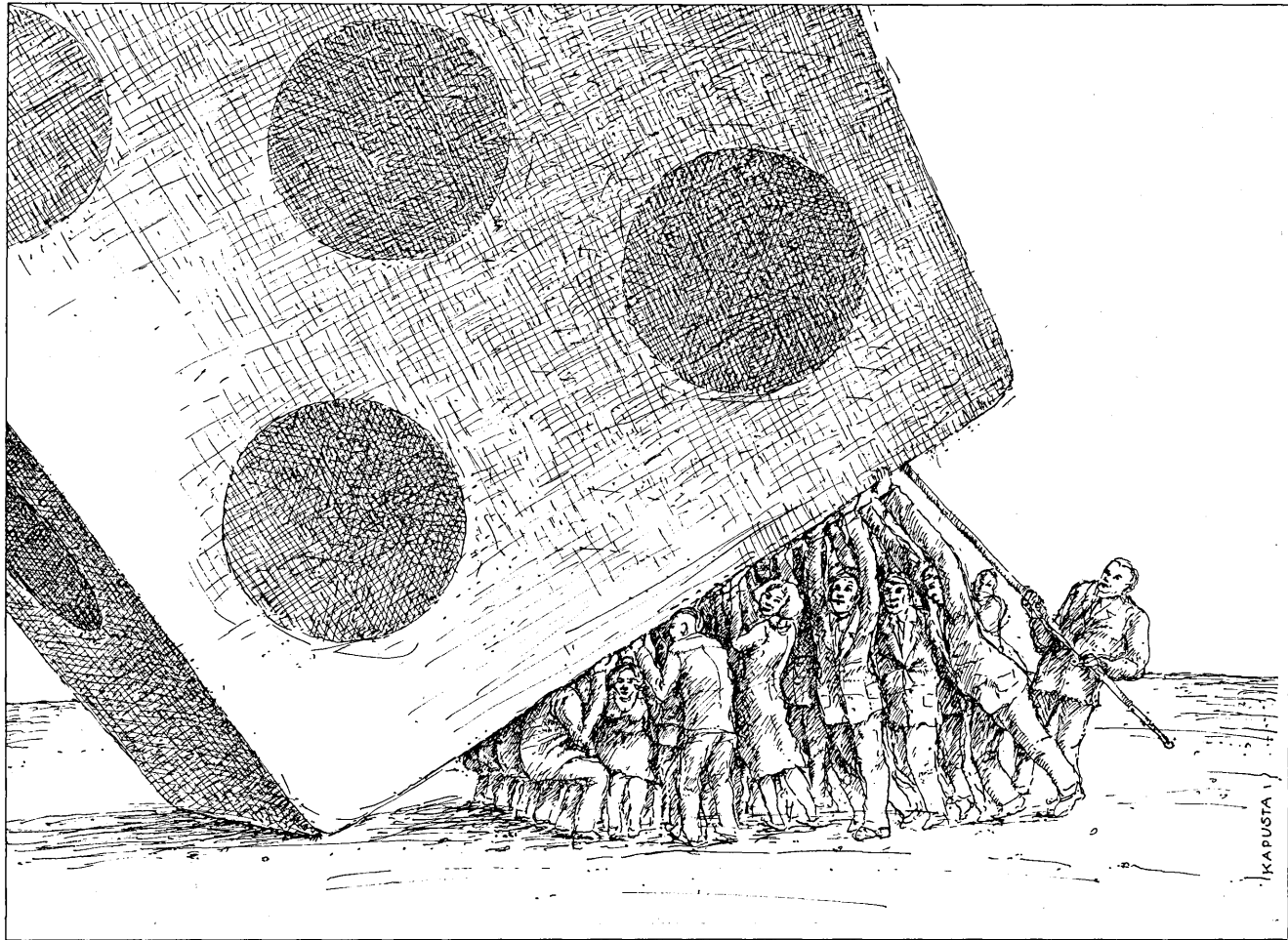
"Times have changed," Aweida adds. "We have had to change our strategy."

**The company doesn't expect to see any significant earnings improvement until the third quarter of 1984.**

We cannot wait until the other guy plays his card before we play ours. The technology takes a long time, and if you lag then you're behind the eight ball." The company wants to avoid problems similar to the 8380 delay in future products, so much so that Aweida says, "The 8380 is the last of its vintage. We are now engineering our products so that only the microcode and the interface circuits will have to be modified if IBM changes its peripheral interfaces."

Moreover, says Scott, the broadened product range will help expand disk and tape sales. "I know of at least 10 companies that currently have no Storage Tech-





nology equipment but are looking seriously at the optical storage subsystem. If we can get into those companies with products that IBM doesn't make, then it becomes that much easier to sell them our disk and tape products the next time around."

Larry Roberts, an analyst with Hambrecht & Quist, concurs. "They are taking a systems approach, and their products are very well integrated to sell solutions to customer problems. And having more products where there is no IBM competition gives them more strategic flexibility," because any pricing or product moves by IBM will have less of an effect. Overall, says Roberts, "the thought pattern makes sense. It's a good marketing strategy."

Other analysts take a dimmer view of STC's new look. "Storage Technology is no longer focused enough," says First Boston's Edelson. "When they focused on large-scale storage devices they did very well, but when they started to diversify they got into trouble. Their communications products all failed. They should stick to their knitting; that they haven't is a sign that the storage market isn't as good as it once was."

But it is the storage market, first and foremost, that is central to STC's future. Its storage products must succeed if the company is to survive, and it is here that they

have had the most problems. Development projects for a 3370-compatible disk drive and a Virtual Storage Subsystem were canceled when funding for the 8380 ran short; the 8650 disk drive was shipped with a

**Aweida: "Times have changed. We cannot wait until the other guy has played his card before we play ours. If you lag then you're behind the eight ball."**

faulty head-disk assembly that required a \$20 million recall; several key executives in the disk area, including Erik T. Ringkjøb, a company cofounder who headed the disk business, left to head up Pro-Link in Boulder; and the 8380 itself was besieged with technical problems that stalled its development.

Solving the 8380's problems and shipping it in volume had to be the first priorities. "The 8380 is our bread-and-butter product and we know it," Vertuca says. "Several projects were cut so we could get it out the door. Another company executive says more bluntly, "If the 8380 had trouble, the corporation would be in trouble and it would be immediately obvious."

Analyst McClellan believes that "they're betting the company on that product; they face disaster if it's not successful

and there's no way to get around it."

Yet Ringkjøb, among others, believes that STC may have trouble selling the unit. "They certainly are paying the penalty of being behind on the technology," he says. "Their 8380 order rate has been hurt because IBM has been pushing the 3380 and Storage Technology had nothing to ship."

With the future of the company so clearly hinging on a product that is lagging IBM's competition by over a year, STC has concentrated on providing increased performance. "The 8380's got some real artillery now," says Bob Williams, vice president for product marketing. A double-density version is promised for the second quarter of 1984, but until then the primary performance booster for the unit is its 8890 Sybercache controller.

The Sybercache, Williams explains, can boost the 8380's performance up to 60% by eliminating many time-consuming disk accesses. Since many users typically pack their disks at far less than capacity in order to reduce access times, the Sybercache is expected to encourage users to buy the large capacity disk drives. IBM has yet to announce a competitor to Sybercache, despite studies that show users typically running their disk drives at only 62% of capacity. STC is also selling the 4305 solid-state disk and the 4800 tape drive ac-

## NEWS IN PERSPECTIVE

celerator as performance boosters. Both are also essentially cache devices.

The degree to which these devices can increase performance is limited, however, since only data that are frequently read sequentially and written rarely can be cached effectively. If the market for the 8890 is not as broad as STC expects, this limitation may curtail sales of both the 8380 and the 8890.

At Sundstrand Corp., Rockford, Ill., for example, a Sybercache unit produced significant immediate performance increases the day it was installed; but, says corporate director for information resources Harold L. Baeverstad, "You reach a point of diminishing returns rather quickly. We installed a second unit and it was much less

### **The optical disk drive and CMOS mainframe are as important to STC's growth as the 8380 is to its survival.**

effective than the first. I suspect that if we installed a third unit it would have no appreciable effect."

Sales of the 8380 could also be hurt in other ways. The company expects to produce 500 units by the end of the year, and 5,000 in 1984. "I wonder whether they can ramp up their production rate as rapidly as they anticipate," says Roberts of Hambrecht & Quist. "They have set very aggressive goals," and if they cannot be met then customers might be left hanging.

"Storage Technology's customers are fairly loyal, but not too loyal," Harry Edelson says, and they may not be willing to wait. "There is also the risk that IBM will be far enough down the learning curve to cut prices again when Storage ships the 8380. Another risk is that IBM will announce its Sierra cpu in the fourth quarter, which may adversely affect the results of the 8380."

Of course, STC could respond by cutting its own prices, and it has already done so. When the 4600 tape drive was introduced in August a week after IBM cut tape drive prices by 20%, STC vice president for tape marketing Jim Campbell admitted that the final price tags on the 4600 were adjusted to reflect the IBM move. But, as Edelson points out, "Their margins are already very slim, and they may not be able to cut any more and still make a profit."

Aweida argues to the contrary, despite Value Line reports showing operating margins running at 18% instead of the historical 23%. "We have not slowed down the cost of our research and development despite the pressure on our revenues. Cash is the least of our problems. We have the resources to fund anything we want."

Indeed, STC has been fairly liberal in spending money on research and development. Says Vertuca, "I feel that our gross research and development spending is high-

er now than it should be for a technology company. We're plowing about 10% of our revenues into R&D, compared with the 6% or 7% I think we should be spending."

Yet two of STC's prized new products are the results of outside investments. These products, the optical disk drive and the CMOS mainframe, are as important to the company's growth as the 8380 is to its survival. Both were funded by tax-sheltered limited partnerships because "the return on investment if they were to spend their own money would have been unacceptable," according to McClellan.

Their development was necessary to the company's growth, Aweida says. "We are pushing the technology to the limits of what magnetic recording and bipolar logic can deliver. The more you push the technology, the more difficult it is to improve, but people still want more improvements for less money." By shifting to new technologies, the company feels it can make greater improvements at lower cost.

Of the two products, the optical disk will be the more challenging, since "the optical disk market has yet to be established," Roberts says. "To sell the product requires a missionary process that they are not used to." McClellan adds, "I think the optical disk market as a whole will be slow getting off to a start."

Storage Technology agrees. Says Gene R. DeKoster, vice president for planning and requirements, who is heading up the optical disk project, "We intend to control the hell out of this thing with a very extensive early shipment program. We won't let this dude out until it's ready." The company expects to sell about 20 to 25 of the units as part of an early shipment program, so that applications can be developed for the unit and so that the transition from hand-built to machine-built units can be made more smoothly.

STC needs to develop applications scenarios that will convince would-be customers that they need this new technology. That's not so easy, especially since STC doesn't want to step on its own toes in the process. "You can bet your ass we're not going to price this to go into the disk or tape area," DeKoster says. Instead, the company is positioning the optical drive as a replacement for tape media and for other forms of document storage, like fiche and paper. STC is concentrating on applications that can take advantage of the drive's 4GB per platter capacity, on-line capability, long disk shelf life, and nonerasability. "There is a positive side to not being able to write over data," DeKoster says. "It provides data security, because data can never be changed without leaving a permanent audit trail."

Several applications have already been developed for the unit. Perhaps the most appealing is for storage of large, permanent databases. Data from space sat-

ellites, seismic data generated by oil companies looking for places to drill, and maps and engineering drawings can all be stored on the disk.

Another application area would be transaction logging, in which the central computer could record thousands of transactions per second for backup and auditing; typical users in this area might be airlines for flight reservations. But using the optical disk for backup gets close to the traditional functions of tape: Storage Technology does not want people to use the 7600 for archiving or backups. "Typically, you always have some tapes that you take as backups each night and then rewrite the next night," DeKoster says. "In those areas a tape drive makes more sense."

Nonetheless, the optical disk product is bound to have some effect on tape drive sales, and some company officials think it may be a major effect. "By the 1986 or 1987 time frame, I expect the optical disk to have a fairly hefty impact on the tape business," Williams says. "The price of tape can come down, but not enough."

The impact of the optical storage subsystem is likely to be even greater when the company announces several expected follow-on products. Aweida notes that read-only drives, an automated library, and high-speed modules are all under development. The continued R&D, as well as the

### **If the cpu has an Achilles' heel, it is money: STC may not be able to continue investing the vast amounts of capital needed to produce new models.**

production of the drives, cannot be funded by the limited partnership that allowed STC to develop the initial product, but Aweida insists that full funding for follow-ons has been committed from within STC's coffers.

The same financial picture clouds the future of STC's mainframe, the other product developed by a limited partnership. The all-CMOS machine is being positioned initially as a competitor for IBM's 3083 and 4300 processors. It will offer speeds ranging from 2 to 16 MIPS, and will run the VM, MVS/SP, and MVS/XA operating systems natively. It is tentatively priced in the \$300,000 per MIPS range.

As with the optical disk, Storage Technology is planning a slow release for the cpu, which will restrict early revenues. "I don't expect our customers to immediately buy our cpu just because they buy our tape drives," Aweida says. Internal forecasts predict that sales of 50 to 60 units will generate about \$70 million in revenue during 1984, the first year that the unit will be shipped.

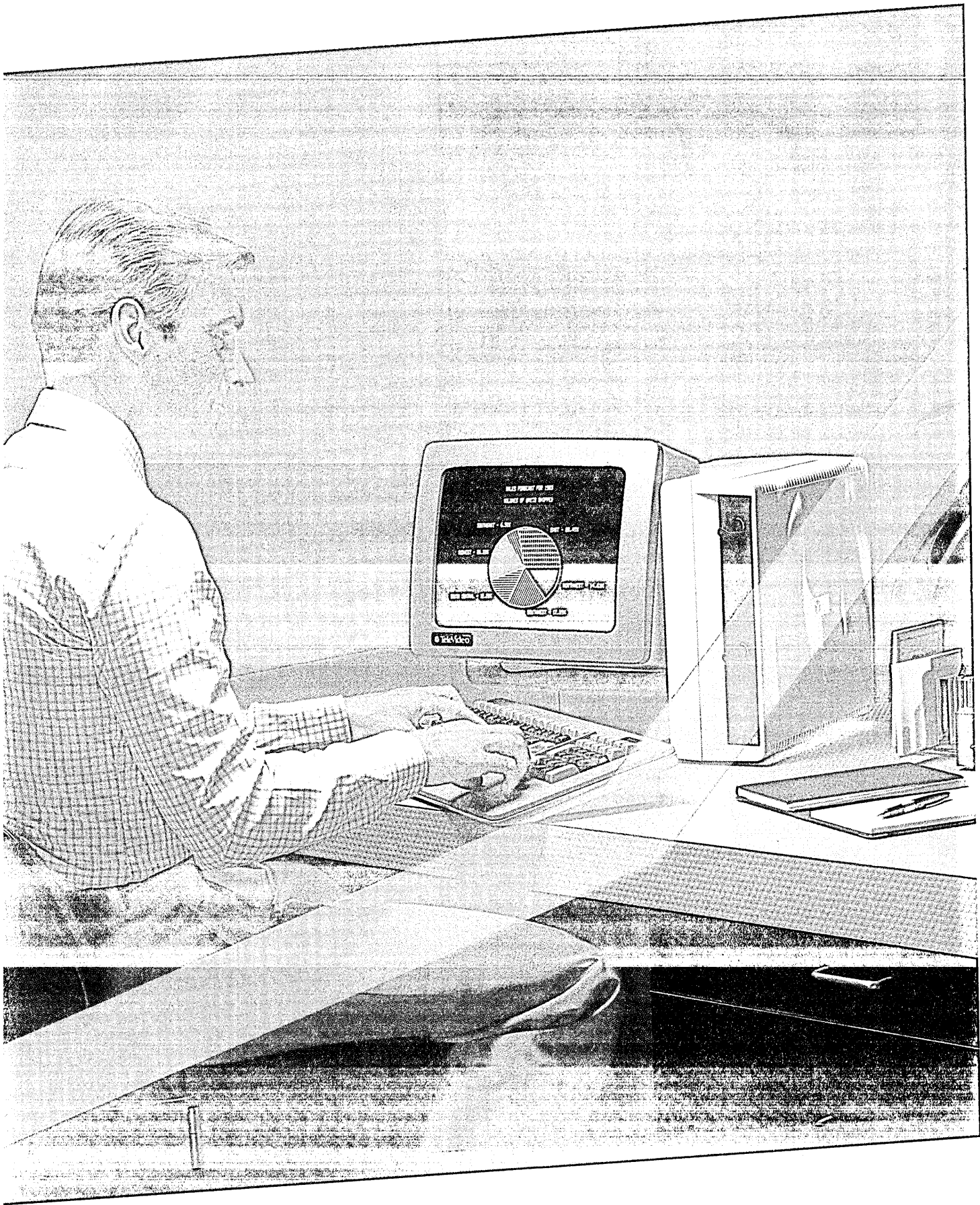
Even when the unit is in full production, volumes will remain small. Gary

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# THE PERSONAL COMPUTER BOOM.

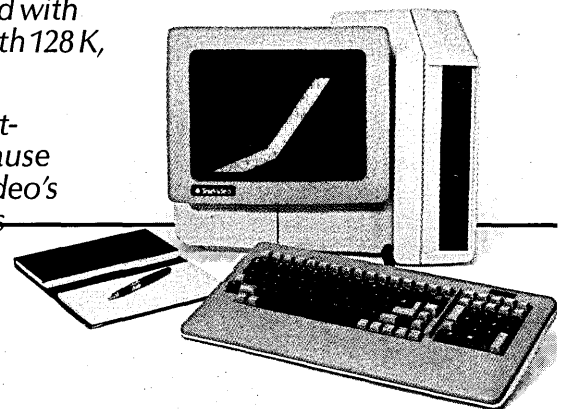
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## TeleVideo Personal Computers

 TeleVideo Systems, Inc



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The TeleVideo Portable Computer equips the professional who's going places.

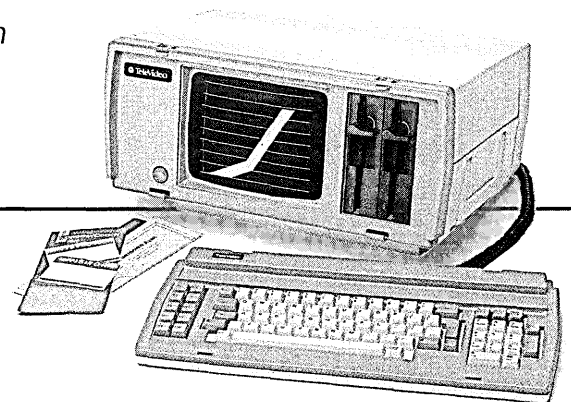
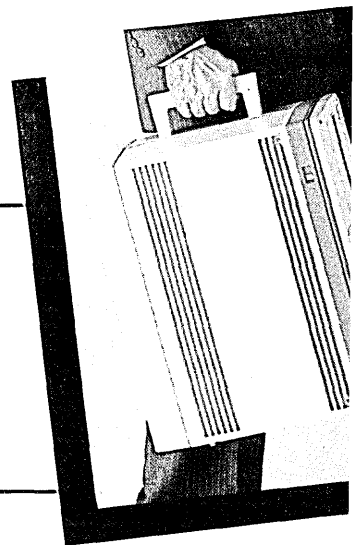
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The TeleVideo Portable has a full 9" yellow phosphor screen and a double-sided double-density 5 1/4" floppy disk drive. The ergonomically designed keyboard includes a ten-key accounting pad not normally available in a portable.

There are 2 communications ports. One for a printer. One for a modem to help your users keep in touch with your mainframe.

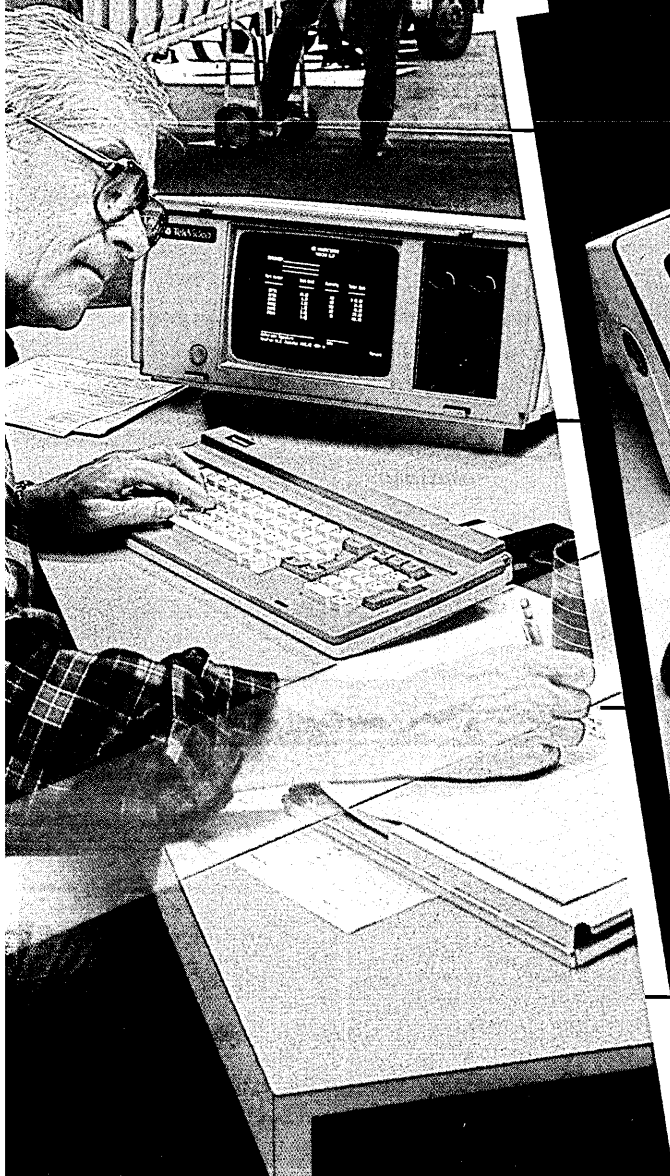
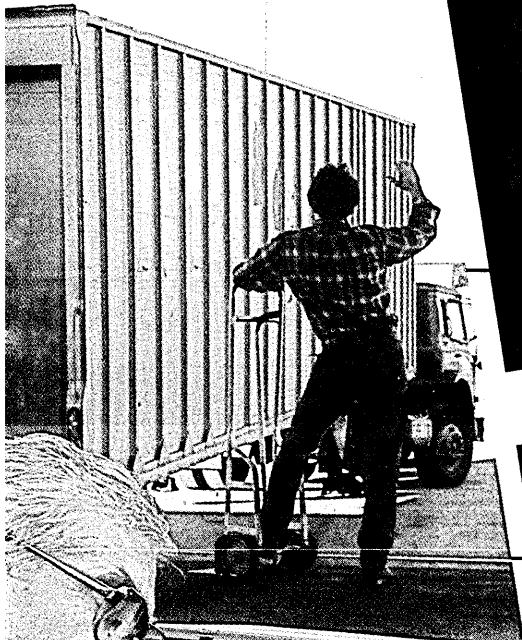
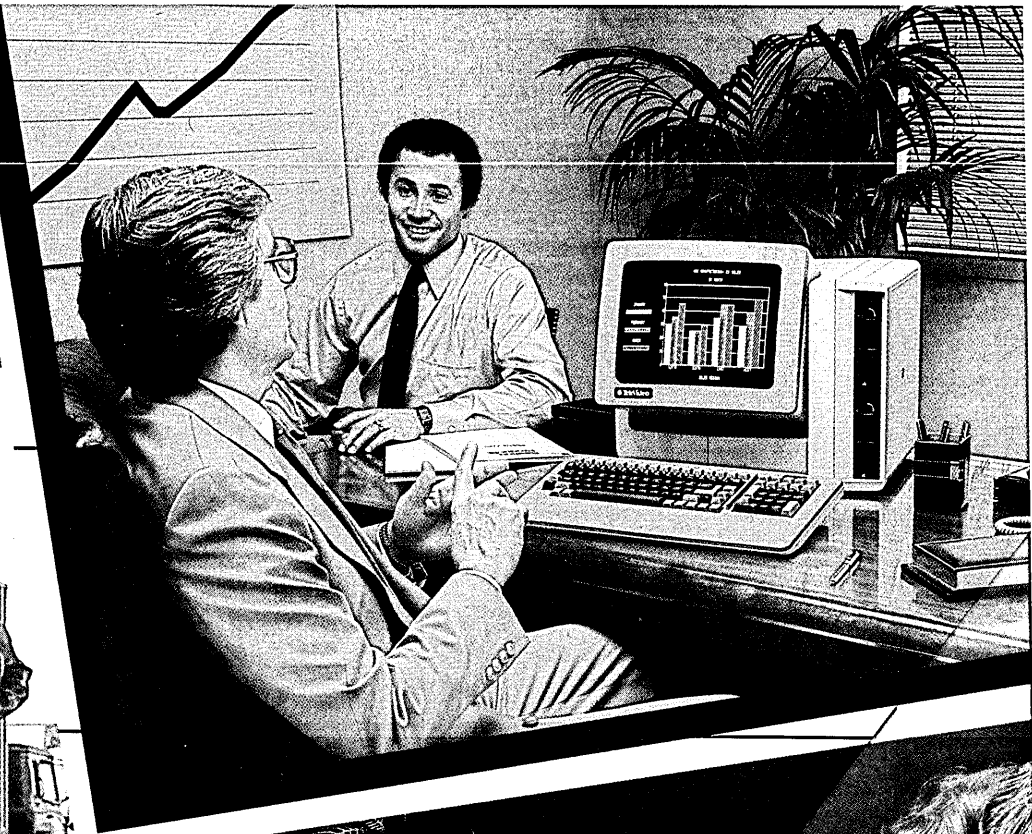
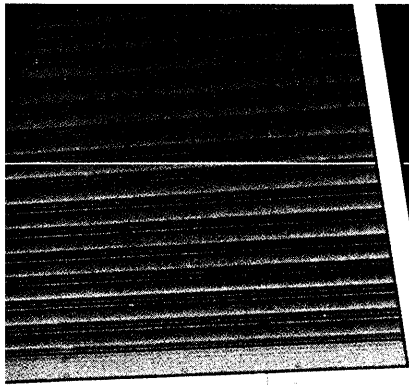
The TeleVideo Portable comes complete with CP/M operating system, spreadsheets, word processing and graphics software. At a suggested retail of just \$1,599, it adds portable power at a very affordable price.

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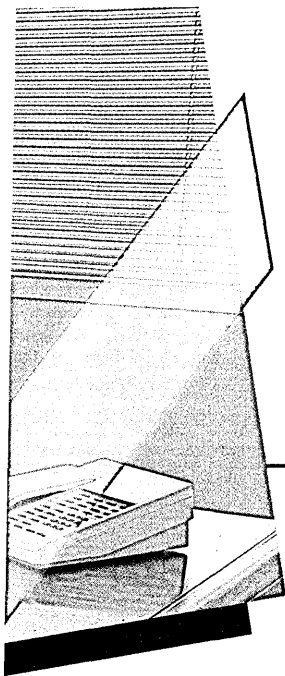


## TeleVideo Personal Computers

TeleVideo Systems, Inc

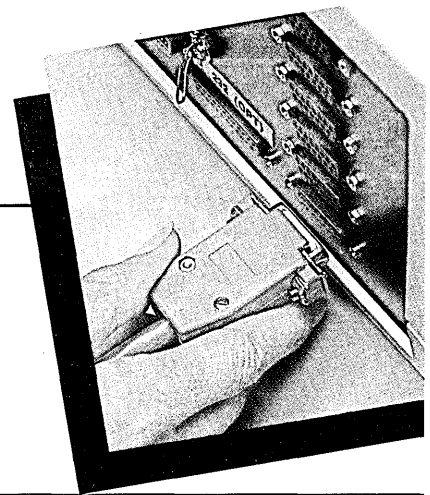






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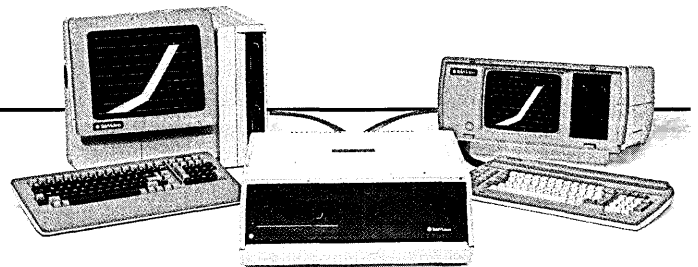
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CIRCLE 29 ON READER CARD

## NEWS IN PERSPECTIVE

Holtwick, vice president in charge of cpu marketing, says he expects to sell only about 2,000 to 3,000 processors over the expected 10-year life span of the product. Nonetheless, he says, the cpu family could account for \$1.6 billion in revenue in 1991, according to a "semiconservative" company forecast.

STC also has high hopes for the computer's successors. "I believe that we will provide the same performance as Trilogy's machines, before they will," Holtwick says. "We will have competitive machines, possibly the fastest engine in the industry." But it will probably not be a uniprocessor like Trilogy's 30 MIPS cpu, he adds. "You won't end up with one big hummer, but with distributed systems. You can't hang enough devices off one machine."

If the product has an Achilles' heel, it is money: specifically, the company may not be able to continue investing the vast

**"I think either a good decision or a bad decision is better than no decision at all," Aweida says. "I like to move fast."**

amounts of capital it takes to produce new processor models. While the limited partnership removed most of the risk from the initial developments, future products will have to be funded internally, McClellan says, and "I rather doubt that they can afford it."

Holtwick concedes that STC could run out of money on the project, particularly if the product does not sell well off the bat. "We knew it was tight," he says. "We knew it would take a lot of money, more money than we had from revenues from current products, to continue the series." If the well runs dry, he says, the company is still committed to the mainframe business and would resort to another limited partnership, stock offerings, or other alternatives in order to raise the necessary capital.

"The burden will be on marketing," Holtwick says, because the manufacturing process will be able to churn out machines as quickly as the market demands. But the burden will also be on marketing because STC's forecasts show the product turning positive as early as the second year of production. "There's more of a market niche for our cpu than people think," Vertuca says, "because we're using proven technology and because so many applications are obvious." The primary selling point of the CMOS mainframe over bipolar models is that the STC unit can deliver similar performance while using significantly less power and space, since cooling systems can be much smaller.

But expectations of fast sales clash with Holtwick's and DeKoster's hopes of releasing the cpu and the optical disk drive gradually. "There's more cause for concern that the market window will close than

that the management here will try to rush the products," DeKoster says.

Because Storage Technology is not the only vendor in the emerging optical disk marketplace, there is more than a slight possibility that the market window will close before the product is fully released. Hitachi, Control Data Corp. (in a joint venture with Philips), and NEC have all introduced large-scale optical disk drives intended primarily for archival and document storage applications.

While executives may be patient with the cpu and with the optical disk, they have not been patient with other projects.

Indeed, STC—like its chairman—favors speed over conservative judgment. "We make more mistakes in public than other companies because we move so fast," Vertuca says.

As Aweida puts it, "I think either a good decision or a bad decision is better than no decision at all. I like to move fast."

That philosophy has always been apparent. When Documation was acquired, its product line was cut radically, although company officials claim it produced better results. "When we bought Documation," Scott says, "they had one printer family for every 100 lines per minute from 1,000 to 3,000 lines per minute. We picked the best in each class and eliminated the rest, and now they're doing better than they ever were before we acquired them."

Nor has the company been sitting around with its more conventional business. Hot on the heels of the recent 4600 announcement is an automated library and an 18-track tape subsystem, which STC plans to announce when IBM announces its own 18-track version. That product has been expected for at least four years, and Williams says STC has planned for it. "If IBM announced it tomorrow, I could look my customers in the eye and tell them that I have something better today. The conversion to 18-track is more than most users are willing to make." The company has also established a division to design applications software for release inside of three years, and is seriously examining entry into the terminals market through acquisition or internal product development. Finally, a systems integration division has been set up to act essentially as an oem, providing complete systems composed partly of STC products and partly of outside products.

But STC's haste has also hurt the company. Last year, the company twice laid off hundreds of workers. The first time, Williams says, the company did not take enough time to include an appraisal process, and many good people were lost. (Since the beginning of the year, about half of the layoffs have been called back, Aweida says.) The company's style has also forced several high-level managers to resign from the company, although Aweida retorts, "I can count on the fingers of one

hand the people I hated to see go. To the one, the others, including those often mentioned in the press, left because they were not right in their jobs or because they did not want to move as fast as we did."

Moving fast also means announcing products before they are ready for market, and STC has been burned several times by having to cancel products after their introduction. The company was also hurt when Amdahl backed out of a potential merger because it felt STC did not exhibit sufficient patience or conservative judgment in conducting its business.

Yet while STC has altered its strategic direction, it steadfastly refuses to change its style. In fact, the fast-moving style more befits a company breaking out of IBM's shadow than a company content to offer compatible products and not much else. As a result, Wall Street is beginning to revise its opinion of the company. Roberts, Edelson, and McClellan all expressed some optimism about the company's revival, and the brokerage firm of Crowell, Weedon & Co. recently revised its stock recommendation and encouraged its clients to buy STC stock. And while the future is anything but assured, it appears that the company may indeed have weathered the worst of the storms that have buffeted it so relentlessly in the past two years.

## TRYING HARD AT NO. 2

**Digital Equipment has seen better days but now says it is on the way to recovering past growth.**

**by Ralph Emmett**

During the 1970s Digital Equipment Corp. rode the crest of the distributed processing wave to become everyman's interactive computer company. Success in the company's traditional oem markets was so absolute as it entered the '80s that it enabled DEC to break from the vendor pack and eclipse all but IBM.

But with the new decade has come a new focus for interactive computing. The mini has been replaced by the personal computer. Oem markets are giving way to end user business. Suddenly, the number two computer company doesn't seem quite so exceptional anymore. Now, rather than leading the pack into the high-growth personal computer and office automation (OA) markets, DEC has been a follower, engaged in a dangerous game of catch-up.

Unlike IBM, which appears to be en-

## NEWS IN PERSPECTIVE

### WHEN PLANETS COLLIDE

Digital Equipment's cancellation last May of its 36-bit mainframe project, code-named Jupiter, came as no surprise to Larry Kirsch.

"I've been trying to make a bet with my DEC engineer for four years that that machine would never see the light of day. He declined the bets, but always insisted that it would," says the Brandeis physics professor, computer architect, and university computer center chief.

"Once DEC started to implement its core strategy of consolidating around its VAX line, it was clear there would be no room for deviant 36-bit developments in its plans," Kirsch states.

DEC's decision to drop the 36-bit line of DECSYSTEMS surprised others, however, as the machines had for many years represented the pinnacle of timesharing computing. Popular in universities, the large computers had been the vehicle for much advanced computing work, from interactive programming environments to artificial intelligence research. The company's request that DECSYSTEM users migrate to the VAX line of 32-bit machines may mean a severe decline in the firm's standing in the educational sector.

Says a user at another Massachusetts campus, "The signs were there. After all, there's been virtually no new software development for the DECSYSTEMS-10 and 20. Only a FORTRAN 77 compiler—and that was several years late."

"Though we read the signs," adds Bob Dumont, operations manager at Systems Architects, a Boston area user, "DEC kept telling us not to worry. They straight out lied to us to keep us happy. We have several DECSYSTEM-20s for timesharing, but we've needed more throughput for some time. DEC kept telling us we'd get Jupiter."

Other users claim that they were offered tours of DEC's Large Computer Group Facility in Marlboro, Mass., aimed at showing that Jupiter was going well. And

even after the mainframe, which would have challenged IBM's 308X series—and was in part being built by former IBMers—slipped past its expected year-end 1982 announcement, DEC was still trying to allay fears.

"They told us that Jupiter had been delayed because of inconsistencies in its performance tests," another educational user remembers. "But they assured us that the problems didn't warrant scrapping the machine."

Sonny Monosson has been following the progress of the project over its four years. "I was very surprised when they killed it. DECSYSTEM-10 and 20 users have periodically ridden out the prospect that support for their systems would be withdrawn. Until the Large Computer Group reemerged with a strong mandate close to three years ago, users were unsure there would be a successor to the KL-10 processor [on which all recent DECSYSTEM models are based]."

But with the resurgence of the Large Computer Group, sometimes known as the Marlboro Computing Company, "it looked like management was really going to go for it," says Monosson.

Though DEC had been skeptical about large computer sales, it saw the market picking up. "This reading of the potential was borne out in 1982 when U.S. sales of DEC's large systems grew nearly 40%. So this is a very mysterious about-face for them," Monosson notes.

Insiders claim that the base of DECSYSTEMS is probably worth around \$1 billion, and possibly generates \$150 million a year for Digital. "Though DEC won't be hit hard financially by this move, it's probably a strategic error. Because when a user is growing—and most of them are—he has to migrate to someone else."

As New York-based independent consultant Phil Dorn puts it: "The door is now open."

Digital, which says it will continue to support its 36-bit base, has said little about why Jupiter was scrapped. Executives talk of technical difficulties and not having the long-term semiconductor technologies in-house.

Says Win Hindle candidly: "We haven't yet developed a real understanding of large multi-MIP systems, that's true. We've been in a learning period."

Hindle clearly expects some defectors. But he is hopeful that the majority will wait until next year for a larger VAX machine.

But, as Dumont of Systems Architects explains: "Migration from 36 bits to 32 bits could be horrendously expensive. A nightmare. And we for one won't undertake it." Dumont says his firm has been looking at Tandem and IBM. "In two years we'll be a non-DEC shop."

Dumont points out, as others do, that while the DECSYSTEM 20 is a "beautiful" timesharing machine, the VAX isn't. "Timesharers don't want a complex, business-oriented operating system," says one. "VAX is not user friendly, and it's also too slow and unreliable for timesharing."

The DECSYSTEMS have, however, been ideal for universities, and their success has helped DEC build up a powerful presence in the educational sector that is the envy of even IBM.

"This could now be undermined," argues Monosson, "and provide IBM with the perfect opportunity to capitalize on recent overtures it has been making in the sector, including large development deals with Carnegie-Mellon and MIT."

"The fruits to DEC of its long association with the universities has not so much been in the equipment sales as in the networking and interactive software developments that the students have come up with," says Dorn. "Those fruits could soon be on offer to IBM."

—R.E.

tering new markets with aggression and skill. Digital, its critics say, has been notable for late entry, lackluster marketing, and delays in its bread and butter VAX supermini line. For the opening three years of the decade, DEC's capital productivity has declined, and even its formidable user base (put by some as high as 600,000 units) and cash position are showing signs of erosion.

Inevitably these problems show up on the bottom line. Net profit for fiscal 1983, ended June 30, dived 32%—the first time in 13 years that the minimaker's yearly earnings failed to rise. Even more alarming was its almost zero growth (only 2% plus) in equipment sales for the year.

"Put bluntly," sighed one New York analyst, "the company seems to have gone to sleep." But how could that be? What's causing this numbing inertia, and is

there a remedy that can put DEC back on the fast growth track?

To begin with, observers and insiders seem agreed that the current inertia is a reflection of DEC's past: its weighty matrix organization, the compatibility demands of

### "Getting a decision made in DEC is like drawing a line in sand."

its enormous and loyal user base, and an increasingly conservative marketing approach that's out of touch with the market demands of the 1980s.

"Together, these have resulted in a failure by Digital to implement its ideas during the past few years," a former manager explains. "You have to realize that getting a decision made in DEC is like draw-

ing a line in sand: it seems crisp, but in time it gets filled in. The net result is long product cycles and disillusioned employees.

"To its credit," the manager notes, "DEC has been battling this problem for the past 18 months by trying to realign the organization around better lines of communication, both inside and out, and a shorter production cycle that matches the high-volume, low-cost nature of emerging end user markets."

According to Win Hindle, executive vice president, the man who controls DEC's daily operations, "that battle has now been won.

"We believe we've already succeeded in bringing decision-making closer to our customers and giving them a greater part to play in the process," Hindle says.

However, Hindle is the first to ad-

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## NEWS IN PERSPECTIVE

mit that the new "winning formula" won't be reflected in any new products for quite some time because of the transition from the old order to the new. In contrast, DEC's recent and impending products—including five new VAX computers set to be shipped over the next 18 months—all reflect DEC's former "matrix" organization, and, to varying degrees, its failure to consummate or carry through management's wishes.

"Under the previous matrix," claims another former manager, "engineering and manufacturing were at the mercy of 18 squabbling 'fiefdoms'—product line groups, each with its own marketing as well as profit and loss objectives.

"It was like management by flagpole," he adds ruefully. "One of the groups would send a flag up and see how the others reacted. The trouble with such consensus management is that it is difficult to get anything started."

By his assessment, all the upcoming VAX models have been delayed as a result, and the company's tardiness has been equally apparent with its new personal computers and OA products, all of which were late to market.

The most severe problems involve the company's high end, where it has been trying to build a machine more powerful than the VAX 11/780, which was introduced in 1977. Insiders reveal that DEC engineers

### **"It was like management by flagpole," says one former employee.**

are working on two machines, coded the 11/785 and Venus, which use complex and expensive ECL technology and are supposedly two times and four times the speed of the I-MIP 11/780. A similar but unrelated attempt by DEC's Marlboro-based Large Computer Group to build a 36-bit mainframe replacement for its DECsystems-10 and 20 was recently scrapped (see box). But according to Olsen, Venus will see the light of day next year, and has been undergoing intensive simulation for the past 18 months.

Sources point out that this is about the amount of time it took the Venus project to get off the ground to begin with, as management seemed to be searching for the perfect solution "seven to nine years down the road." More recently, engineers have had trouble getting the required performance levels out of the Venus machine when working through DEC's Unibus system and have had to change the control logic. DEC declined to comment on this.

Olsen does not apologize for the company's apparent tardiness with Venus, despite the fact that DEC lost the high-performance 32-bit lead when Data General unveiled the MV 10000 early this year.

"It's worth taking the extra time for a product that has so many good years ahead of it," he said recently at a DEC pep

talk to analysts and the media.

"The gamble behind all DEC's recent products in the OA and PC domains," says Yankee Group's DEC watcher Peter Lowber, "was that if the company could get its products to work together well, it could enter growth markets late and still succeed.

"This argument was proved fallacious in the personal computing sector," Lowber contends, "because you don't have time to worry about compatibility when the product cycles are so short. IBM reasoned, correctly, that the most important thing was to get a jump on the market and build up the largest workstation base.

"Now that IBM has established the de facto standard, everybody else—including DEC—is worrying about how to be compatible with its P.C.," the analyst says.

Lowber maintains that IBM has taught DEC another useful marketing lesson: "When product cycles are short you can't do everything by yourself; you need help. And DEC is in a better position than many to get it, should it so choose."

The analyst was referring to the horde of software and hardware companies that, according to analysts, will help create a \$6 billion market for DEC-compatible products and services in 1985.

"While DEC claims that it has about 300 commercial oems, there are in fact only about 60 authorized DEC distributors. Why doesn't it create more?" wonders Lowber. "And why," he asks, "is there still no major third-party software program to boost applications?" Third-party software was noticeably absent on DEC's personal computers, which still, for example, do not have an MS/DOS base, he adds.

Lowber points out that the picture is much the same in the office automation sector. "DEC is one of the handful of companies to develop an integrated software package for the office [VAX's All-in-One], yet it

### **"If the company [DEC] could get its products to work well together, it could enter growth markets late and still succeed."**

is complex and expensive, and its interfaces need updating considerably."

Lacking, according to the Yankee Group analyst, are an English language interface, a query language, and relational database. "Yet, the software is out there in the hands of such companies as Oracle Corp., or even closer to DEC's home turf at the Software House, Cambridge, Mass. All they have to do is certify the third party they want and get the bridges built to All-in-One's Codasyl DBMS."

DEC's insistence on doing everything itself could backfire in other ways. Says independent California-based consultant Robert Patrick: "A growing number of

networking middlemen are emerging who provide the boxes and software to glue together incompatible pieces of equipment. The universal interfaces, if you will.

"The net result," says Patrick, "is that vendors will begin to worry less about compatibility and more about whether they have the most aggressive marketing strategy to get the user."

One such "universal interface" maker is just beginning to emerge in DEC's home area, insiders reveal. A young Need-

### **The most severe problems involve the company's high end, where it seeks to build a machine more powerful than the VAX-11/780.**

ham, Mass., venture, Software Research Corp., has just gone into beta test phase on a generalized SNA subsystem interface that works with at least eight mini/micro makers' products—including DEC's.

Says Boston analyst John Adams, "DEC has been investing too much effort, time, and money on things it could get for less trouble on the outside."

Adams says that he has been alert to this danger for some time because of declines in Digital's capital productivity since 1980. "In the years leading up to that time, the company had invested 20 cents in fixed assets—plant, equipment, and the like—for every dollar of sales. But during the past three years there has been an enormous jump to 30 cents invested for every dollar.

"One would assume," he reflects, "that the increases in the net plant account would be buying DEC something. Indeed, the company justifies them by saying that it is out to achieve greater plant automation, and thus in turn, higher quality and lower costs.

"However," Adams argues, "DEC's balance sheet provides no evidence that its manufacturing costs have declined, and the company's relative sales momentum does not bespeak any notable advantage in quality.

"Thus," he concludes, "it is very much to the point to ask management what it has bought with its incremental investment in semiconductors, mass storage, automated equipment, and the like. On the numbers alone, it has bought nothing."

There are clear signs that with the reorganization and an investment in Trilogy—its first in another computer company—some of these points are hitting home with the company's top management. For this reason, Wall Street analysts have generally remained bullish on the stock. Adams sums up the general view:

"DEC is in an unusual situation. The capital productivity numbers are poor—and getting worse—and yet we like the stock. This paradox is not easy to explain. Perhaps it's just best to say that DEC has other virtues



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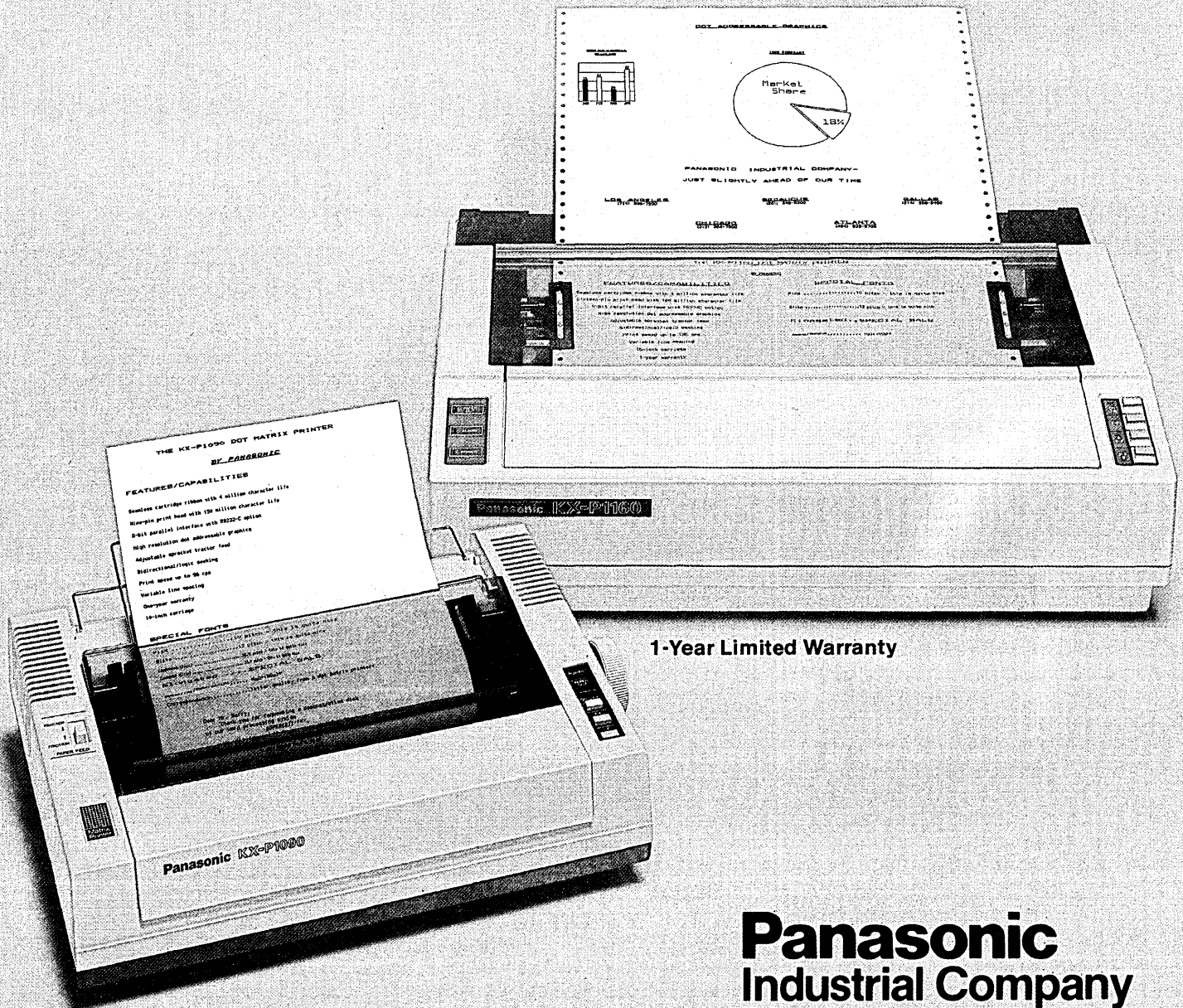
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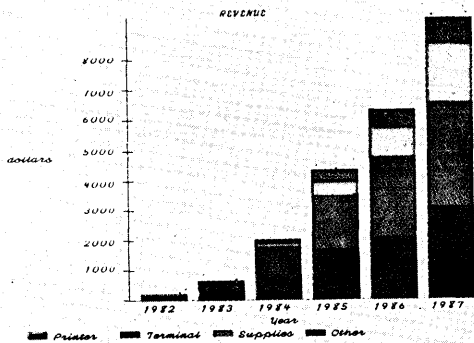


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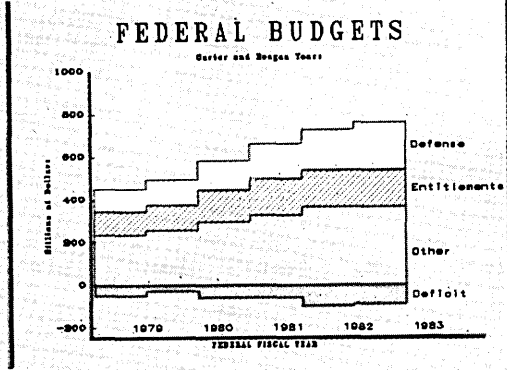
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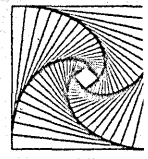


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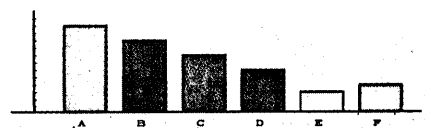
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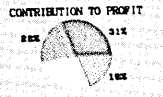
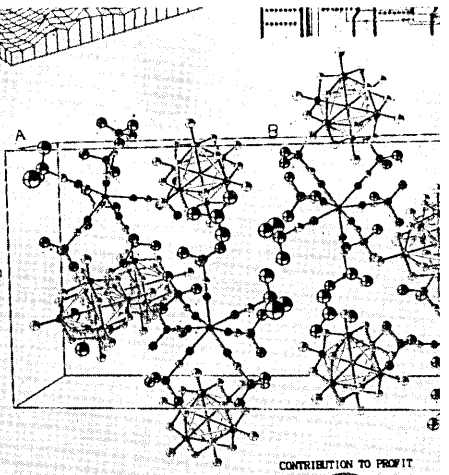
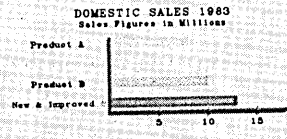
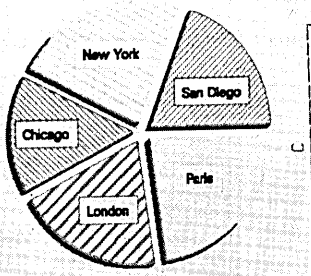
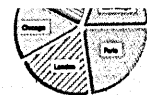
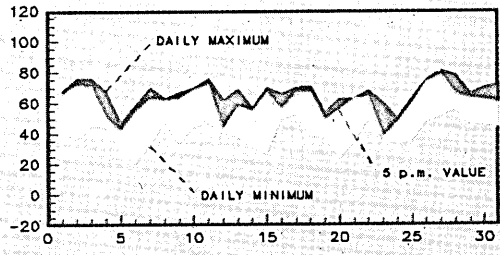
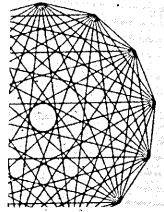
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CIRCLE 33 ON READER CARD

D10/83

## NEWS IN PERSPECTIVE

that presently seem more important than its virtues: the company's strengths in technology, products, and distribution have all been brought along to the point where an explosion in sales volume seems imminent."

Other analysts—admittedly in a minority—warn that any infatuation with DEC's stock may be based on blind faith. They point out that there are the many question marks surrounding DEC's future—including the necessary transition phase into new markets.

Even the five new versions of the VAX family—including an imminent 0.5MIP 4MB desktop VAX for \$15,000 to \$30,000—will not be enough to bring DEC's net income growth back to the average 38% a year levels of 1971 to 1981.

Because of this, most analysts seem to be looking for growth at the 20% to 25% levels for the next few years. Hindle says he is optimistic that the reorganization will return DEC to its former growth levels. Time and the market may take care of the 150 or so microcomputer workstation companies

**"DEC's balance sheet provides no evidence that its manufacturing costs have declined, and the company's relative sales momentum does not bespeak any notable advantage in quality."**

that are challenging DEC and eroding its base.

"These are conservative times financially," explains Ken Bosomworth, at the research firm International Resource Development, Norwalk, Conn., "and many of these [workstation] companies are running at huge negative cash flows. They have overcommitted cash they don't have to build new buildings and products, and will have trouble getting more."

Bosomworth says that the "bubble is in the process of bursting," and there could be a bloodbath in the recent high-tech stock issues. "DEC with its \$500 million cash balance and its conservative management will not be subject to these pressures, and could be the chief beneficiary."

But even if the company's conservatism should result in such an unexpected bounty, it is clearly working against DEC in other ways. "DEC is used to being number one in its oem world, but this is no longer so in end-user domains," argues Bosomworth. "All its battles from now on will be fought head to head with such companies as IBM and AT&T, and conservatism, especially in marketing, is a big negative. What is needed instead is flair."

Flair seems to have been singularly absent from Digital's marketing since it began to leave its traditional oem markets. Its 1976 attempt to enter office markets with its DECmate word processor was poorly or-

chestrated. The machine was virtually bereft of software and support.

"The company doesn't seem to have learned much," says Yankee Group's Lowber, "because when its three PCs were announced last year, they too lacked the distinctive software that would allow them to stand out in the market."

Frederic H. Cohen, analyst at L.F. Rothschild, Unterberg, Towbin, wonders why DEC offered a "multiplicity of product choices," that is, three personal computers compared to IBM's one. Hindle replies that "the company wanted to let the market decide which of the machines it wanted."

Analysts point out that DEC's marketing strategies in the OA area have also lacked coherency, despite its large product spectrum.

Said one insider: "Digital has lost its last six head-to-heads with Data General in the office because of chaotic marketing." Two of these losses were well publicized: The Forestry Commission deal (which First Boston Research's Marc Schulman says could be worth \$300 million) and a \$40 million E.F. Hutton order.

Some observers put DEC's errors down to a "sort of adolescence or learning phase" in new markets and say they will be ironed out in due course. Others, less confident of DEC's ability to change, say the snafus are a reflection of a 1970s "mindset and culture" which must be revamped with fresh insights.

Under DEC's former matrix, Olsen and Hindle looked at the computer industry through 18 autonomous product line divisions and thus rarely achieved better than a fragmented view of the whole. This was reflected in DEC's marketing efforts.

DEC has tried to improve its marketing by reorganizing around the customer and becoming account driven. But this, too, has its dangers. Sonny Monosson, publisher of the *Monosson on DEC* newsletter, quips, "DEC could be jumping from the frying pan into the fire."

**Analysts point out that DEC's marketing strategies in the office automation area have lacked coherency.**

He points out that DEC's new focus on selling and service is concerned with the customer as an individual. Ironically, this still leaves Digital with a fragmented view of the industry.

"It's now more vital than ever that DEC develop new marketing know-how to balance this approach," Monosson warns. "The company must learn to identify a set of future needs related to industry-wide perspectives. Otherwise, marketing, under the new structure, will be absorbed at the sales or field level, with dire consequences." Experts suggest one obvious danger when marketing gets absorbed at the field level:

DEC might be unable to anticipate and link sales/service demand to changes in the economy. Thus, for example, DEC could unwittingly push on with a manufacturing buildup at a time when customers are unable to pay for it. A look at the balance sheet indicates this happened last year when the firm was left with excess manufacturing capacity and inventory in an economic slump. As a result, its formidable cash reserves were eroded by more than \$200 million in the fiscal year to end at \$556.2 million.

The reverse side of the coin is that DEC would come to depend on its users for new marketing ideas and become a virtual puppet of its customers.

This has already happened, claims

**DEC's top managers have been together for over 20 years, leading to what one insider called "intellectual incestuous relations."**

Yankee Group's Lowber, "because the company has allowed the size and power of its user base to determine its key strategy for the 1980s—namely, compatibility." One reason for this is that the company never has been able to achieve industry-wide focus.

Hindle certainly seems alive to the dangers. As part of the reorganization he created a new vice presidency and appointed Ed Kramer director of corporate marketing, and also created six new marketing group manager positions. He states that DEC is "now more focused on strategic aspects of the marketplace than ever before."

That may be true, but some observers suggest the company is short on new ideas to cope with today's markets and its place as the number two computer maker in the world.

"What the company really needs is some fresh blood—perhaps a new culture," says Monosson. He points out that DEC's top tier of managers have been together for over 20 years without change, leading to what one insider described as "intellectually incestuous relations."

So far, there's been no sign of hiring top management from outside the corporation. DEC may be too mature a company for that kind of change in the executive suite.

What many analysts think will save the company after all are its traditional strengths in engineering: new products expected shortly include a top-end VAX, low-end VAX workstations, a number of enhancements to the three-model personal computer line, and a replacement for the highly-successful VT-100 terminal.

"We don't apologize for continuing with the same strategy," remarked chief Ken Olsen in a recent speech. Wall Street isn't asking for apologies, just a return to the fast track.



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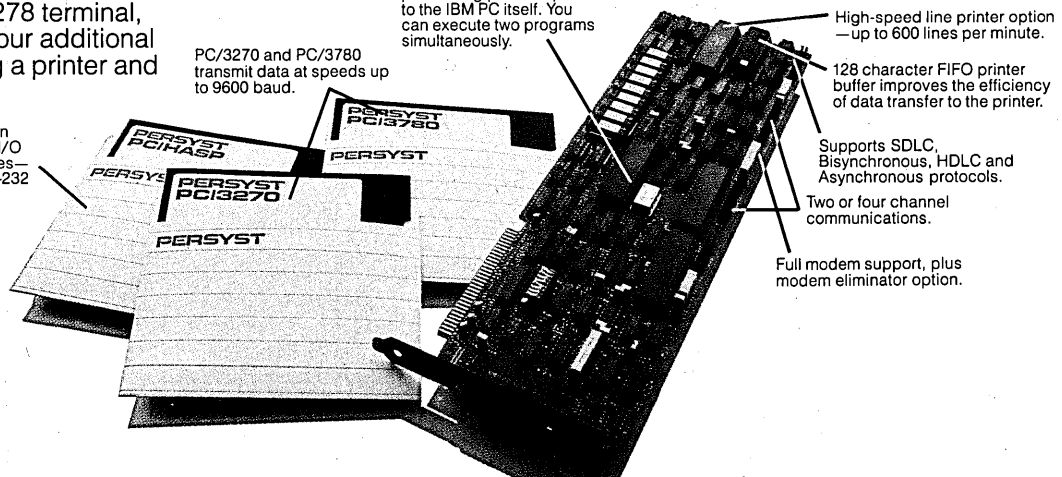
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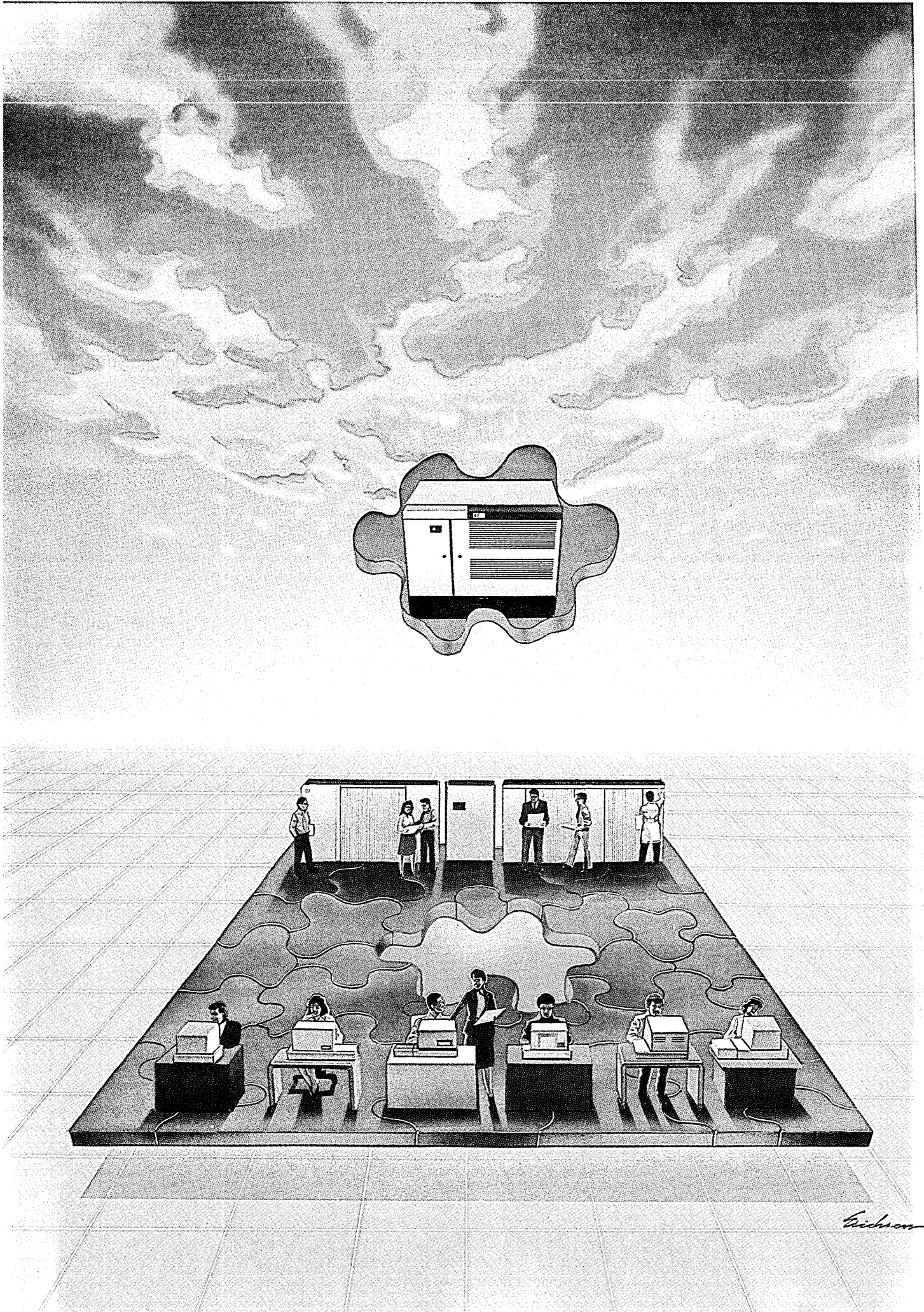
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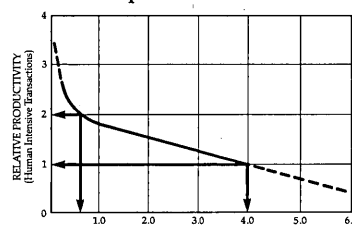
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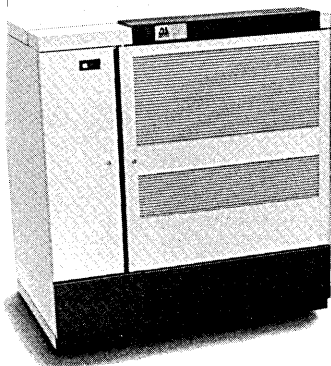
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## NEWS IN PERSPECTIVE

### NATIONAL PLANS

# A GERMAN DP POLICY

**The country's dp industry calls for government help in battling IBM, the Japanese, and others.**

by Maureen O'Gara

West German computer companies last month jointly called upon the Kohl government to set new industrial and social policies to help native industry compete more vigorously at home and abroad, it has been learned.

A group of 17 companies and trade organizations said it wants most a U.S.-style entrepreneurial business climate, complete with over-the-counter stock trading and freer sources of venture capital, in order to compete with U.S., Japanese, and other European manufacturers. Not surprisingly, IBM has declined to sign the preliminary memorandum the German manufacturers have written, which will be the basis

of a more formal presentation to the conservative government headed by Chancellor Helmut Kohl.

The memo, however, has received a strong endorsement from Heinz Reisenhuber, chief of the influential Ministry of Research and Technology.

Considering the previous German political establishment poured DM3.5 billion into the local dp industry between 1967 and 1979—an effort widely regarded as largely a waste of money—the subject of renewed German information technology policy and federal spending is a touchy issue with certain factions in the Bundestag.

However, Nixdorf vice chairman Klaus Luft, who is acting as the industry's spokesman in the matter of the memo, told DATAMATION that the Kohl government was swept into power on the strength of its economic reform promises. Those promises must encompass the dp field since it is one of the few sound economic sectors left with a future in it. If the promised reform does not materialize in the coming months, Luft predicts, the government may fall.

Therefore, in what seems a politically savvy move, the memo largely rejects the industry's old role as a federal subsidies sop. It does not altogether reject, however, the whole notion of subsidies. It advises the government to subsidize particular but unidentified R&D projects.

In an interesting sidelight on the issue, Siemens, although a signatory to the memo, has quietly prepared a report of its own for the ministry on what kinds of research—energy, space, advanced dp—are most suited to subsidization. Siemens, of course, should be remembered as the company that gained the lion's share of federal subsidies during 1967-79.

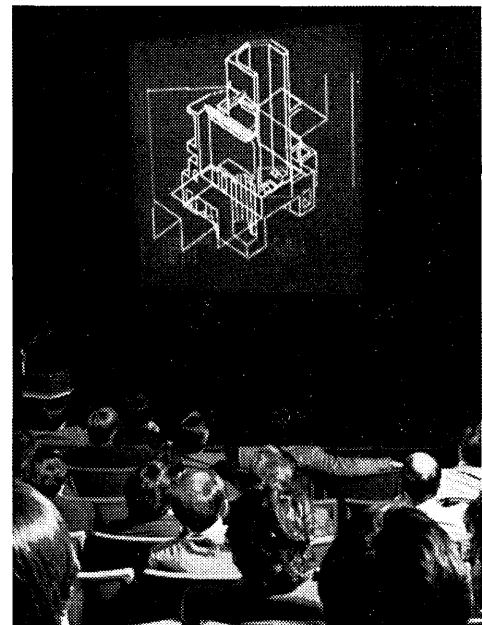
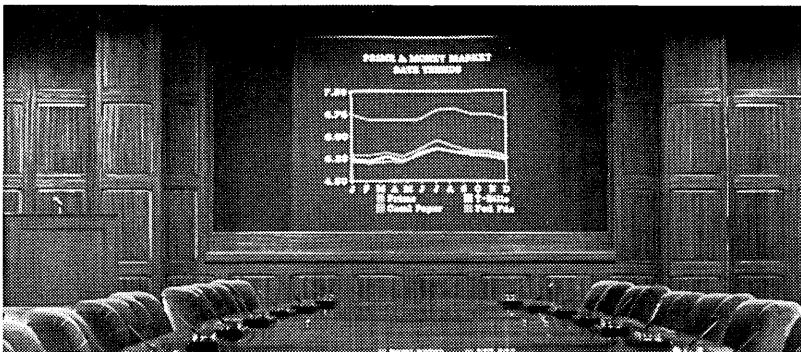
But in the general memo, the industry made it clear it does not need more random reinforcement policies like those it received in previous administrations.

Instead, it has called for an overall strategic industrial policy made central to the national economy that will fortify the

**Federal subsidies are not altogether rejected but are seen as helpful in certain areas.**

industry to reclaim the home market from the U.S. Such a policy will also help it expand into the world market, where it is currently losing out to both the U.S. and Japan and may well lose more ground in the future to the French and English.

The new government can start, the memo says, by revamping its own outmoded federal procurement policies and standards. Instead of buying run-of-the-mill equipment, Bonn should support inno-



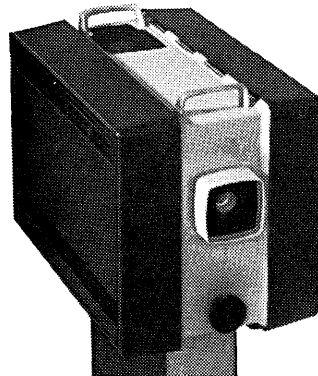
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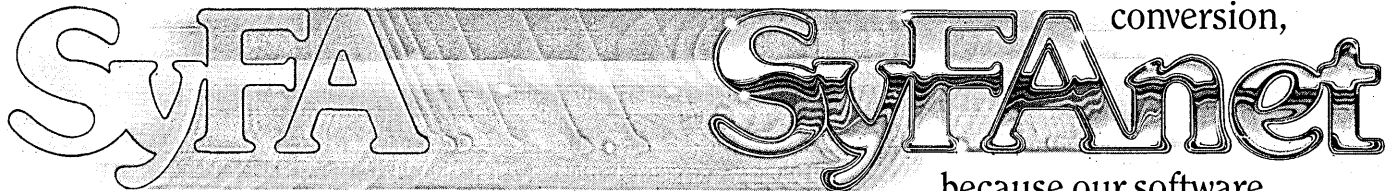


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## NEWS IN PERSPECTIVE

vative applications-oriented technologies and apply them on a broad scale. It could also spark breakthrough R&D projects in future technologies.

The memo's implicit criticism of the status quo on this point is aimed mainly at the monopolistic German PTT, now modernizing its communications network infrastructure and exerting do-or-die influence over terminals gear.

In a fit of uncommon cooperation, the industry also proposes forming buying and manufacturing consortia to reduce the individual corporate cost of purchasing or making semiconductors, components, subsystems, and software.

In addition, it says, German dp companies should codevelop basic technologies, especially software, and off-load

### **The new government has been asked to revamp its own procurement policies, particularly in the conservative PTT.**

much of their middle- and long-term R&D projects to universities and research centers whose activities should be more coordinated and focused than they are currently.

Most important, the memo recommends widespread social and economic changes to create a more entrepreneurial high-tech climate based heavily on the U.S. model. Instead of direct financial aid, Bonn has been called on to support indirectly the IT community by instituting reform measures such as tax concessions for R&D expenditures and risk capital, improved depreciation procedures, investment aids for the initial acquisition of information technology products, subsidies for R&D investments, development of new sources of venture capital, and establishment of an over-the-counter stock market.

Lastly, hand-in-hand with a heavy computer buying spree by the government, the industry has called for a propaganda campaign to make the German man-on-the-street more sympathetic to computerization. It wants computer training in the schools as well as less focus in universities on theory and more on practical applications. It is willing to install the necessary gear in the country's high schools and vocational schools on its own initiative but needs the educational authorities to recruit teachers and set up classes.

The research and technology ministry believes it will get the chance to act on almost all the industry's recommendations, but acknowledges it will probably have considerable trouble convincing fellow agencies such as the redoubtable and conservative PTT to alter its procurement policies. Reisenhuber himself, however, has characterized such changes as "necessary for German survival."

The memo represents the first time

German computer companies have made a joint effort to influence public policy. The impetus for the collaboration came from Reisenhuber himself, who came to office with Kohl. He invited industry representatives to a high-level meeting in April at Winterscheid, a Bonn suburb. It was the industry, however, that in a day and a half spent airing its problems and frustrations resolved not to lose momentum but put its suggestions in writing.

For purposes of the memo, the firms have banded together as the Information Industry Association and include Nixdorf, Siemens, Triumph-Adler, AEG Telefunken, Computertechnik Mueller, Dietz, Kienzle, Krupp Atlas-Electronik, Softlab GmbH, MBP GmbH, Peripherie Computer Systeme, Adv/Orga F.A. Meyer GmbH, and the Beratungsinstitut Fuer Informations und Kommunikationstechnik.

Also subscribing to the document are the VDMA and ZVEI, associations respectively representing all German office automation and computer firms. The ministry said the paper was also read and approved by the BTU, an organization representing software and dp consultants.

One oddity in the lineup is the inclusion of Philips Data Systems and Philips Kommunikations Industrie ag. As subsidiaries of Dutch parent Philips N.V., they are the only foreign-based concerns involved. The ministry explained that Philips took a pre-Winterscheid role in advocating cooperation during discussions among its fellow VDMA members.

Philips's presence in the supporting group highlights the absence of IBM Deutschland, whose long-time involvement

### **Increased computer teaching at all levels of schooling have been called for.**

in Germany, its dominance of the marketplace, and its hefty German employee rosters have served to make it practically a German company.

The ministry suggests that IBM did in fact have an opportunity to attend the Winterscheid seminar, but points out that however German IBM Deutschland may seem, IBM policy is made in Armonk.

Conversations with Luft, however, leave the impression any new pro-German dp policy will perforce be anti-IBM. "It irks," he says, "that our own defense ministry is spending DM 150 million a year with IBM for dp."

Europe's share of the world market for information systems has slipped in recent years, primarily at the hands of IBM and the Japanese. Recent tabulations show European countries holding only 15% of the total world market. In West Germany, Siemens had 1982 dp revenues of \$1.27 billion, followed by Nixdorf at \$796 million and Kienzle with \$247 million.

## TECHNOLOGY

# ETA LEAVES HOME

### **Can the supercomputing startup raise \$100 million and bring gigaFLOPS to market by 1986?**

by Jan Johnson

"Now maybe they'll get on with the business of building supercomputers." That was one of many offhanded comments heard after William Norris, chairman of Control Data Corp., announced that CDC had spun off its 2XX development—for a follow-on machine to the Cyber 205—into a startup called Engineering & Technology Associates (ETA). Was CDC really getting out of the supercomputer business? Well, now exactly.

It became clear that the 2XX group was getting out from under a corporate bureaucracy that threatened to "seriously" slow down the development of the 2XX. That slowdown was making a bad CDC picture look even worse among those at the leading edge of supercomputing, primarily users in government and national laboratories. Members of that elite user group, with its insatiable need for more megaFLOPS, generally rated CDC's supercomputer effort as inadequate for their needs. CDC's machines, the Star 100/Cyber 205, they say, are "out of balance."

Although fast in vector processing, the machine was too slow on the scaler side. In addition, CDC's commitment to the business was not trusted. No one ever knew when or if the company would get to the next generation.

Lloyd Thorndyke, former head of the CDC 2XX project and now ceo of ETA, confirms part of that industry perception: "We've had customers telling us that the normal plans at CDC were too late; we were taking too long to get the next generation out." At fault is the bureaucracy of big companies, according to Thorndyke, a longtime CDC employee. "I've been through it before," he says. "Every time you have a successful product, the follow-on gets slowed down. We were being asked to spend too much time on 205 variations and sales support and not enough time on the 2XX development."

There was also the problem of budget reviews and in-house battles for limited resources. "We had to deal with the question of how to balance the needs of the next hardware phase against the needs of soft-

## NEWS IN PERSPECTIVE

ware development." The powers-that-be wanted to accelerate 205 software development because, as Thorndyke readily concedes, "customers will order if they can get the applications."

But the 2XX group felt it couldn't slow down and still succeed. As Thorndyke sees it, "We are in a time race." His goal is to produce a machine capable of a peak performance of 10 billion floating point operations per second (10 gigaFLOPS) and a 5 nanosecond cycle time by 1986.

Is that realistic? Says John Rollwagen, chairman and ceo of Cray Research, CDC's arch-competitor, "It is easy to talk about gigaFLOPS in '86—fine. I'm not going to enter into that contest. Our intention at Cray in 1986, '87, and '90 is to make the fastest machine there is and however many gigaFLOPS that takes, that is what we will do."

Perhaps Rollwagen's cool response hid more concern than he cared to reveal. When asked to comment on ETA, he noted: "Basically, it sounds like a good idea to me. It's just like Cray at the beginning. The supercomputer project is out there and will have to sink or swim. It will succeed or fail. It is not going to be subsidized by CDC anymore."

George Michael, computing research group leader at Lawrence Livermore National Laboratory, Livermore, Calif.,

**"The whole advantage of being small is that now you can move capital equipment through quickly. You don't have to share the same devices with other groups."**

posed some hard-hitting questions on the gigaFLOPS challenge: "If Neil Lincoln [CDC's 205 and now ETA's 2XX architect] is talking 10 billion floating point operations per second, that implies memory traffic on the order of 100 billion bits per second. How are they going to feed that thing with the next problem? You would have to be up in the tens of billions of bits per second and disks do only 5 million bytes per second right now." In other words, a supercomputer is only as fast as its slowest part. It certainly looks as if someone is going to have to do something about bandwidth, channel speeds, disk access times, and disk transfer rates.

Broken free of CDC's bureaucracy, Thorndyke's immediate concern is getting the 2XX designed and running, to meet a slated first delivery date of 1986. "The end date is sacred," he said, alluding to the tension felt by U.S. supercomputer makers toward Japanese efforts, especially at Hitachi, Fujitsu, and NEC. Hitachi and Fujitsu have both slated fourth quarter 1983 for delivery of their machines, the Fujitsu VP 200 and the Hitachi S810 and S820—each

promising a 500 MFLOP peak vector rate, a 6 MFLOP scalar rate, and 15 nsec cycle times. NEC is talking first quarter 1985 for delivery of its SX-2, a machine capable of a 1.3 GFLOP vector peak, a 20 MFLOP scalar peak, and a 6 nsec cycle time.

The pressures don't stop with the Japanese; there are national efforts within France and the U.K., as well as from Cray Research and a growing number of makers of array processor and parallel processor upstarts. Faced with this aggressive competition, Thorndyke says, his team was bothered at CDC with sharing equipment back and forth and formulating strategy to fight

for corporate money and capital resources. Thorndyke's group designs high-speed computers using high-speed computers, the same resources that the CDC 205 software group needed.

"The whole advantage of being small," he says, "is that now you can move capital equipment through quickly. You don't have to share the same devices with other groups. My whole effort now is to get the tools my engineers need to get the job done." Topping the tool list is the purchase of a Cyber 176, to act as a local terminal controller and handle traffic to a remote 205. In about a year and half, ETA figures, it

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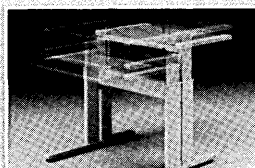
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## NEWS IN PERSPECTIVE

will put down the money for its own 205. "We need a 205 full time for software development," insists Thorndyke.

Sound like an expensive development effort? It is. To capitalize the company, ETA expects it will need a minimum of \$100 million, coming from private placement or public offering. CDC has committed itself for up to 40% of the total capitalization, or about \$40 million, ETA sources indicated. In addition to its \$40 million investment, CDC will provide people and an oem agreement to purchase 2XX systems. By the end of the year, Thorndyke hopes to have lured most of the 2XX group from CDC, along with another 40 or so employees from elsewhere.

Among the key people already committed to leave CDC for ETA are Neil Lincoln, ETA vice president and chief architect, and Tony Vacca, ETA vice president and chief technologist. Vacca was responsible

**Four years ago, "we would have been laughed right out of the place if we started talking about two processors linked together."**

for developing the semiconductor technology for the 205. Another key man is Dan Sullivan, lead packaging specialist who worked with Thorndyke on disk drive development projects.

"CDC is allowing us to select people instrumental to our program," points out Thorndyke, who adds that he is careful not to hobble CDC's continuing 205 effort. In forming this way—keeping the 2XX program virtually intact—ETA expects to lose only a month or so from the trauma of the move. "That is why we expect to hold our delivery dates," he claims.

The relationship between ETA and CDC is very tight, stress Norris and Thorndyke. The benefits to ETA are clear, but what's in it for CDC?

CDC is keeping the 205 and continuation products and all software application work. But the high-risk, future computer generations—the leading edge machines—will be graciously turned out and made eligible for public support. In fact, if ETA takes off, CDC could reap a healthy return on its initial 40% investment, as it did from an early investment in Cray Research. Moreover, CDC can direct the money that would have gone to the 2XX program into application software development to support commercial sales of the 205. In short, spinning off the high-risk hardware development project to the public sector is an elegant solution for an otherwise expensive, low-profit, slow-payoff task.

Both ETA and CDC, through an oem arrangement, will market ETA systems. Thorndyke, who grew up in CDC's oem peripherals business, says he is completely at ease with the idea of competing against his

own machine, sold by CDC and with CDC application software on it.

"CDC has spent five years developing particular applications for 205 machines. They own those applications, ETA doesn't. There will be times when those applications will sell the machine. But other customers won't need applications and it is those contracts that ETA will have a chance at winning," foresees Thorndyke.

Instead of focusing on application software, ETA will focus its efforts on developing software to allow multiple processors to work together. "We will license that software back to CDC and they will license their application software to us," predicts Thorndyke. "There will be a two-way flow of technology, hardware, and software between the two companies."

The reason there can be that two-way exchange is that ETA's 2XX design will be upward-compatible with the 205. "We feel that architecture of the Star 100/205 has enough flexibility in it that we did not have to scrap it and restart to get the performance in the next machine," Thorndyke explains. Building on what has come before, ETA can enter the commercial marketplace at a run. "Compatibility allows you to get into the commercial marketplace easier," agrees Thorndyke.

"Of course, we do have improvements, rather subtle, elegant changes, going in the new machine, but it will still be compatible, software-wise, with the 205," he assures.

Among the key changes made to the 2XX design is a vector length that will be shorter than the 205's, an improvement sure to please the high-end scientific/engineering community. The 2XX is also supposed to operate at a 5 nsec cycle time per processor. Carried over from the 205 will be the 64-bit word length and the 512-bit data path out of memory, says Thorndyke. Fully configured, the 2XX system will contain eight processors, each with its own memory, I/O capabilities, and scaler and vector units. Fully configured, the 2XX should cost in the \$20 million range, ETA estimates.

Four years ago, observes Thorndyke, "we would have been laughed right out of the place if we started talking about two processors linked together." But the industry has recognized that perhaps it cannot keep pace with the staggering demands for more and more horsepower with only single or dual processor configurations. The idea of linking several processors together dawned on the traditional computer makers only in the late 1970s.

"Instead of doing one design for a single processor system, another design for a dual processor system and yet another design for a quad processor system, as is typically done today, we are going to design a single processor and replicate it eight times," said Thorndyke. What ETA proposes is a multitasking, parallel processor

machine, similar in concept to the parallel HEP machine made by Denelcor of Boulder, Colo.

That kind of thinking marks the dawn of a new age in computational mathematics. In the new machines, one processor should be able to handle the whole job or the job could be split over two, four, eight, or more processors. The problem would be independent of the number of processors. This situation, say many involved in supercomputing, does not exist today. Tomorrow's processors are going to have to be linked by sophisticated software that can handle a complex computing environment where a problem is broken up, and results have to be delivered to the right location at the right time or risk the wrong answer. "The two main pieces of software needed to run code today are a compiler and a loader," says a source with a national lab who asked not be identified. "A new piece of software will have to be developed for parallel processing. We need something that might be called a run-time analyzer, something that can take code and partition it among the processors while it is running."

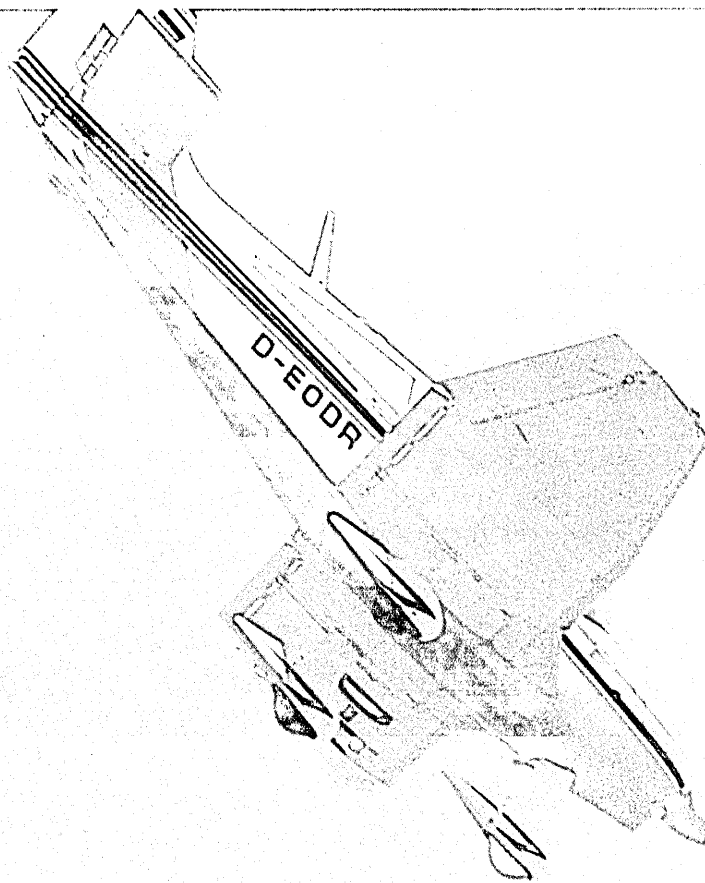
Therein lies a great challenge and an expensive development project—building software to manage that flexible environment. Moving from the world of sequential processing to parallel processing is no trivial task, stress many observers worried about the coming changes. Advancing the frontiers of parallel processing is a challenge that Thorndyke says ETA has embraced.

Meanwhile, Cray Research is also very much aware of this trend and the Cray-3, originally scheduled to be delivered in

**The challenge is to build software that can split the problem into manageable pieces.**

1986, is suspected of having up to 16 parallel processors, designed with GaAs (gallium arsenide) chips. Nearer term is the Cray-2, to be delivered in 1984, with a prototype scheduled to go to the NASA-Ames Research Center in December 1985. The Cray-2 is expected to have a 4 nsec clock time and up to four processors under one hood. But the machine's first design would not "stabilize" and the clock time climbed toward 7 nsec, according to one well-placed source. Seymour Cray scrapped that first design and is working on another attempt. This is not unusual, explains the source, for Cray often has one or two stillborn designs before he hits on a workable solution.

The false start is attributed to slow memory circuits. Continual problems with memory and logic chips have sent Cray and CDC overseas to Japanese suppliers, a situation that has made the U.S. intelligence community—a prime supercomputer user—uncomfortable. To protect itself in the

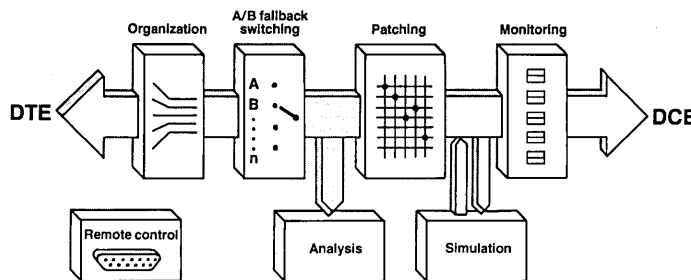


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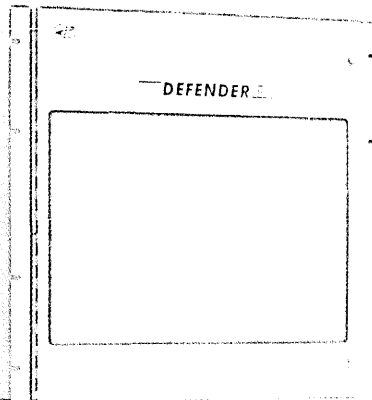
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future, Cray Research is said to be developing its own in-house GaAs capability.

ETA has another idea for dealing with U.S. chip makers. The 2XX design is based on 20,000-gate CMOS chips, which, at present, no one makes. But ETA says it is working with four U.S. chip makers—among those suspected are Motorola, Intel, and National Semiconductor—and two Japanese makers to develop its own VLSI design. ETA doesn't question the skill of the U.S. companies so much as it questions their commitment to working with a low-volume customer. Nevertheless, ETA has decided to work with American firms, confirms Thorndyke. To get their attention, ETA is leveraging its order for memory chips to get its logic chips. "One company will design memory and logic devices together. We won't procure one without the other," Thorndyke explains.

Although the CMOS chip has a slower switching circuit speed than the high-speed ECL class chips, ETA is attracted by CMOS's potential for high gate density, low power consumption, low heat, and a speed gain characteristic that has been observed when CMOS is cooled to the 77-degree kelvin range.

The potential for VLSI on a CMOS chip would enable ETA to reduce the complexity length of wiring. "With a 20,000-gate chip, we think the distances are so short compared to ECL that the net [gain] is better. We think we can effectively approach supercomputer performance with a 20,000-gate CMOS," Thorndyke says. To illustrate this, he points out that about 80 Cyber 205 logic chips equal one 2XX logic chip. Furthermore, CMOS draws about one thirtieth the power of a 205 chip, he claims.

Liquid nitrogen is ETA's cooling agent of choice, thus far. The company was not specific on how it will handle the nitrogen, but Thorndyke indicates he is leaning toward a system similar to a refrigerator. Chips would be cooled by cold air blowing between wiring boards. If ETA succeeds in solving its liquid nitrogen handling/packaging problem, the benefits could be very interesting. Thorndyke claims that when CMOS chips are kept quite cold, around 77 degrees kelvin, their speed tends to double and suddenly those eight processors rival the performance of a 16-processor system.

But can ETA and its chipmakers actually design a 20,000-gate chip, and can they actually build a reliable nitrogen-cooled system? Another obstacle is the production of the new 2XX processor. Each processor is a rather large machine in itself, of a class that has never been produced before. But for ETA, it is no longer just a matter of producing one processor, but eight per system.

"There will have to be a significant improvement in production capacity," speculates Allan Gottlieb, professor of computer science at the Courant Institute,

and principal investigator on NYU's Ultra project, which is aiming for a 4000-micro-processor parallel machine.

The perception in universities and

**ETA's supercomputer will be indirectly cooled by liquid nitrogen, a scheme that will help boost the speed of its CMOS chips.**

national and government labs and agencies is that if the U.S. is to hold its lead in supercomputing, it must solve these and many other problems on the way to parallel

processing. To act more quickly, "we have got to end the isolation of computer scientists," stresses Ken Wilson, holder of the James W. Weeks Chair of Physics at Cornell University and winner of a 1982 Nobel prize for his work in bulk matter phase changes. "Computer scientists must be put in regular contact with industry, with users, with other scientists and engineers across many disciplines."

To help this process, "the government should focus more attention on the universities. That is the only place where you are going to get the kind of bold thinking and leaping that is going to make it

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possible to move fast on these problems," says Wilson. He and other leading researchers have called for more interplay between various research communities and more access to more computers for university researchers and students.

If companies like Cray, ETA, and Denelcor do not survive, do not solve their software, hardware, and production problems, and do not progress as strong participants in the supercomputer market, then the U.S. military, intelligence, and industrial communities will be dependent too heavily upon foreign firms for their computational needs.

# MAKING MAGNETS STAND UP

**That's what vertical or perpendicular recording is all about.**

by Jan Johnson

For years disk makers have been spinning out crowd-pleasing advances with relative ease, doubling recording densities every two to three years while increasing prices only 20% or so. In the mid-'70s, however, things began to slow down. It appeared that disk makers had just about double-sided and dual-densitized their way to the limit of available technology. Yee gads! Where to go next?

It's generally conceded that cost-effective read/write laser disks are still a few years away and bubble memories—remember them?—have fallen into obscurity as their price/performance was far superseded by traditional magnetic recording. In the struggle to pack ever more data onto ever smaller platters, manufacturers have squeezed more density out of the traditional disk drive through plated media, thin-film heads, and a promising new storage method, perpendicular magnetic recording.

It's the potential for extreme bit and track densities that has everyone all whipped up over perpendicular recording (PR). How does a laboratory-demonstrated PR capability of 440K flux changes per inch (fcpi) sound? When combined with increased track-per-inch densities that may reach into the 100K tpi range on the optimistic side, the flux changes per square inch (fcpsi) rating jumps off the scale into the billions.

Flux changes rather than bits per inch is a more consistent way of discussing disk densities. A recording head reads the signal created above an area where two magnets meet so that signal is called a flux

change and disk densities are commonly measured in fcpi. Although it bears some relation to fcpi, the bit count can be higher depending on the encoding schemes in use.

Compared to the off-the-scale possibilities envisioned for PR, standard longitudinal recording (LR) technology appears mundane. Current LR technology for rigid disks is in the 6,400-fcpi/960-tpi range for a grand fcpsi total of 6 million. Optimists talk of stretching LR recording technology into the 100K fcpi range. Lasers, meanwhile, are currently limited to 25K fcpi and 25K tpi due to the width of their light beam, about one micron.

The critical difference between LR and PR is the orientation of the tiny magnets embedded in the recording media. In conventional longitudinal recording the magnets lie end to end and are oriented parallel to the recording surface. In PR the magnets are standing up and are oriented perpendicular to the recording surface.

The advantages of PR over LR boil down to two key principles. One is that a magnet has a minimum length that must be maintained relative to its width. If the length becomes too short relative to width, data begins to disappear because opposing poles tend to demagnetize each other.

In LR, the only way to cram more magnets per inch is to make the magnet shorter, but if the magnet is made shorter then it must also be made thinner or the length-to-thickness ratio gets out of whack and demagnetization becomes a problem. Hence, thin-film media.

In thin-film media the entire magnet is made smaller, the length to thickness ratio is honored, but now the second principle kicks in. The smaller the magnet the weaker its strength, which means the head must fly closer to the recording surface. The trend is obvious: to stay with LR yet get higher densities, disk makers must deal with the same microscale problems faced by chip makers as they move into VLSI gate densities.

There are two popular options for achieving higher densities in LR: stay with conventional particle coatings but go to a thinner oxide and a new head design that can handle more tracks per inch; or use a new media, such as thin-film metal plating, which has a stronger output signal, and retain conventional ferrite heads.

In PR, the length-to-thickness ratio of the magnets is not a problem. As more magnets are crammed onto the same space, their width is squeezed instead of their length. The length-to-thickness ratio steadily improves at higher densities, so consequently the demagnetization effect does not worsen.

There are several routes to perpendicular recording and several offshoots within each route, and, of course, advantages and disadvantages associated with each. But disadvantages aside, the race is on among U.S. companies, and next year

promises to be a busy year for new PR product introductions.

One contender is Spin Physics, an operating unit of Eastman Kodak located in San Diego, Calif. It is producing sample quantities of a 5¼-inch, 20K and 40K fcpi floppy ISOMAX disk with a capacity of 1, 5, or 10 megabytes. The products use an isotropic particle that can be magnetized in many directions. Spin Physics says that at 20K and 40K fcpi it is just getting started. Spin expects the isotropic particle to eventually carry its floppy disk densities into the 100K fcpi range. Sample quantities of the 40K-fcpi, 5-megabyte platter sell for about \$12.50 each compared to \$8 for a conventional 10K-fcpi, 1MB, 5¼-inch disk.

"We expect hardware manufacturers to introduce hardware for this media next year," says William Kroon, director of marketing for Spin Physics' magnetic media division. "We expect volume markets by 1985." Dysan Inc., which was oblique about what direction it intended to take into higher densities, is said to be among the companies working with Spin Physics.

As a business decision, going with a particle-based PR media makes sense. "You don't have to do anything different than getting the right heads and media," says Kroon. The coating process is essentially the same, so a drive maker does not have to throw out old equipment, and sink money into new. Also, the PR disk works with conventional ferrite ring heads, after some minor modifications.

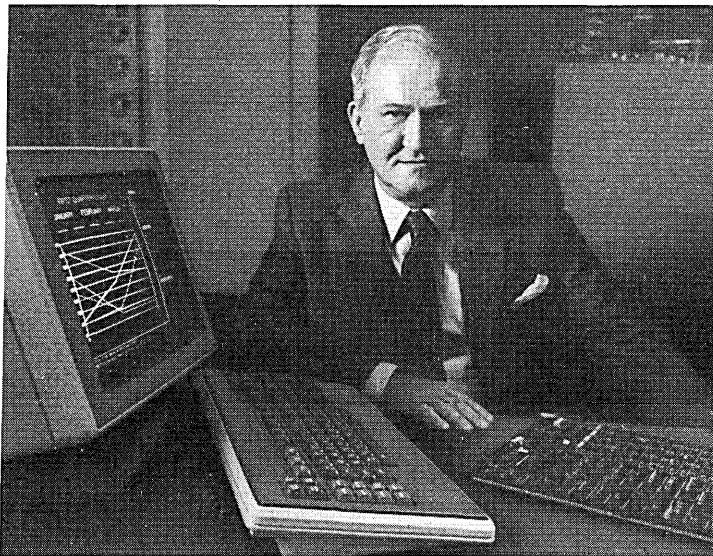
There are drawbacks, however—some may say serious drawbacks—to using an isotropic particle. "We have been developing isotropic particles internally for some

### Floppy disk densities may reach into the 100K fcpi range, according to Spin Physics of San Diego.

time," says Durkee Richards, division scientist in 3M Corp.'s data recording products division. 3M was dissatisfied with the isotropic particle's stability. Mechanical stress—such as bending or hitting the disk—and temperature changes could cause the isotropic particle to switch magnetic direction, says Richards. Spin Physics indicated it will address the day-to-day handling problem by putting its disk in a cartridge similar to the one micro-floppy disk makers are using.

Not as far along as Spin Physics in getting its manufacturing process up and running is Minneapolis startup Vertimag Systems Corp., whose largest backer is L.M. Ericsson, the Swedish telecom company. Other investors include Polaroid Corp., LeaRonal Inc., and Vermont Research Corp., plus a number of venture capital firms. Vertimag expects to sample 5¼-inch flexible PR disks before the end of the

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year. After a change in disk design, density is expected to be 30K fcpi with 5 megabytes of capacity (2.5 megabytes per side, formatted), says Clark Johnson, Vertimag founder and chairman. When in full production, quantity price per drive is expected to be in the \$100 range and disk price is expected to be \$20 per disk. Commercial production will begin late in 1984, assuming the company clears all its current production hurdles.

Unlike Spin Physics and its particle approach, Vertimag has chosen a chromium and cobalt metal film media. What is more, Vertimag, in addition to struggling with a new disk technology, has also taken on the task of making drives, buying electromechanics, and adding its own head and electronics.

Many believe Vertimag has bitten off more than it can chew. It is planning to use a thin-film head, "but ours would be much simpler than the other thin-film heads," assures one source at the company.

Then there are the manufacturing problems associated with the sputtered metal film disk coating process. Although the sputtering equipment required is similar to that used in the semiconductor industry, coating a floppy that can survive in a drive for a reasonable period of time is not easy. "There are all kinds of problems," admits the source. "You can't get the substrate too hot when dealing with flexible disks. And throughput is low, partly because the deposition rate is high." A thicker recording layer is used in PR, compared to the thin metal coating required in more advanced LR processes.

James DeStefano, manager of business strategy, advanced technologies, at Dysan, brought up another major potential problem—impurities. The disk substrate, mylar, comes in rolls. A powder is put on the surface of the material to keep layers from sticking to each other. "That powder is a nightmare in a vacuum and the substrate

### **Vertimag plans to build disk drives as well as develop new types of platters.**

itself has to be kept at very low pressures," says DeStefano.

Even if Vertimag and other PR hopefuls conquer their production problems, that does not mean the system makers will beat a path to their door. Nor does it mean the task of integrating PR into a system will be anything but slow and cautious. "The fact that a new technology comes along does not mean the whole world will switch," observes Geoffrey Bate, senior vice president of research and development at Verbatim Corp. "My view is that in 1990, the very highest performance flexible disk will be a thin-film PR disk. But those disks will represent only a small portion of the total number and dollars of flexible

disks sold."

Although flexible PR disks are expected to hit the commercial market first, rigid PR disk development is not far behind. The two most notable names in the field are startups Lanx Corp., San Jose, Calif., and Allied Information Memories, Milpitas, Calif. Both are focusing on the 5¼-inch and smaller market.

Lanx will introduce a thick, durable film that works with conventional heads and happens to give high recording densities, says Lanx president Robert Potter,

### **Like other pioneers, Lanx has put together its own manufacturing process equipment.**

who spent 12 years with IBM before forming Lanx in 1980.

The Lanx product will also work with thin-film heads. "If you change the ferrite head to a thin-film head, you gain a 20% improvement in linear densities for longitudinal recording. With perpendicular you can do much better," says Potter. "My belief is that thin-film heads and perpendicular recording are a good combination."

Using Lanx media and in a 5¼-inch drive with a conventional head, Potter envisions a system that could operate at 20K to 40K fcpi with a transfer rate of 1.5 to 2 megabytes per second. In comparison, the 3380 has a linear density in the 10K fcpi range with a 3 MBps transfer rate. He noted, however, that "most of the world doesn't want a 3 megabyte transfer rate. They are very happy going with something in the lower range. There is a large market at the 2 megabyte range and below."

Like other pioneers in the PR field, Lanx has put together its own vacuum deposition process to apply metal to the disk substrate.

Potter says he is "comfortable with yields at this point. But our yields at this point are not as high as we think they will be. They are progressing at an acceptable rate." As for throughput, Potter "anticipates" being able to ship half a million disks per year out of Lanx's 15,000-square-foot building.

The company has signed licensing agreements with Control Data and National Micronetics Disc Inc. and is currently shipping sample quantities of its PR metal media. "I would say we will see something on the market in 1984 in terms of an 8-inch or smaller system that operates at 40,000 fcpi or lower with a 1.3 to 3 megabyte rate that may use a ferrite or thin-film head, depending on the manufacturer," says Potter.

Startup Applied Information (AIM) is also focusing its efforts on the smaller diameter rigid disk market, 5¼-inch and under, says Jack Taranto, founder and president. He acknowledges that today there is no market for PR disks. "No one

knows how to use them," he says. To hurry things along, AIM has taken on the ambitious and expensive task of developing media, drive, and a new single-sided probe head for the PR market. Taranto does not expect to hit the market with a PR product line until later next year.

In the meantime, AIM is busy at work on an LR-based product line. "In order to get to the marketplace quickly, we will use the sputtering technique to make a longitudinal disk that can go as high as 30,000bpi," proclaims Taranto.

It seems fairly evident that established disk companies are in no hurry to throw away their investment in LR technology. PR is not going to supplant LR anytime soon, agrees industry trend watcher Jim Porter, President, Disk/Trend Inc., Mountain View, Calif., which publishes an annual market study on the disk industry. The general consensus is that the crossover point from LR to PR will come somewhere in the 50K to 100K fcpi range and will happen in the late 1980s. It will be a slow transition, one that will begin to take place over the next three to four years, with both LR and PR existing side by side.

A shakeout in the disk drive business can also be expected, says Porter. It costs much money to support development

### **Developing a product that works is only half the problem; getting the attention of users is often more difficult.**

efforts for ever-higher densities. Sputtering techniques are not cheap, as those in the semiconductor business have unquestionably shown, nor is the effort to move current LR technologies into the submicron range.

"New companies don't have the economies of scale to compete," agrees DeStefano at Dysan. "As a consequence they resort to some outlandish directions. I expect to see some fallout, especially in the 8-inch rigid disk area."

Those vendors that do survive will be the very big and the cooperative. "The days of a Xerox inventing xerography by itself are over," reckons Memorex's vice president of technology Frank Sordello. "Today's developments are made through massive infusions of capital, equipment, and development effort."

It's an integration problem, adds 3M's Richards. "Today you have to be very aware of the careful interplay required between media, head, and the other components in a disk drive system."

By the same token, only those entrants with enough capital resources will be able to bring full-fledged disk drives to market, say observers. The already crowded arena has little room for under-financed companies.

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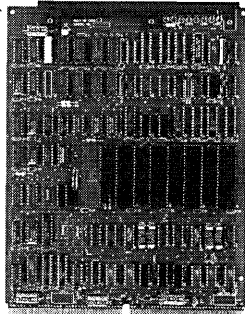
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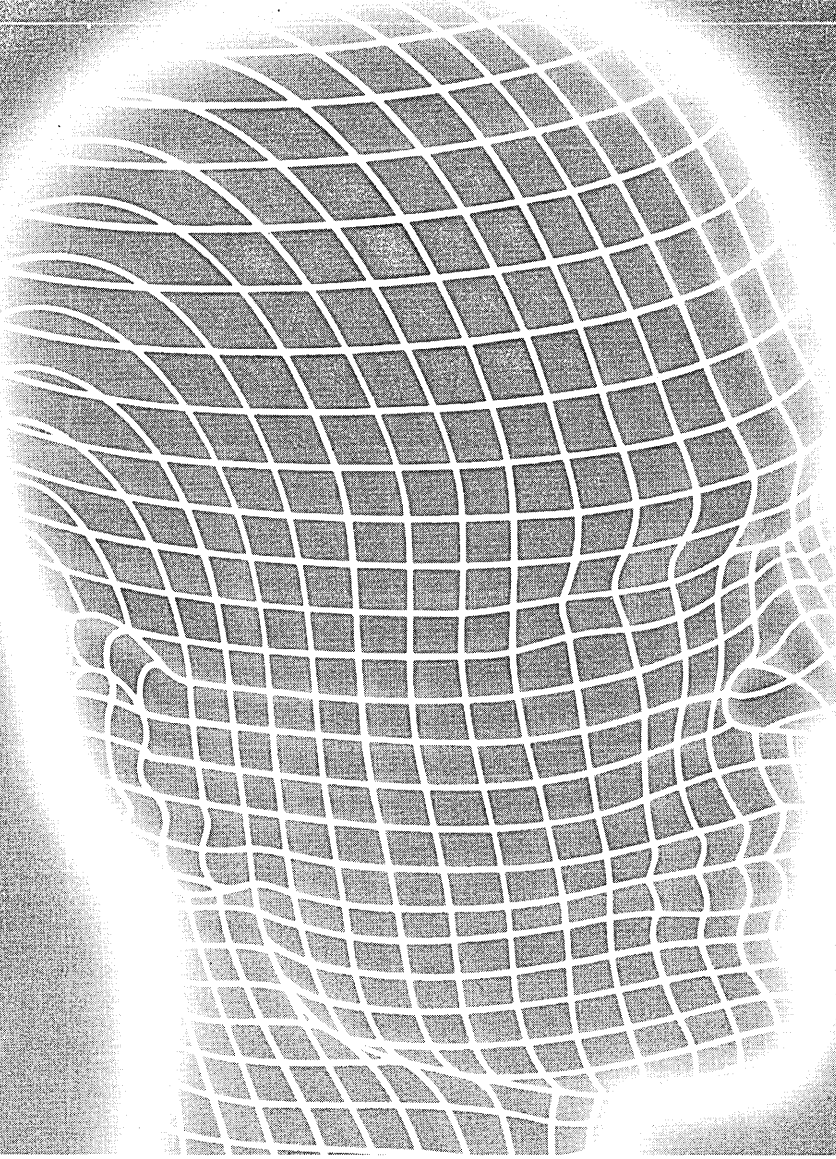
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## NEWS IN PERSPECTIVE

### ARTIFICIAL INTELLIGENCE

# (((LISP) (MARKETS (GROW)))

**A dozen or so startups in the artificial intelligence field are fueling interest in new Lisp tools.**

by John W. Verity

The race for market share in the nascent artificial intelligence (AI) industry is off to a flying start as a small, aggressive group of software and hardware suppliers competes vigorously to lock in systems developers early in their design efforts.

Suppliers of symbolic computing tools are rushing to tie up the promising AI market before IBM, Digital Equipment, Sperry, and the dreaded Japanese enter forcefully. Their ranks are limited so far to less than a dozen suppliers that seek the business of a handful of pure-AI startups and of a much larger, potentially more lucrative group of industrial companies active in symbolic computing.

Symbolics Inc., Xerox Corp., and Lisp Machine Inc. together control the estimated \$50 million market for personal Lisp machines, the wheels of choice for high-speed Lisp. Their products, the Harley-Electra-Glides of personal computing, are powered by bit-sliced von Neumann blocks and customized with massive virtual memories, high-res, bit-mapped screens, and software that makes other PCs bite dust. No helmets are required.

While artificial intelligence research has occasionally spun off marketable ideas to traditional dp—notably timesharing and Xerox Star/Apple Lisa-like graphics—the commercial promise of the field is only now being tapped directly. Several dozen new companies have been formed in the past two years to exploit the wealth of academic, military, and otherwise publicly funded research that has accumulated over two decades. Many of these new firms intend to bring together natural language and so-called expert systems, computers that deal in knowledge and reasoning instead of mere number crunching.

Meanwhile, symbolic computing is being put to work in traditional systems design efforts. Lisp and related object-oriented languages such as Smalltalk and Flavors are especially good for quick prototyping of interactive systems before designs are locked in to more efficient but far less flexible structures.

“Lisp-based workstations will have

tremendous impact on programmer productivity,” says Philip K. Meyer, analyst with F. Eberstadt & Co., a Wall Street brokerage house. “Tenfold gains will be experienced. This, in turn, indicates potentially explosive market growth for this new class of computers.”

The challenge for the hardware makers then is to make the power of symbolic computing available to end users who can't be bothered to learn the intricacies of AI or Lisp, a 25-year-old language whose name is often taken to mean “lots of idiotic, stupid parentheses.” That challenge is being helped somewhat by the arrival of ge-

neric AI software building blocks—inference mechanisms and knowledge representation systems—from the hardware vendors themselves and from an equally ambitious group of software houses.

Symbolics is evidently the leading vendor of Lisp hardware in terms of sales. It shipped its 210th machine last month, according to president Russell Noftsker, who says the Cambridge, Mass., company is shipping at a rate of more than 30 systems a month. “We had our first profitable month in June,” he says. “Business is very good.” So good, in fact, that there is talk of taking the company public in a few months.

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Until that happens, however, the company will be able to use the \$16.5 million it raised in a private placement in early September. That brings Symbolics' total capitalization to more than \$30 million.

Number two in the race is Xerox Corp., which offers a family of three Lisp machines to Symbolics' one. The company's Special Information Systems division is concentrating its marketing efforts on the smallest of those machines, the model 1108 or Dandelion, which is a remicro-coded version of the Xerox Star office workstation. The company was slightly late in shipping the 1108 to customers, due to

difficulty in working within the 4K-word limits of the writable control store.

According to marketing manager Robert "Bo" Bomeisler, however, work is under way on boosting the 1108's price/performance with increased main memory, improved virtual address space, more control store, bigger disk capacity, floating-point hardware, and "faster overall performance." He declined to say when any of those enhancements are to be delivered, but said he hoped to unveil at least one by year-end. No prices were made available, but he said users could expect "economies of scale" to help keep prices down.

Symbolics and Xerox continue to square off with differing and opposing marketing strategies. Symbolics' 3600 processor, introduced last year, sells in the \$90,000 range compared to Dandelion's price of about \$32,000. Each company is out to capture the Lisp worker's desk, but from a different angle.

Xerox pitches the Dandelion as a personal Lisp engine for those with limited budgets. Symbolics' Noftsker praises the Xerox machine as a "good training tool" but claims that its hardware limitations can hinder large-scale AI projects. "Dandelion is good if the size of the job is not too big. Most people, however, are uncertain of how big their job will be until they get well into it," he comments. "Our machine has 20 times the performance of the Xerox 1108."

Xerox counters that argument with two higher-priced, higher-performance Lisp computers, the 1100 and 1132, which can be connected to 1108s through Ethernet. The 1100 sells for about \$50,000 while the 1132 sells in the \$150,000 range and offers ECL, pipelined architecture.

Coming on strong after a rather late start in the hardware race is Lisp Machine Inc. (LMI), which has begun shipments of a Lisp processor for the Nu machine, a Unix-based workstation built by Texas Instruments, which bought it from Western Digi-

### The challenge is to make symbolic computing available to relatively untrained users.

tal. Texas Instruments is apparently hot on the AI market, having bought for an undisclosed sum a 25% equity interest in Lisp Machine, according to Morris "Mache" Creeger, director of marketing at the Culver City, Calif., company.

"Our philosophy is to integrate our Lisp hardware into the Nu machine and take advantage of the economies of scale in that hardware," Creeger says. The TI connection will also help in the area of maintenance, he adds.

LMI's Lambda processor, he notes, offers a 64K by 64-bit virtual control store that resides in 16K of physical space. "That enables functions to be fast since they're written in microcode. The user can conform the machine's architecture to a specific application," he states. Writing microcode is handled in Lisp itself, he says.

A typical Nu machine equipped with the Lisp processor sells for \$72,500 with a 470-megabyte disk and 1 megabyte of main memory, Creeger says. For \$17,000 extra the user can buy Unix and Ethernet capability. While LMI hopes to sell many of the machines as development systems, it hopes also to attract customers looking for so-called delivery vehicles, systems on which a turnkey AI application is put for end-user installation. Xerox, too, is

BY LIEBERT

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## NEWS IN PERSPECTIVE

### THE SELLING OF AI

While in the past most AI work has gone on at universities or in sequestered labs within large corporations, the past few months have seen many AI-related startups get off the ground. Several of these companies have managed to line up venture capital—as much as \$10 million in one case.

Meanwhile, work under way at IBM and other computer manufacturers promises to bring AI technology into the general purpose marketplace as never before.

"This is a technology looking for problems to solve," says Fred Luconi, president and cofounder of Applied Expert Systems Inc. (Apex), Cambridge, Mass. "Artificial intelligence is bringing about new paradigms for intellectual work and computing. The issue with data processing in the past was the efficient use of scarce hardware resources. With AI it's the human issue, making computers work the way humans do."

An area of AI that many of the startups are concentrating on is that of knowledge-based expert systems, systems that are designed to reason and infer from a set of rules how to solve particularly complex tasks. The best known of the few commercially built expert systems is that of Schlumberger, the French oil-well drilling equipment company. It has devised a system to analyze well logging data for patterns that indicate likely deposits of oil, a task that once required highly trained experts.

Luconi's Apex plans to build expert systems for financial services companies, ostensibly to help bank money managers move assets and liabilities profitably. Apex has raised a "significant amount" of capital from institutions, Luconi says, declining to name a figure. He also says he has taken care of the most important part of building an expert system, finding an expert who can be debriefed as to how he does his job. Apex has linked up with an unidentified Wall Street company that will share its money management expertise with Apex knowledge engineers, who will code rules of thumb into their system.

Similarly, Syntelligence Inc., Menlo Park, Calif., plans to build expert systems for financial companies, purchasing and distribution managers, and construction companies preparing complex bids. President Peter Hart, formerly of SRI-International and Schlumberger, says the company has lined up "seven figures" of

venture capital and has found a financial industries partner to help build and market its financial systems.

Inference Corp., of Culver City, Calif., formerly known as Systems Cognition, has an inference mechanism—the software that drives an expert system by making decisions based on knowledge stored as sets of rules—with which it would like to build a decision support system for financial institutions as well. Company president Alex Jacobson notes that banks manage their assets and liabilities on a minute-by-minute basis and need all the help they can get, given the myriad of options open to them. Best of all, any gains made or losses avoided in the process fall directly to the bank's bottom line.

Inference was founded in 1979 and built its original software for Control Data, which used the inference mechanism in a VLSI design system. CDC helped finance the startup but has now been bought out, Jacobson says. Meanwhile, the company markets another AI product, a symbolic mathematics system developed at Cal Tech. He notes that the company has raised \$750,000 in a first round of venture capital and will seek more in the near future.

Dynaquest Consulting Groups Ltd. put together a \$1 million limited R&D partnership to fund the development of a system that would help first-time computer buyers choose a system at local retail computer shops. The expert system work itself is being performed under contract with the Carnegie Group, a Pittsburgh startup formed by several Carnegie-Mellon University professors including Raj Reddy, a noted robotics expert. Dynaquest envisions small businessmen entering their local computer store, answering a series of questions about their computer needs posed by a desktop machine, waiting a few minutes while the answers are transmitted to a remote, mainframe-based expert system, and receiving finally a 30-page document that recommends specific hardware and software packages.

Howard Roberts, cofounder of the venture, hopes to franchise the expert system service and, if all goes well, develop further expert systems that would help retailers service personal computers.

By far the most remarkable AI startup is Thinking Machines Corp., Waltham, Mass., which plans to pursue pure AI research in several areas and jointly develop

products with established computer vendors. The company, funded to "the high seven figures," will extend university-based research into the industrial sphere, taking advantage of the best of both worlds.

"We want to pioneer a new model for industry-university cooperation," says principal Marvin Minsky, an MIT professor and longtime leader in AI research. "There are lots of people who want to do AI research but still the universities cannot make room for them all."

Nor can schools pay for the engineering talent required for some of the projects Minsky and his coworkers envision. "At MIT I just wouldn't be allowed to hire a circuit designer from the outside for twice what the university pays a professor," says Minsky. "But that's the going rate."

So, the company will hire such designers and have them help build, among other things, the Connection Machine, a million-microprocessor parallel system that may lend itself to vision processing and other AI pursuits. Connection has been designed by one of Minsky's grad students, Daniel Hillis, who has joined Thinking Machines as a principal.

President of the startup is Sheryl Handler, former chief and cofounder of PACE-CRUX, an international economic development company, and cofounder of Genetics Institute, a Harvard-based bioengineering firm. She is joined by Marvin Denicoff, AI project leader for many years at the Office of Naval Research; Gerald Sussman, associate professor of computer science at MIT; and Howard L. Resnikoff, former associate vice president for Information Services and Technology at Harvard.

Scientists holding "long-term appointments" include Richard Feynman, Cal Tech's Nobel-winning physicist; David B. Mumford, chairman of the Harvard mathematics department; Jayant Shah, professor of math at Northeastern University; and Jerome Wiesner, president emeritus of MIT.

In addition, Thinking Machines has enlisted C. Gordon Bell, former engineering chief of Digital Equipment Corp., as special advisor on construction of the Connection Machine prototype, a 65K processor version.

The company's investors include CBS founder William S. Paley and Benno Schmidt, chairman of Sloan-Kettering Institute.

—J.W.V.

seeking that virtually untapped market.

Symbolics is concentrating its marketing efforts on high-powered development systems. "Our initial strategy is to introduce successively lower-priced products but never lower performance," Noftsker says. He says a custom VLSI version of the 3600 is expected to be ready for marketing by 1985. "We believe the basic

manufacturing costs will enable us to compete in any markets. We'll be in a position to pick our price."

Soon to enter the Lisp market are Sperry Corp., Apollo Computer, Data General, Hewlett-Packard and Digital Equipment, according to industry sources. Sperry is to bring out a timeshared version of Lisp for its 1100 mainframes that is understood

to offer features similar to Xerox's Interlisp-D. Apollo is working on Lisp for its 68010-based workstations; "We think a general purpose machine is the best choice for production work," a company source explains. Data General is expected to enter the race with a Lisp dialect on its MV series of 32-bit computers, while HP is to put Lisp on its 9800 series of 32-bit workstations.

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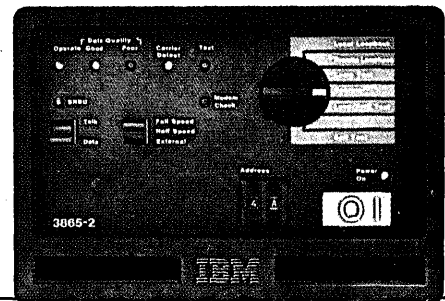
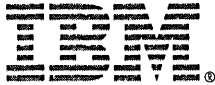
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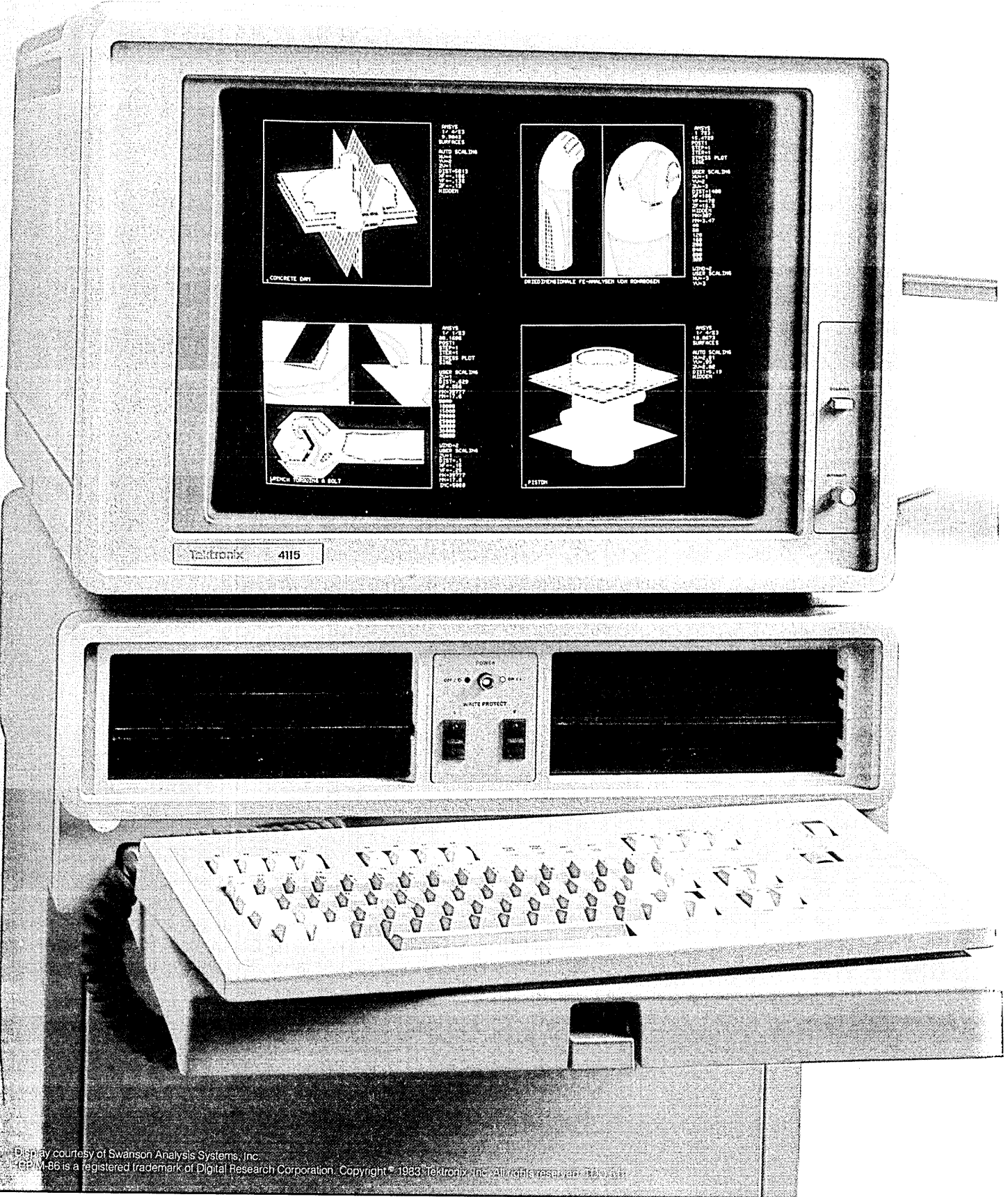
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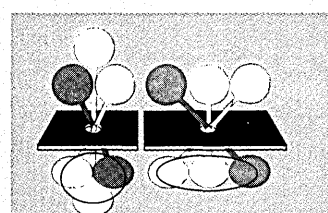
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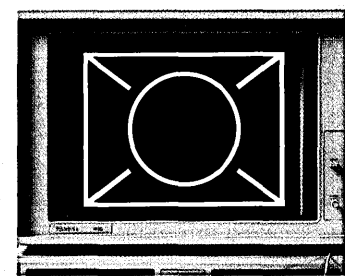
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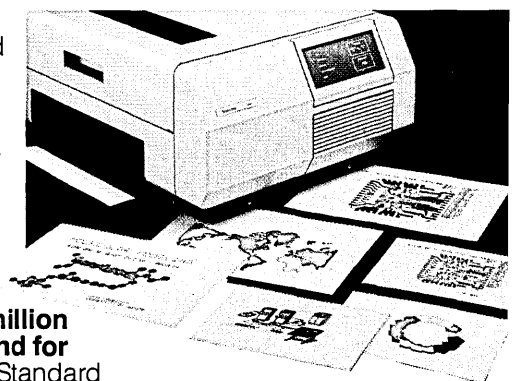
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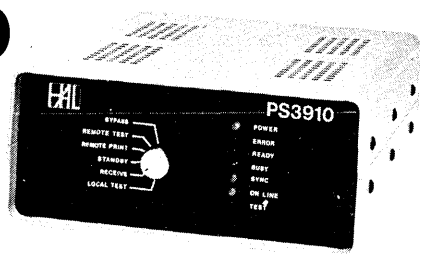
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## NEWS IN PERSPECTIVE

Digital Equipment, whose dead-ended DEC-10 and 20 computers served for many years as the workhorses of AI, is expected to enter the Lisp development market early next year with its VAX. DEC is said to have one of the most concerted AI efforts of any traditional computer maker. The company has production AI systems at work within its marketing operations and is now quietly setting up a second AI lab in Palo Alto, Calif., where Stanford University is located.

"I'll be glad to have DEC in the market," says Symbolics' Noftsker. "It will give us credibility. They will expose more people to Lisp."

He claims that because DEC is not likely to microcode the VAX to handle Lisp function calls the way Lisp computer makers build their hardware, general purpose VAX computers will remain uncompetitive with the 3600 in terms of price/performance.

He cites a benchmark showing a VAX-11/780 running Commonlisp as performing at one twenty-fifth the speed of a Symbolics 3600 with Zetalisp. "Commonlisp on VAX may be a step forward in function but it is a step backwards in performance," Noftsker says.

Commonlisp is an attempt by various parties to define a best-of-Lisp dialect that will take advantage of many functions

## Symbolics, Xerox, and Lisp Machine Inc. control an estimated \$75 million market for personal Lisp hardware.

developed in recent years. Lisp has a long history, having originated at about the same time as FORTRAN, but has blossomed into several incompatible dialects—Interlisp-D, MacLisp, etc.—that are now offered by different vendors. Symbolics' Zetalisp and LMI Lisp, for instance, derive from MacLisp, which evolved at MIT's AI labs.

If and when general purpose computer makers enter the Lisp race, many are expected to offer relatively primitive versions of the language—Gould SEL, for instance, is expected shortly to offer Franzlisp on its 32-bit minis. But many of these versions will not offer the thousands of "functions" that have been designed into the robust Interlisp and MacLisp systems. Those functions, say industry observers, provide not just a language compiler, but a highly productive programming environment that lends itself to much more than pure AI work.

Indeed, Symbolics, Xerox, and LMI are actively seeking non-AI end users who are engaged in so-called exploratory programming, the method of quickly prototyping complex, interactive computer systems before their design is locked into the confines of structured programming (DATAMATION, February). Texas Instruments, for

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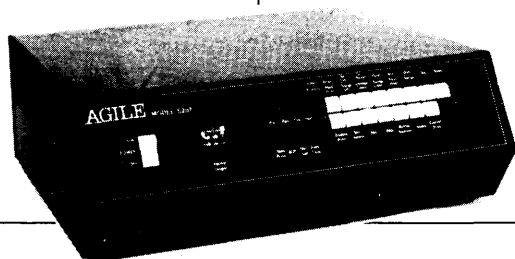
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D10/83

## NEWS IN PERSPECTIVE

instance, is understood to have prototyped a personal computer in Lisp long before actually writing code for its microprocessor.

"Just less than half of our sales are for non-AI programming," says Noftsker. "People are finding the [3600] system a powerful programming tool. Customers buy one and are almost forced to buy more once they see how powerful it is. We are getting many repeat orders from industrial customers; some are in their third order cycle. Each time the volume gets higher."

Xerox, too, is pushing its Lisp machines as "power tools for programmers," as is LMI with its Lambda. Officials say the systems can even be used for maintaining old programs not even written in Lisp.

The new AI software packages beginning to appear are expected to make building AI systems easier, especially for large corporations that need to get to market quickly. Xerox offers Loops, a programming package that so far is only experimental. The company said Loops would be offered at no charge with its Interlisp-D operating system but no support would be included.

Intelligenetics, a Palo Alto, Calif., company that was formed in 1980 to build expert systems for gene splicers, has entered the tool market with KEE, the knowledge engineering environment. Priced at \$30,000 a copy and designed to run on Xerox machines, KEE provides what is known as a frame-based representation system that can form the basis of expert systems, according to Anthony Slocum, president.

Finally, Teknowledge, a Palo Alto, Calif., expert systems builder, plans early next year to introduce KS 300, a knowledge engineering package that will sell in the \$100,000 range, according to Jerrold Kaplan, vice president of business development. The package will be sold with support, he notes.

The hope is that these packages will enable relatively untrained software engineers to build knowledge-based systems without having to become experts themselves in the workings of Lisp.

"If the benefits of expert systems are to become widespread, many programmers and technical professionals are going to need tools that make AI technology available to them. Developers can concentrate on building the knowledge-based system rather than develop tools," notes Thomas Kehler, vice president for technology at Intelligenetics.

It appears that such tools should be in demand, fueling hardware sales, if for no other reason than that there is a severe shortage of "knowledge engineers."

Says Jaime Carbonell, principal of AI startup The Carnegie Group, Pittsburgh, "The demand for knowledge engineers outstrips supply by 10 or 100 to one and will probably continue to do so for the next 10 to 15 years."

## MICROCOMPUTERS

# HP TO MERGE PC LINES

**The mini maker is seeking a more coordinated effort in the PC market through new software and hardware tactics.**

by Edward K. Yasaki

Hewlett-Packard, which recently formed a Personal Computer Group to more fully coordinate its disparate activities in that fast-paced market, is determined to consolidate its product line and make its machines more compatible with each other, according to officials.

Key to that strategy is the new HP 150, a small-footprint, 16-bit machine that will be aimed at the heart of IBM's P.C. line. HP intends to provide software—operating systems, programming languages, and applications packages—that will help users move up and down its PC product line with ease.

The model 150 was introduced late last month with some 30 applications ready from third-party vendors, helping HP in its battle to gain market share in a market it helped forge several years ago.

The new model also continues the company's move to an open architecture; instead of using an operating system proprietary to HP, as the company in the past was wont to do, the 16-bit 150 runs MS/DOS 2.0, closest thing to an industry standard. The company is encouraging third-party software vendors to develop applications to run on the 150. The chassis has option slots accessible to both users and system integrators.

The initial language of choice on the 150 is Microsoft BASIC, but within three

months HP is slated to offer all languages available from Microsoft, the Bellevue, Wash., developers of MS/DOS. "We are also trying to standardize on something called HP Pascal," says product manager Paul T. Antony, "which is a Pascal that we are developing to put on our HP 3000, as well as on our HP 1000." Plans are also to offer Pascal, or a subset of it, on the 150 personal computer, thus promoting program portability from the 150 up to the large 3000s.

It is to that HP 3000 installed base, and large companies in general, that HP has succeeded in selling its personal computers. But the vendor, like all minicomputer makers, has been having difficulties with retail sales.

"We have not been too happy with our performance in the retail portion of the market," says Paul C. Ely Jr., executive vp and general manager of computer groups at HP. "We have done much better in the large company environment, partly because our machines were intended specifically for that environment."

**"We have not been too happy with our performance in the retail portion of the market," says Paul C. Ely, executive vice president.**

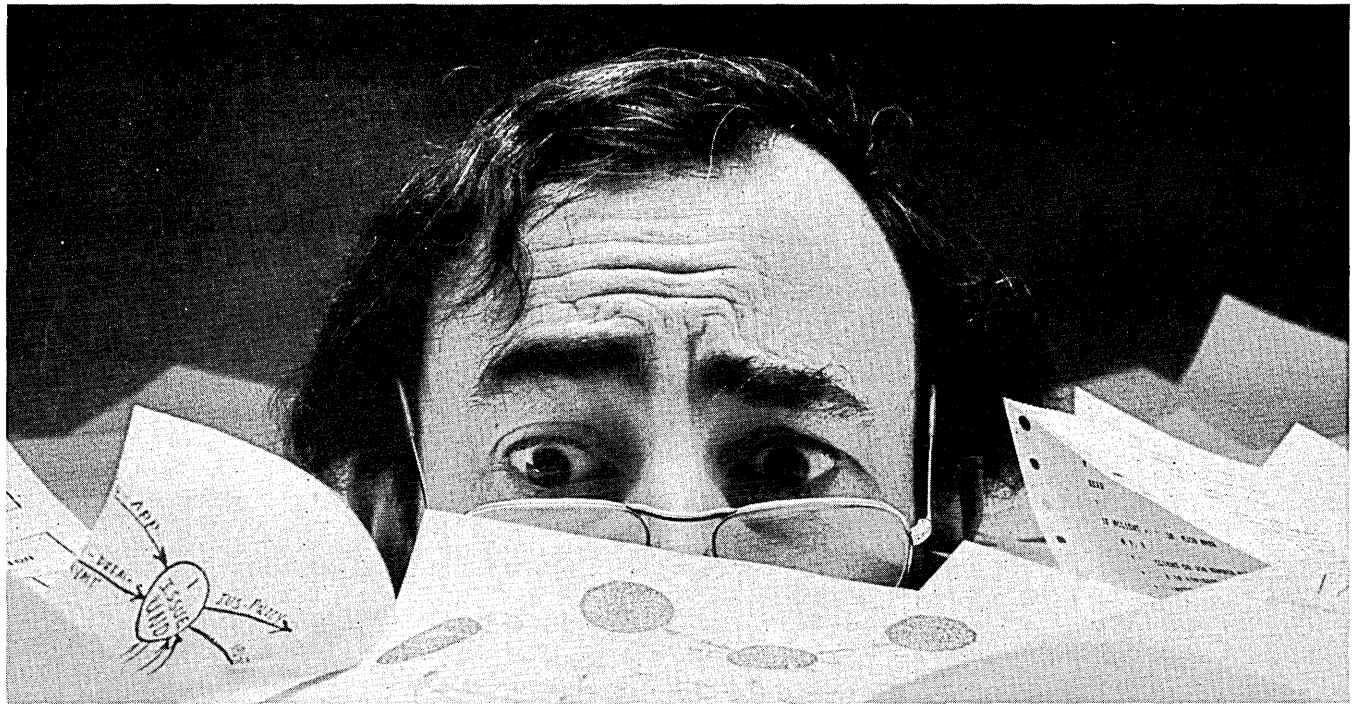
The personal computers in HP's product line originated at several of its divisions. The facility making programmable scientific/engineering calculators in Colorado produces HP's so-called personal technical computers, while personal office computers have emanated from the terminals and handheld computer divisions. As a result, Ely acknowledges, the products don't offer differences in price/performance as much as differences in their point of manufacture.

Those PCs are being handled nationally in only 300 dealerships, which explains not only the lack of sales through that channel but also the lack of public visibility. Within market niches, however, Ely feels HP has done well. Of his technical desktops,



NEW MODEL: Hewlett-Packard's new model 150 personal computer is designed with a small desktop footprint to save space. It uses Sony-designed microfloppy disks.





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## NEWS IN PERSPECTIVE

he says, "I'm sure we have the leadership position," and of sales to large accounts, "We do much better than we do through the dealers." Even sales to oems have been healthy: "We are probably almost as strong in the oem portion of the personal computer market as we are in the technical part." But in today's market it's vital to also be represented widely in dealer showrooms, and that has not been the case with HP. Comments Ely, "I think it's partly because we don't feel our products are quite what they need to be."

Not counting its line of handheld calculators and computers, the company

has three models in its Series 80 PC line, three in the Series 100 office computers, the Series 200 model 16 technical computer based on the Motorola 68000 processor chip, and the HP 9000 that uses a proprietary 32-bit processor chip set. It's a product line that just sort of grew, consisting of more models than necessary. It will have to be whittled down.

"What we're shooting for," explains Ely, "is a line of compatible machines that cover the spectrum of price and performance and the spectrum of desktop to transportable to portable to notebook-size." The new model 150, first PC to be

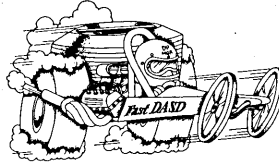
announced since the consolidation of activities under the new Personal Computer Group last January, could become the base for a more compatible line of products. "We'll probably need fewer total products by far than we have today."

There's no question, though, about HP's commitment to this end of the market. When the new PC group was formed, the statement was made that PCs represented more than \$500 million a year in sales for the company. It is growing at the rate of 60% to 80% a year, says Ely.

He recalls the early 1970s when people saw machines like the HP 3000 as entry-level computers for smaller companies. By 1980 that portion of the market was but a fraction of the total.

"Most of them were being bought in quantity by larger companies," he explains. "I think that's also going to be true of personal computers." PCs, he continues, are not just "a market of opportunity," but rather will become a very central part of the business. "The companies that are not participants are going to have to be satisfied

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## The company claims its PC business is growing 60% to 80% a year.

with a smaller and smaller share of the total market." The PC market, however, changes quickly.

Ely explains that the 200 Series is rapidly moving to Unix, an industry standard, and the new 150 runs MS/DOS, also a 16-bit standard. There's a way to bring those two operating systems together. Microsoft, he adds, has products that will work on HP's 120, 150, and the 200 model 16. "We think their technical approach to that is a good one," he says. "We've adopted some of their ideas ourselves."

From one standpoint, the 200-16 can be viewed as the low end of the HP9000 engineering workstation line, and at the upper end of that line Unix is a critical need. Similarly, the new 150 is the top of HP's office PC line. Viewing the two models, Ely says, "We think we can gradually make those two operating systems much more compatible than they are today. And so does Microsoft." Although the 200-16 is a technical PC and the 150 is an office machine, this compatibility is an important issue, he adds.

"We're committed to having what we call computer aided work—spreadsheets, word processing, communication, graphics, and filing—all looking exactly the same in those two products, from the user point of view. That will happen very quickly. About the time the 150 comes out, we'll introduce some common application packages that will run on the two products." Both will soon also have the same keyboard; indeed, the company has settled on the 150's keyboard as the new standard for all HP desktops.

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## NEWS IN PERSPECTIVE

### BENCHMARKS

#### QUOTE OF THE MONTH:

"Those who live by the cutting edge of technology are doomed to die on it," said Dave Lorenzen, former director of customer services at Osborne Computer Corp., Hayward, Calif. Lorenzen and some 300 production workers were let go as the personal computer maker hunkered down under fierce competition in the PC market. Osborne was formed 2½ years ago and at one time shipped 10,000 of its bundled computer systems a month. Founder and chairman Adam Osborne last summer disclosed he was looking for a merger partner after closing the firm's Monmouth, N.J., production facility. The latest layoff left only a skeletal staff of 100 or so. Competition in the so-called transportable computer market has heated up lately as Kaypro, Compaq, and others brought out machines more advanced than Osborne's.

#### MORE DELAYS:

That's what plug-compatible cpu maker Amdahl Corp. disclosed for its top-of-the-line 5880 multi-processor and 5870 attached processors. The former, designed to compete directly against IBM's Extended Architecture (XA) 308X line, was postponed until the second quarter of 1984. The 5870 was rescheduled for first customer shipment to the first quarter of next year, instead of the third quarter of this year. In disclosing the delays, Amdahl said it is taking a "cautious" approach to shipping XA-compatible machines, giving them more testing than had been originally expected. The Sunnyvale, Calif., company said, however, that it still planned to ship XA to customers in the second quarter of next year, as originally scheduled. IBM has been shipping XA—whose primary enhancement is 31-bit addressing—since last March. The Amdahl delays were the second for its high-end machines since last summer. Earlier delays were attributed to a need to conserve scarce engineering resources. The 5880 and 5870 represent Amdahl's first efforts to build multiprocessors.

#### NEW CEO:

Glen Haney, a longtime Sperry Univac executive, left the mainframe maker to take over the helm of microcomputer software maker MicroPro International Corp., San Rafael. Haney was most recently vice president of strategic planning and development at Sperry's Computer Systems operations. At MicroPro he has gained the posts of president and chief executive, taking over from company founder Seymour Rubinstein, who has been named chairman. The former chairman, venture capitalist Frederick R. Adler, has become chairman of the MicroPro board's executive committee. He is joined there by Haney and Rubinstein. Haney joined Sperry in 1956 and moved through its computer ranks to become vice president of

worldwide marketing in 1975. Haney has also left his post as chairman of the Computer and Business Equipment Manufacturers Association (CBEMA).

#### BACKS UNIX:

Stating that it intends to support AT&T's Unix operating system across its 32-bit minicomputer product line, Perkin-Elmer's Data Systems group has acquired the Wollongong Group's Edition VIII Workbench Unix system for an undisclosed price. Perkin-Elmer also cut prices on the Unix version that it has been offering for two years. Instead of \$30,000 a copy, users will have to pay only \$2,500 for the Australian-developed operating system. Reportedly, the company will soon offer the Berkley and AT&T System V versions of Unix as well. Meanwhile, the Oceanport, N.J., computer manufacturer has brought a new release of its own OS/32 operating system that offers a virtual task manager. User tasks consisting of up to 16 megabytes of code and data can execute in a user task memory of only 128K bytes, according to a company spokesman.

#### PROTECTED:

A federal appeals court in Philadelphia decided that computer operating systems are protected under copyright laws because even if they're etched on the surface of a ROM they are distinguishable from the computer's hardware. The ruling came in an appeal by Apple Computer, which is seeking an injunction against Franklin Computer Corp.'s sale of an Apple II-compatible computer, the Ace 1000. Franklin, a Cherry Hill, N.J., company that claims to have sold some \$45 million worth of microcomputers, said the ruling would have a "negligible" effect on its business. In effect, the appeals court has directed a lower district court to hold further hearings on Apple's request for an injunction. The district court had denied Apple's motion in early August, claiming that the rules governing the copyrighting of software were not clear. Apple filed its suit in May 1982, charging Franklin with infringing on 14 systems software patents. Apple found support from Digital Research, Adapso, and Microsoft, which filed amicus briefs. ProLog, which makes ROM programming equipment, filed a brief supporting Franklin's position, which was that while it had copied Apple's ROMs, the software they contained was not protected by copyright laws. Perhaps in anticipation of being forced out of the Apple-compatible market, Franklin recently introduced a CPM-based small business computer. Observers noted that the appeals court ruling refers only to object code, which is generally not readable by humans, and does not change the law regarding source code protection. Nevertheless, the ruling was cheered by Apple's friend in court and is seen as having great potential for the protection of microcomputer object code distributed en masse.

#### \$75 MILLION:

That's how much equipment Raytheon Data Systems has contracted to buy from Convergent Technologies over the next three years. Raytheon is phasing out its own word processing and distributed processing lines in favor of Convergent's Megaframe multimicroprocessor computer and an undisclosed workstation. Included in the oem agreement are stock purchase warrants that give Raytheon, based in Norwood, Mass., the option to purchase up to 1 million shares in Convergent for \$27 a share. Convergent has signed similar deals with mainframers NCR and Burroughs, which sell Convergent's first product, a 16-bit workstation, for office automation and small business computing. Other buyers of the Megaframe, which uses Motorola 68000 and Intel 80186 chips, include Gould SEL and Automatic Data Processing. The workstation to be purchased by Raytheon and Automatic Data has been designed under the name N-Gen (Look Ahead, July).

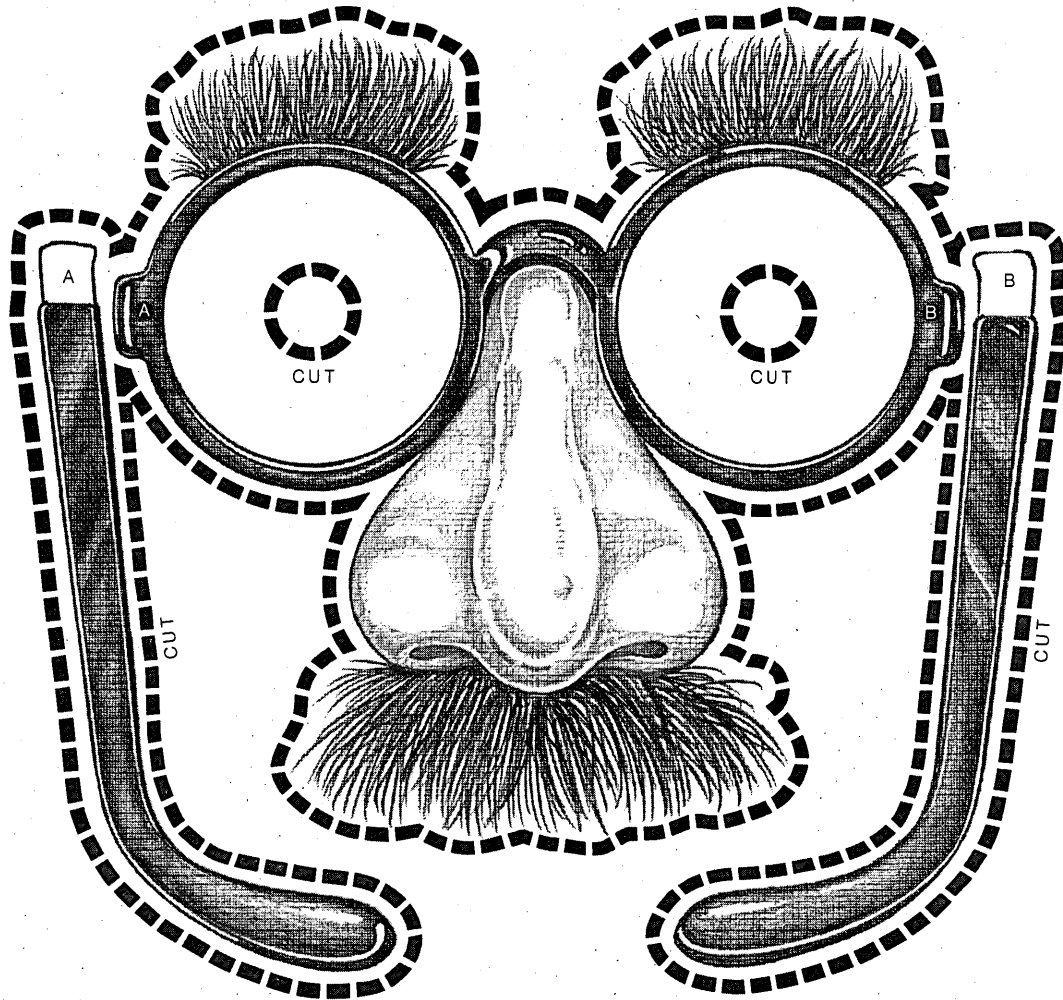
#### JOINT VENTURE:

Britain's International Computers Ltd., France's Compagnie des Machines Bull, and West Germany's Siemens agreed to form a joint project in artificial intelligence research. The plan is to set up a jointly funded institute in Bavaria to begin operating in January. Employing some 50 researchers, the institute would work in such areas as knowledge engineering. No products are to be developed at the center and each member is to continue its own proprietary research. The effort is to complement the Esprit project formed by the European Economic Commission. Observers see the Bavarian institute as the first such joint project among European computer makers in more than 10 years. The Unidata project, comprised of Siemens, Philips N.V., and CII-HB, failed in 1975 because the three couldn't agree on direction.

#### MAN VS. MACHINE:

Angered by a Largo, Fla., automatic teller machine that kept his bank card and refused to do business with him, Jackson Morton, 34, blew three holes in it with a .32 pistol. The Vietnam veteran, who is confined to a wheelchair, said it was the second time in several months that his card had been taken from him by a teller machine, reported the Associated Press. Meanwhile, in Detroit, a jury awarded \$10 million to the family of a man who was killed in 1979 by a robotic materials handling system at a Ford Motor Co. plant in Flat Rock, Mich. Robert Williams died at age 25 in the midst of a five-story machine, built by a Litton Industries division, that stored and retrieved metal castings, according to AP. Finally, a computer failure aboard the Navy frigate George Philip was blamed for firing a three-inch shell said to have landed near a passing Mexican freighter. The incident took place off the northern California coast, said AP.

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1. *Datapro*: "User Ratings of Proprietary Software-COMLETE" November 1982. 2. *Computerworld*: December 20, 1982.

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even more  
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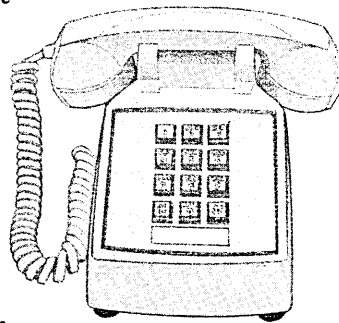
We start by making one individual responsible for your system's performance. He's highly trained

and knows you and your operation first hand. And he's the focal point of a person-to-person approach that makes communication more effective and the entire program more responsive.

The Honeywell service program includes varied resources to assist your representative in meeting every eventuality. Like our National Response Center, operating 24 hours a day, seven days a week. Your one call here is all it takes to trigger action.

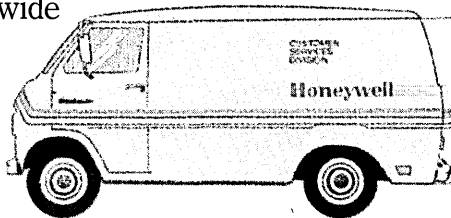
All of the historic data on your system is at their fingertips, all resources at their disposal.

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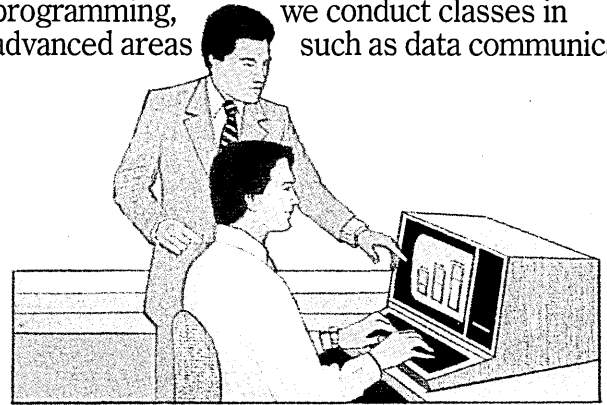


experts, each TAC is equipped with system documentation libraries and advanced capabilities to quickly diagnose your problem remotely.

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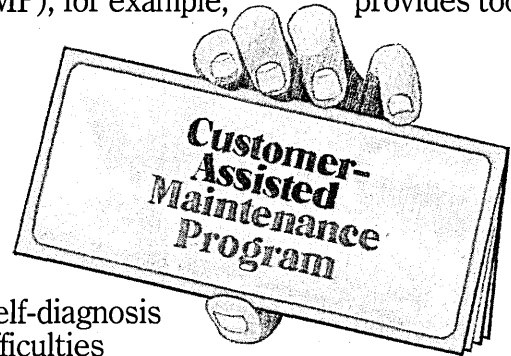


Still another element of our customer service is training. In addition to such basics as programming, we conduct classes in advanced areas such as data communica-



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# Honeywell

CIRCLE 56 ON READER CARD



PHOTOGRAPHS BY STEVE COOPER



**Installing new equipment? You'll need to rethink some of the basics—from cooling to power to fire prevention to employee lounges.**

## **UPGRADING A DP CENTER**

**by James L. Haack**

At the very least, upgrading a computer facility means making some adjustments in the existing computer room to accommodate new equipment; at the most, it means building a new facility from the ground up. Regardless of the degree of change, several basic design considerations apply to every computer facility, old or new, large or small. It's important to keep these guidelines in mind as you plan to upgrade your computer center, so it can serve your organization efficiently and economically far into the future.

Ideally, you should be selecting your new equipment and planning and designing your upgrading facility *concurrently*. The two functions are completely interdependent. The type of equipment you select directly influences a number of design considerations: room layout and environment, mechanical and electrical support systems, human elements, and especially, space for today and for the future. In turn, the design of the room will directly affect the reliability and efficiency of the computer equipment you put into it.

It's true computers are getting smaller and using less power to do more work. But in spite of this, computer rooms seem to be expanding, simply because everyone is constantly finding more uses for computers. Where you once had only 12 people on a system, for example, you could now have 50 or 60 terminals spread



## Deciding how much storage space you really need means taking a number of variables into consideration.

throughout an office—or around the world. Changes like this occur frequently, and computer systems themselves seldom have a life span of more than seven or eight years. It is a fact of life that for the foreseeable future, computer centers will be changing equipment on a regular basis; this mandates a flexible floor plan with ample room for expansion and reconfiguration.

Besides the actual computer floor space, a number of other factors must be considered in planning for efficient, cost-effective use of floor space:

- Comfortable offices and work stations for data preparation and programming;
- Temperature-control and secure-storage areas;
- Maintenance and support-function areas where spare parts and testing equipment are kept;
- Electrical and mechanical systems, located in discrete areas and acoustically isolated;
- Lounges and conference/training rooms;
- Delivery docks and warehouse areas, conveniently located and secure.

All of these areas must be near the dp center, with good traffic flow between them and the computer room.

Some computer facilities are simply stuck into an existing room with little regard for people, creating unpleasant and inefficient working conditions; over the long run this can be quite detrimental to system efficiency.

Good design can help. Movable wall panels, for example, give a sense of privacy without isolating a worker completely. Within each paneled workstation, tabletops, chairs, and the terminals themselves should be adjustable for ease of use and vision. Each station will also require shelves for manuals and storage for personal belongings.

Carpets can help absorb noise; if the area is still noisy, background music or "white noise" units may be in order, with frequency and volume controlled by individual areas. Because a recent study by the National Institute for Occupational Safety and Health recommends 15-minute rest periods every one or two hours for constant users, you'll want to consider conveniently located, comfortable lounge areas. If possible, lounges should provide a nice outside view (although outside views are not recommended for the computer room itself, due to security and temperature factors).

Lighting is critical to worker efficiency and morale, too. Light must not be so bright that it causes disturbing contrasts and reflections on the screens. Nor should it be too low, which makes reading paper copy difficult. But switching between the two is difficult, distracting, and time-consuming for workers. Both task lighting and general illu-

mination should be considered as options. The best compromise is often low-level, indirect lighting, with wide enough distribution to avoid "hot spots."

### PROVIDE AMPLE STORAGE

Just where do you put all those disk packs, microfilm or microfiche cassettes, tape reels, cartridges, printouts, and manuals? Providing an optimum amount of good storage space in optimum locations can be difficult. You have to plan for storage near the computer room, and, like the computer itself, the storage area must be temperature and humidity controlled.

A 10,000-square-foot computer center serving a large public service utility's regional dp facility in Missouri requires an entire warehouse to store computer paper. The warehouse was climatized to keep too-dry or too-wet paper from clogging sensitive equipment. In addition, a staging area was included just inside the computer room, where the paper can be further climatized before it ever reaches the machines.

Consider, too, that disk storage racks approach what is called "library load"; that is, they can weigh in at 150 to 250 pounds per square foot, as opposed to the 70 pounds per square foot most office floors support. Your facility may need extra underfloor reinforcement. Deciding how much storage space you really need means taking a number of variables into consideration, and, though there are rules of thumb to go by, it is best arrived at on an individual-case basis.

Raised-access or plenum flooring is essential to any computer room. This is typically installed 18 inches above a concrete slab floor. Power lines, air source, and fire suppression systems are located in the plenum to be out of everyone's way and still be easily accessible for maintenance or moving. Ramp access to the computer center above the plenum area—for bringing in supplies on carts or for bringing in new equipment—is important.

In an older structure being rehabilitated, it's advisable to install structural channels beneath the access floor in order to distribute computer equipment loads more efficiently and offer maximum flexibility. Under very heavy mainframes, it's a good idea to install special joists for extra support.

In new buildings, however, rather than raise the floor, it's possible to "push" it down, so there are no inconvenient changes in floor heights; the access area is still beneath floor level, but you avoid the need for ramps or steps.

A thoughtful architect has noted the clear connection between effective design and more efficient electrical and mechanical

support systems: "It has become a truism that the less of any commodity that is pumped into a building—be it ventilation, cooling, heat, electricity, or especially money—the greater the need for careful and informed design if the building is to live up to its promise." This observation is especially applicable to computer centers, where reliable, finely tuned support systems (which can be expensive) are absolutely essential.

Assessing your electrical load size and bringing in enough lines to handle it are only part of good electrical system design. You must also consider ease of installation, equipment reliability, and configuration flexibility—plus costs. Costs here means two things: first, many computer manufacturers will not honor warranties if equipment malfunction is traced to power line irregularities. Second, and most important, in the event of a power failure, your system could lose its entire databank, or the equipment itself could be damaged—and your company could be out of business for an undetermined time.

In planning for your computer center's electrical system, there are two critical questions. Just how expensive would it be to lose this operation? And, what conditions will exist during a power failure?

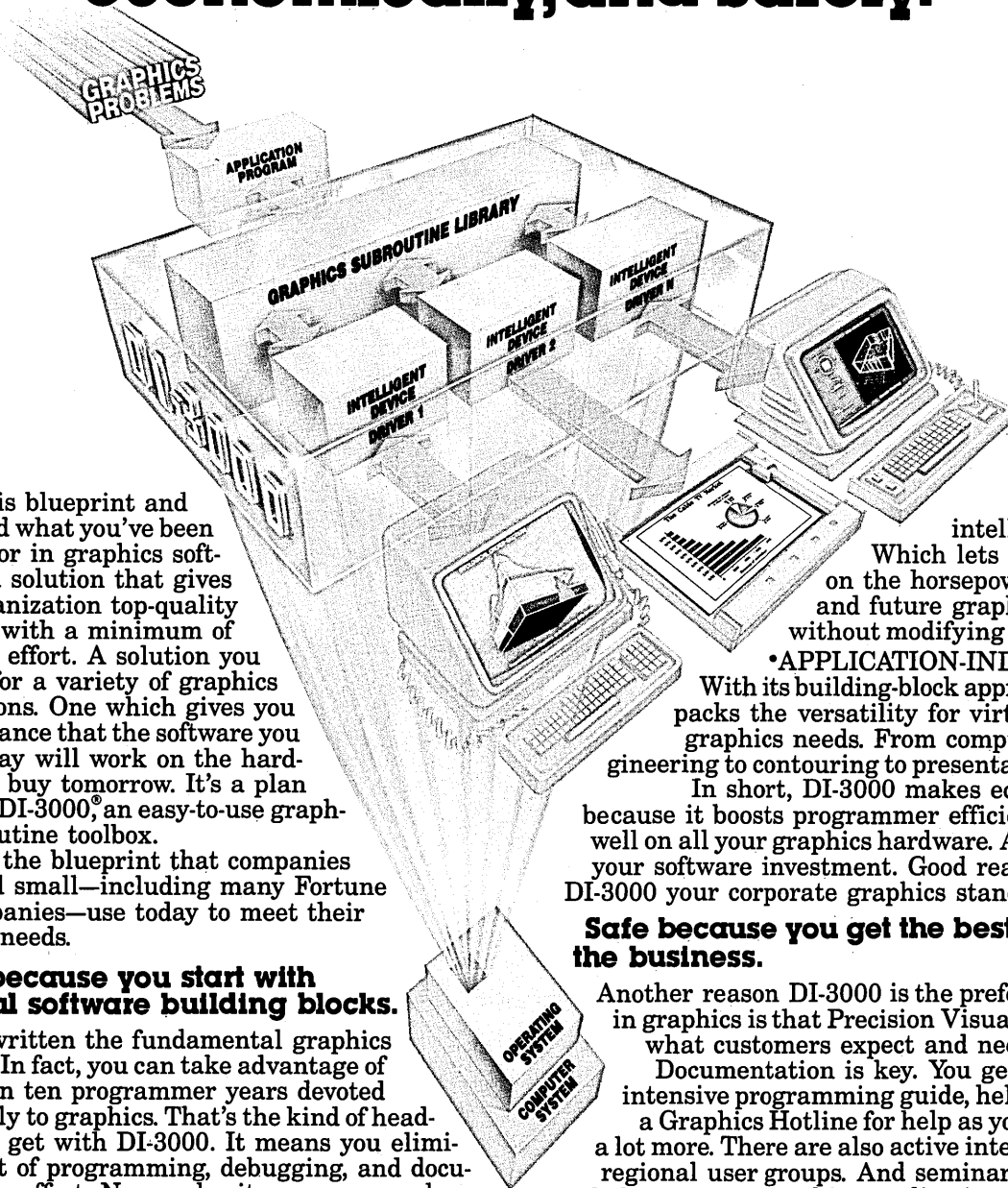
Your most basic protection is redundant electrical power lines. Your local utility company should bring in at least two dedicated lines to the computer room, independent of the rest of the building's power lines and of each other. The lines should come from two different substations.

### PROTECT POWER WITH UPS

The greatest degree of power protection you can buy, of course, is an uninterruptible power system. Here are some things to remember regarding UPS system design. The systems are very noisy; if possible they should be stored in a basement, away from office activities. If they're based on wet-cell batteries, it is necessary to provide for ventilation, since noxious gases can occur. Battery room temperature should be kept to 80°F ambient for maximum performance. UPS systems are also extremely heavy; structural support is recommended if the UPS is not located in a basement. Space is needed for the UPS control system, synchronizers, voltage monitors and switch gear. The UPS circuitry cabinet and battery pack should be close by (not necessarily in the same room) to save on wiring and installation costs. The UPS room should allow space for goggles and fire extinguishers and should contain "No Smoking" signs.

A UPS system is a good investment if your organization rises or falls on the strength of its computer center. A UPS can pay for itself many times over in the event of more

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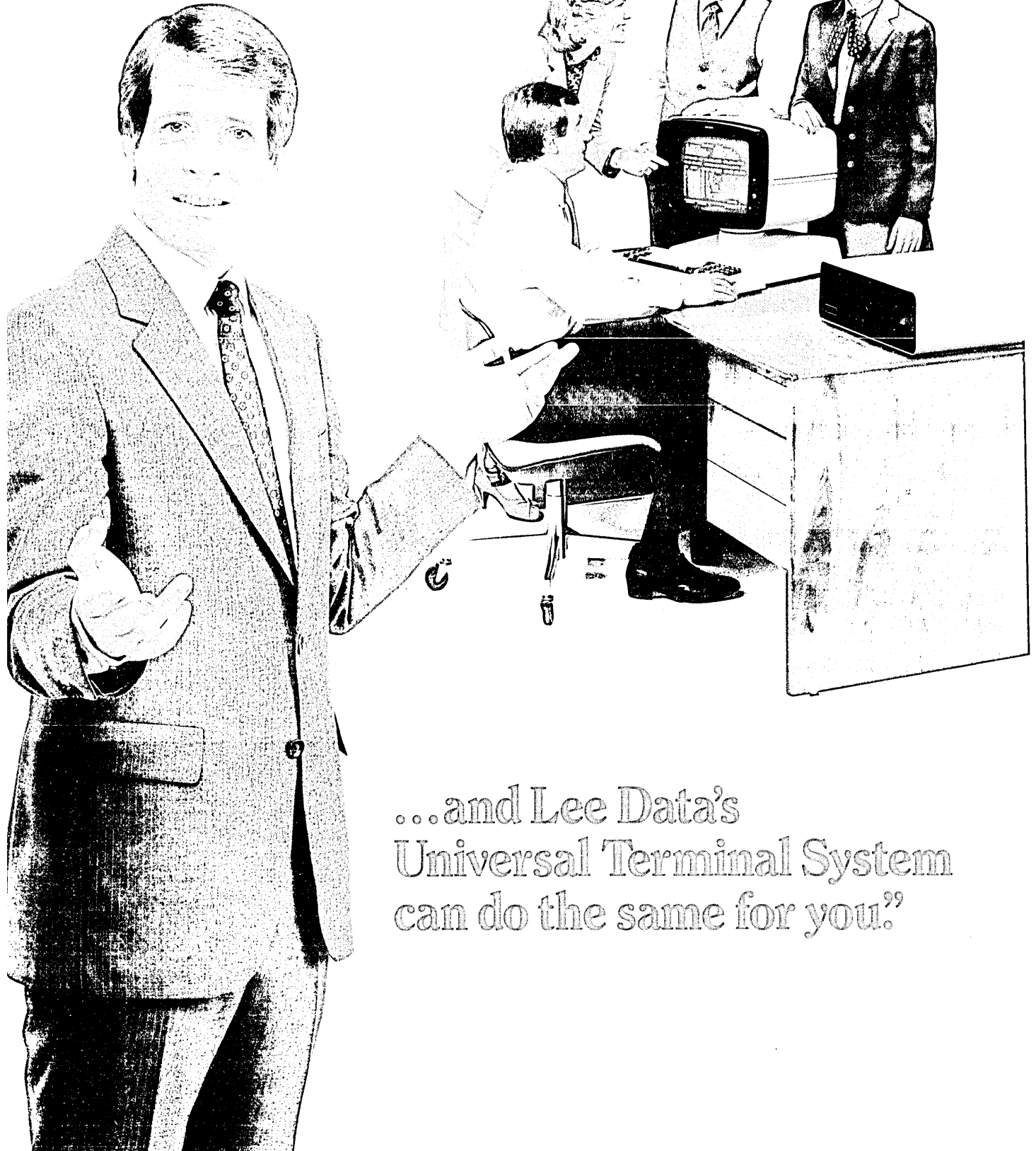


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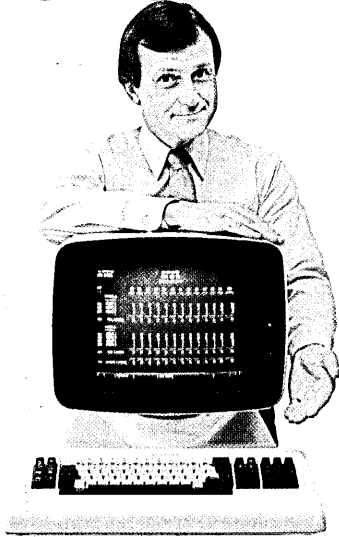
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## Preventive design plays a prominent role in your computer room's environmental controls.

brownouts and blackouts. (For more on power, see story on p. 121)

Preventive design also plays a prominent role in your computer room's environmental controls: heating, ventilation, and air conditioning (HVAC). The cost of an installed HVAC system in a computer facility often comes to 10% or more of the total construction costs.

The rule of thumb is that computer rooms should be kept at a constant temperature of 72°F, with 50% relative humidity. But, like any mechanical system, air conditioning equipment can fail. So, the air conditioning system, like the electrical system, should be redundant, and completely separate from the central building air system. Yes, the redundancy is expensive. Some organizations have tried to cut expenses by installing undersized air conditioning systems, supplemented with air from the central building system. The difficulty is that this leads to filtration and humidity problems and frequently ends up costing more than it would have cost to install the right equipment in the first place.

Designing a computer center air conditioning system for maximum performance means considering your computer equipment's parameters for temperature and humidity. The cooling load of the computer room determines the needed capacity of the air conditioning equipment. This is based on hardware watts (btu/hour), lights, people, outside air, and so forth. The rule here: the minimum capacity of your cooling equipment should allow for 30% growth in your computer hardware.

Airflow should be kept as high as possible without producing noise or drafts. Fresh air should be kept to a maximum of 15 cubic feet per minute (cfm) per person; this is more than adequate and minimizes any additional loading on the system. A slight pressurization of the computer room is desirable to remove any dust at leakage points; too much outside air makes this difficult.

Process cooling systems solve these and related air conditioning problems in computer rooms. These systems are designed especially to meet the needs of computer hardware. They also control humidity, wide temperature swings, and air distribution. Modular process coolers are installed in the computer room as freestanding units (they look like computer hardware). Room air is taken in, distributed and cooled beneath the floor, then reheated to add enough humidity before it is discharged at the proper temperature.

The most advanced process coolers use a glycol coolant system. Other types use air-cooled, water-cooled, and chilled water systems. Most systems are available in 2-ton to 20-ton capacities. It's a good idea, howev-

er, to divide the cooling load in the room; for example, if your room requires 15 tons of cooling capacity, consider installing two 7.5-ton units or three 5-ton units, all on separate circuits to reduce the risk of total system malfunction.

Process cooling systems come in a variety of packages. Minicomputer controlled systems can be recessed into suspended ceilings, replacing standard 4 inch x 2 inch tiles. Some packages include variable air-volume systems with an economizer cycle; this type of process cooling system is in use at the 147,000-square-foot IRS National Computer Center in Martinsburg, West Virginia, and it cools computer room support areas virtually for free when outside temperature is less than 55°F.

If humidity control is difficult or very critical, adding an extra humidifier to your cooling system may be in order in both the computer room and the tape/disk storage area. Too much humidity, as everyone knows, causes deterioration of electronic circuitry in the hardware, and leads to erratic performance. Too little humidity increases static electricity. The best type of humidifier is the evaporative panel model with hot-gas water heating; unlike electric-powered humidifiers, this type cannot overhumidify, and its installation cost is relatively low.

Ideally, the computer room should be partially earth sheltered (or at least windowless) to minimize moisture entry and migration. If there are external windows, however, they should be sealed and double-glazed. The entire room—ceiling, walls, floors—should be vapor sealed. At the very least, vinyl wall covering will ease the moisture situation.

### RECOVER WASTE HEAT

An effective way to control room temperature, cut costs, and use energy efficiently is to recover waste heat generated in a computer room. The IRS National Computer Center in West Virginia uses this kind of heat recovery system. Its computer room is cooled by 26 modular process cooling units that generate 5 million btus per hour of waste heat. Of that, 2.4 million btus per hour can be reclaimed by two water-to-water heat exchangers. Any excess heat flows outdoors to 20 rooftop water-to-air heat exchangers. The system provides enough heat for the entire building, and there is even enough left to divert to the sidewalks to melt snow and ice. In all, the IRS center saves 1.26 billion btus annually, enough to heat 25 average homes. The cost of the system is comparable to the cost of heating and cooling the building for two years.

A 1982 Amdahl Corp.-sponsored study of 24 large American and European companies found that nearly half of them had

no formal backup arrangements for their dp centers. Yet disaster-countering measures are easily incorporated into a computer center design.

Disaster recovery procedures should be developed, set down in writing, and practiced regularly. Computer room design contributes to disaster recovery in terms of circulation patterns, entry access, power systems, security (including safe, off-site storage of critical records and archives), and a variety of other factors. A 1981 survey showed that the average time to reestablish full-scale computer operations after a disaster is three months; with a good plan and good design, you can cut this time considerably.

High heat alone can cause computer catastrophe. Tapes and disks can be damaged at 150°F. Most large computer equipment has automatic shutoff in case of high heat, but you never want to hit this point. Remember, too, most computer rooms are very tightly sealed with little outside air available.

The optimum (but most expensive) type of fire protection is a microprocessor-controlled system that, when activated by under-floor detectors, performs decision-making logic, releases extinguishing agents, takes sequential emergency shutdown actions, controls HVAC and other systems, and reports status on a regular basis. Such systems even produce a hardcopy printout of events and locations, a plus for insurance collection. Such a system requires floor space for only a small cabinet and a monitor panel.

Most large computer centers use a Halon gas fire suppression system. Held in pressurized bottles beneath the floor, the Halon is discharged in half a second under hazardous smoke or fire conditions. The gas does not adversely affect humans (although you don't want to spend a day in a Halon-filled room), nor does it affect computer hardware.

A shutoff mechanism for HVAC systems will prevent fans from helping to spread fire. Further protection includes barriers at walls, floors, and doors, and smoke vents and smoke shafts.

An elaborate fire protection system at the 19,000-square-foot IRS Computer Center in Fresno County, Calif., combines a variety of preventive measures. The building is made entirely of precast concrete and uses only incombustible materials. Smoke detectors and evacuation alarms were specified throughout the building. Sprinklers were built into office and support areas. An under-floor Halon system was installed in the computer room. A central console in the computer room controls the fire protection system and power shutdown interlocks; it also monitors the silent burglar and intrusion alarms and closed circuit TV system.

# Introducing an IBM-compatible multiplexing scheme that multiplies your terminal network options.

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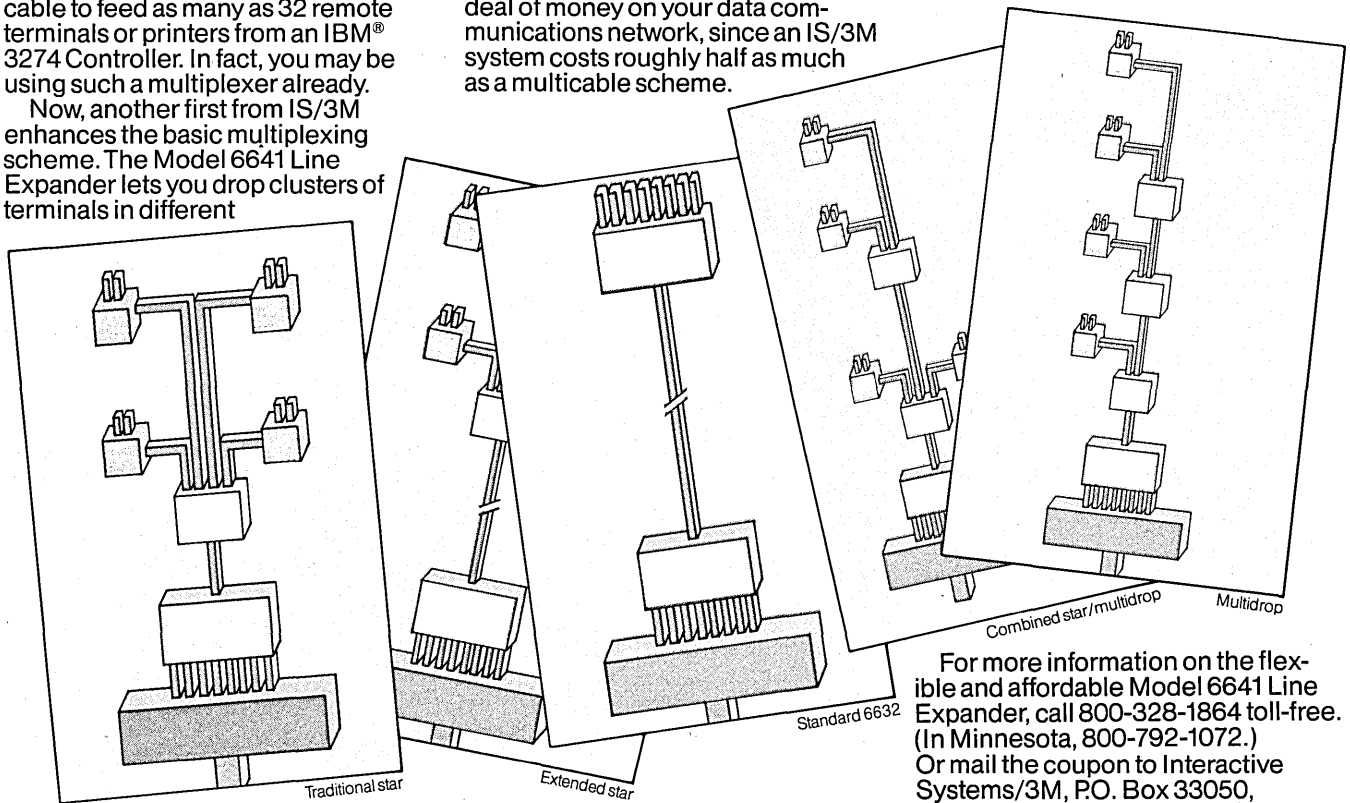
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The Model 6641 Line Expander employs repeater technology used in long-distance telephony and DP communications for years.

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## Floods are another danger to design against. A surprising number of computer systems drown every year.

At the very least, your computer room should be equipped with Class A and Class C fire extinguishers, light enough for women to handle.

Floods are another danger to design against. Even a third floor computer room can be threatened if a steam line ruptures or an air conditioning system breaks or condenses too much water. And, of course, there is the danger of natural floods from heavy storms. A surprising number of computer systems drown every year.

You can do a lot to prevent this kind of disaster if your computer room design includes a water detector system: a low-cost, industrial package, or a network of even lower-cost, easy-to-install detectors located beneath the floor. Resembling turtles, the "feet" of these simple alarm units are conductors that sound a warning when water is present. Your design should also allow for good drainage under the floor; include at least two drains, so if one is stopped up, the other can remove the water and save your cables.

### TAKE SECURITY MEASURES

Finally, there's the possibility of humans willfully damaging the center. Feature films aside, there are some real-life horror stories about high school kids breaching sensitive data systems. Internally, too, as more and more people have access to a cpu via terminals, the danger of a security breach increases.

The computer room should be designed so that it is not visible from the outside. But entries into the room (main entry and warehouse access routes) should be clearly visible, so employees in these areas can see who's coming and going. Circulation corridors around the computer room should also be manned. Tape/disk storage should be close to the computer room.

All cpu cabinets should have heavy-duty locks that protect the equipment but still

allow access for maintenance. Vandal-proof welded iron conduits rather than the standard aluminum might be considered for all electronic communications lines; you can inspect the welds periodically and easily notice if one has been broken.

The best security, of course, is continuous surveillance. Many commercially available packages offer a wide array of options, allow for facility growth, and are cost-effective. Some are designed especially for computer rooms. If the area has been broken into, the exact location of the breach is shown on the central office screen, and an alarm is sounded at the locations you designate (police, fire, key personnel homes, and so forth). Such systems also monitor smoke, fire, water, overheating, power failure, and more.

Some internal security measures are also required, such as codes, keys, badges, or pass cards. The pass card system is growing in popularity because of its simplicity, cost-effectiveness, and ease of use. Employees insert a credit-card sized "key" into a terminal just outside the computer room or other sensitive areas. The terminal, connected to a small cpu, reads the card's code, permitting or denying entry. Card codes can be easily and immediately canceled or changed as personnel changes occur.

To protect your data assets from outside tampering or interference, a radio frequency (RF) shield is also recommended. This is difficult to install in existing facilities but easily incorporated in a new design. The RF shield places a continuous conductive surface around the area to block radio waves and protect against all communications frequencies (14KHz-40GHz). The shield is made of thin, conductive metal sheets laminated to form panels that are built into floors, ceilings, and walls.

A Southwestern Bell dp Center in Tennessee, for instance, faced a potentially

damaging power penetration problem from nearby radio transmitting antennae. The entire center was enclosed with a continuous conductive copper screening in the walls and under the roof slab. The concrete slab foundation under the raised access flooring incorporates a galvanized sheet metal covering. All doors are steel. Door frames are gasketed with electrical conductive materials to insure the shield's continuity.

Given that your new equipment is ready to be delivered, and that your upgraded facility now includes a variety of the systems and provisions we've just reviewed, how do you set about the move itself?

Moving requires as much detailed, critical planning as all the other steps. A good computer room design is crucial at this point, because the changeover will not happen in a day or even a few days. In many cases, old and new equipment will have to operate side by side for up to a year or more before switch-over is complete. It is quite likely that at least temporarily you will need sufficient space in the new or upgraded facility for hardware from *both* systems.

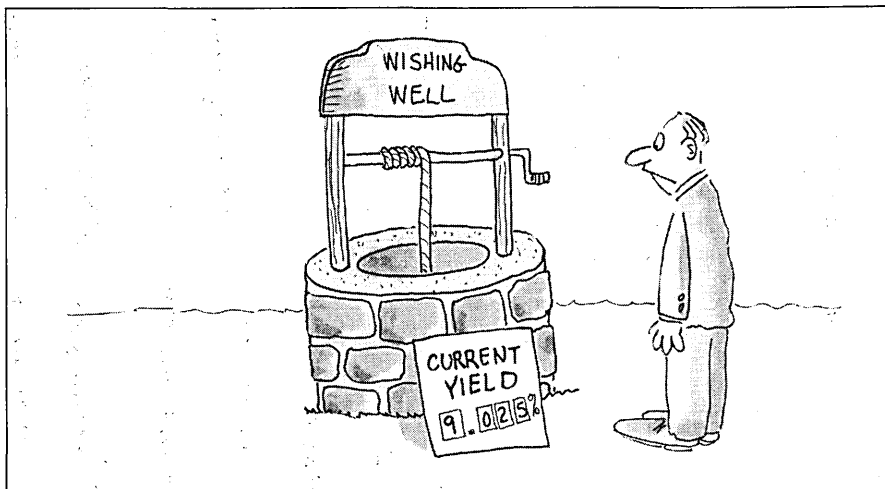
Above all, a thorough, well-thought-out conversion schedule is required. Maximum safeguards for the protection of the environment and data should be provided. A task-by-task breakdown is essential, pinpointing who will do what, and when. This includes not only you and your staff but vendors, utilities, and consultants.

Your upgraded computer system will work only as well as the computer center environment allows. With careful planning and good design, you can achieve that ideal environment, and expect maximum performance, economy, and reliability from your computers throughout their entire life cycle.

James L. Haack, A.I.A., is vice president, chief architect, and manager of the architectural division of Sverdrup Corp. in St. Louis. He holds BS and MA degrees from Washington University. He's responsible for Sverdrup's architectural projects, which have included planning, design, and construction of computer centers for the IRS, the Bell companies, and a variety of other clients.

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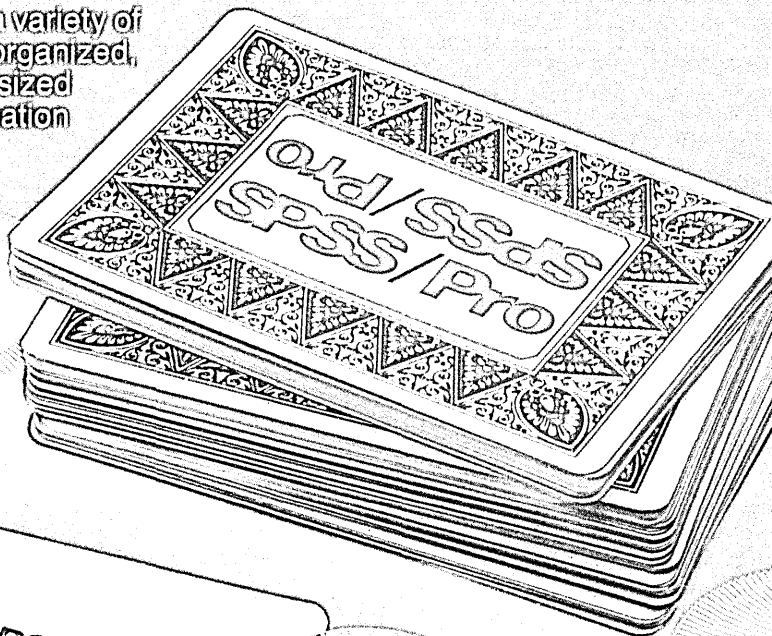


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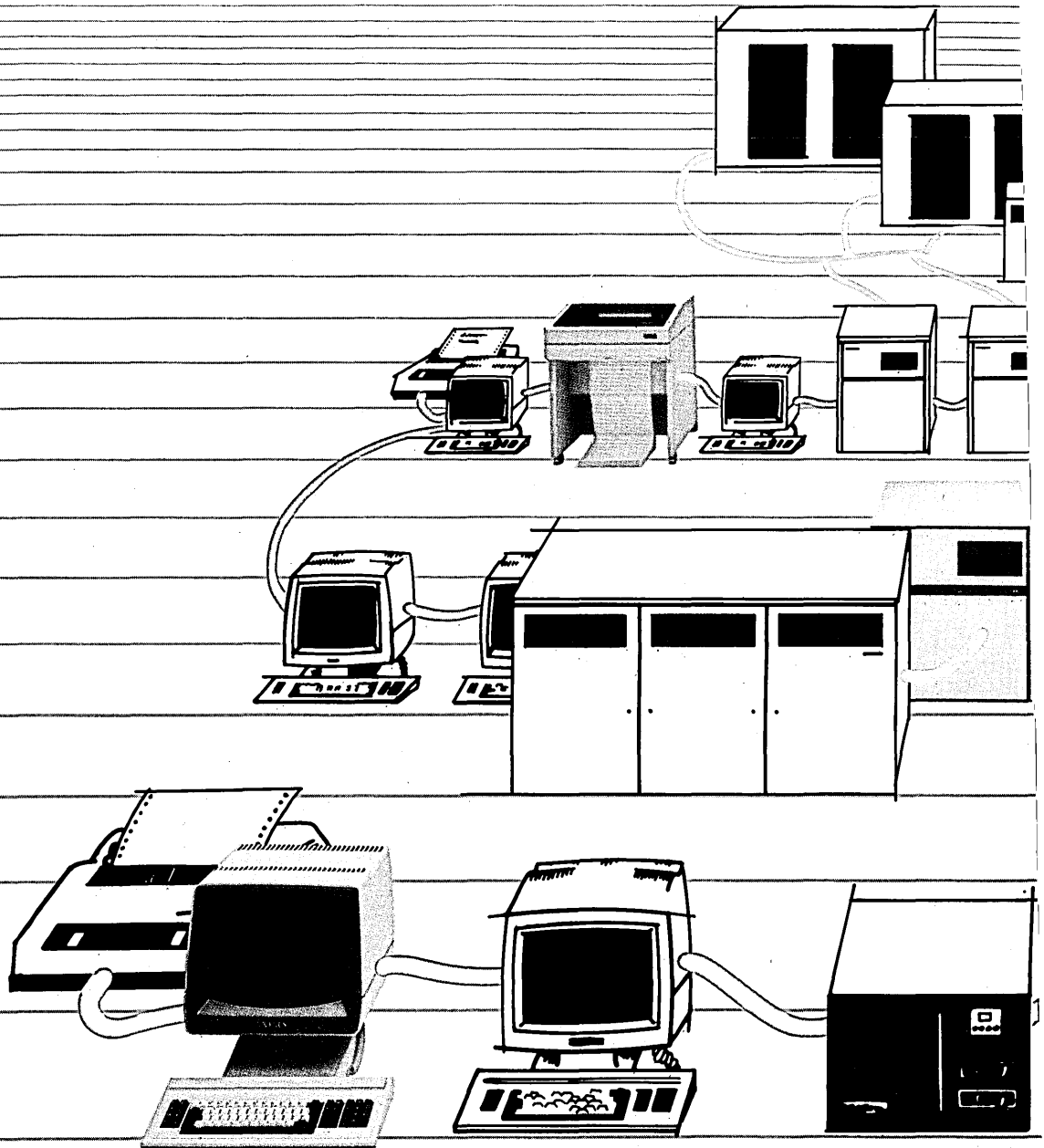
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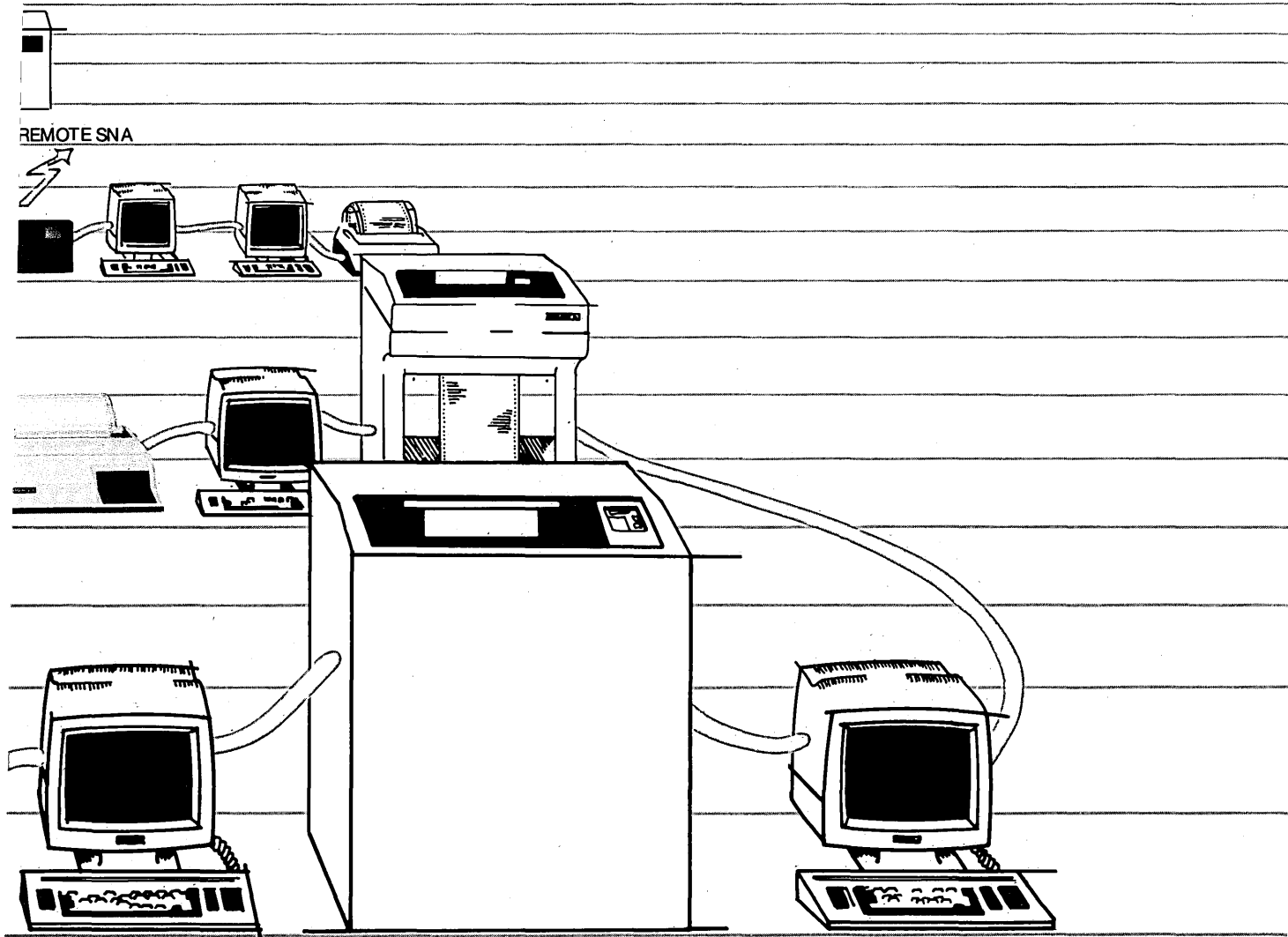


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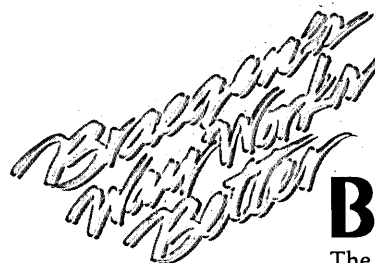
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**As computers spread, so does the need for clean, reliable power. Here are some pointers on how to provide it.**

# MORE POWER TO YOU

**by D.B. Bhagat,  
H.E. Brandmaier,  
and J.E. Ford**

The problem of installing computers in a building that lacks appropriate power facilities is an increasingly common one. Whether the building is an older, multistory factory or a relatively modern, one-story warehouse or office, putting computers where there formerly weren't any means a significant amount of electrical work.

Once the basic computer equipment has been selected, there are a host of nitty-gritty power questions that have to be answered, and a number of decisions that the dp manager and his installation team will have to make. A good first step is to divide the task into three phases: data accumulation, design and trade-off studies, and procurement and installation.

The data you need to provide power for a new computer installation fall into one of three categories: computer equipment specifications, building characteristics, and electric utility data.

Computer equipment specifications are generally the easiest to obtain. One or more members of the installation team should spend whatever time is required with each equipment vendor and map out the specifications for each piece of equipment. These data should be compiled into a physical planning manual containing such items as voltage and amperage requirements, types of cables and connectors required, circuit breaker (single or three pole) requirements, heat generated by equipment, physical dimensions, and weight. This manual is an invaluable tool for the team to use for planning, designing, and installation.

In addition to gathering these data, you should define the computer tasks as critical or noncritical, based on the duty performed by the computer. Critical loads affect the profits and losses of an organization, the health or life of individuals, or the security and safety of a given facility. Examples of critical loads are airline reservation facilities, computer aided manufacturing, and the computer aided security system for a military base. Noncritical computer loads are those

FIG. 1

## ELECTRICAL DATA

### COMPUTER POWER REQUIREMENTS

Input voltage \_\_\_\_\_ volt a-c \_\_\_\_\_ phase \_\_\_\_\_ Hz

Acceptance tolerances

Voltage + \_\_\_\_\_ % - \_\_\_\_\_ %

Maximum total harmonic content \_\_\_\_\_ % of voltage

Frequency ± \_\_\_\_\_ Hz

Power Requirements Present \_\_\_\_\_ Future \_\_\_\_\_

Connected load \_\_\_\_\_ Kilovolt-amp

\_\_\_\_\_ Power factor \_\_\_\_\_ KVA, \_\_\_\_\_ Pf

Operating load \_\_\_\_\_ KVA, \_\_\_\_\_ Pf \_\_\_\_\_ KVA, \_\_\_\_\_ Pf

Load current unbalance (3-phase system) \_\_\_\_\_

Inrush load in KVA or current \_\_\_\_\_

Its duration in milliseconds \_\_\_\_\_

Acceptable ambient temperature range \_\_\_\_\_ °C to \_\_\_\_\_ °C

Acceptable relative humidity \_\_\_\_\_ %

Heat loss \_\_\_\_\_ Btu/h

### UTILITY POWER SOURCE:

Is a dedicated power source from utility available? \_\_\_\_\_

Are dual independent power sources from utility available? \_\_\_\_\_

Power source characteristics

\_\_\_\_\_ Volt a-c \_\_\_\_\_ phase \_\_\_\_\_ Hz

Voltage regulation + \_\_\_\_\_ % - \_\_\_\_\_ %

Output frequency accuracy ± \_\_\_\_\_ %

Maximum total harmonic content \_\_\_\_\_ % of output voltage

Available short circuit \_\_\_\_\_ Amps at \_\_\_\_\_ volt

**It's a good idea to consult with another company in the area that has installed a computer system and see if they have any power-related problems.**

Fig. 2

**POWER CONDITIONING EQUIPMENT EFFECTIVENESS**

COMMERCIAL POWER SOURCE ABERRATIONS & CAUSES	POWER ENHANCEMENT EQUIPMENT				POWER SYNTHESIS EQUIPMENT	
	Spike Suppressor	Isolation Transformer Shield	Voltage Regulator	Combination of Spike Suppressor, Shielded Isolation Transformer, and Voltage Regulator	Rotating Machine - Motor Generator Set	Uninterruptible Power Supply (UPS)
<b>NOISE</b> High voltage transients-lightning Spikes—utility capacitor Switching Oscillatory transients—electric tools, fluorescent lighting, etc.	YES	NO	NO	YES	YES	YES
	YES	NO	NO	YES	YES	YES
	YES IF FILTERED	YES	NO	YES	YES	YES
<b>VOLTAGE</b> Under- and over-voltages—power line faults and fault clearance process Voltage fluctuations—starting heavy electrical equipment Brownout and line droop Outage	NO	NO	YES	YES	YES	YES
	NO	NO	YES	YES	YES	YES
	NO	NO	YES <sup>1</sup>	YES <sup>1</sup>	YES <sup>1</sup>	YES <sup>1</sup>
	NO	NO	NO	NO	NO <sup>2</sup>	NO <sup>3</sup>
<b>FREQ.</b> Frequency variations	NO	NO	NO	NO	YES	YES

1. If serious brownout or low voltage conditions are known, proper provisions should be made in specification before the procurement of equipment.
2. Motor-generator sets can provide power for outages having a duration of 5 to 10 cycles.
3. Outage duration depends upon the backup battery size. If standby diesel generator is available, it can provide power to computer without interruption.

used for convenience, such as computer aided design and word processing.

Building characteristics can be similarly accumulated. The principal items here are:

- Available electric ground and lightning protection system.
- Available electric power and its distribution in the building. Obtain a schematic showing the flow of power from the utility sources to the devices in the building that use it. The team also needs layout drawings showing the locations of the power distribution centers; power panels; switches; wall outlets; heating, ventilation, air conditioning (HVAC), and lighting equipment; and the raceways that are used to interconnect these devices.
- Data on a standby diesel generator if one is available. Determine whether the spare ca-

capacity can be used for computers.

- Actual site voltage measurements of incoming power. The team should use instruments and recorders capable of measuring transient voltage changes. Determine allowable floor loading, existing HVAC system capacity, and its air-flow distribution.

Electric utilities provide their customers with AC power that has a definite nominal voltage at a frequency of 60 Hz. This utility power profile is specified in ANSI Standard C84.1. The steady-state voltage tolerances at the power source as defined by the standard are  $\pm 10\%$  for industrial power. Before talking to the local utility, the team should understand some basic terms (see box).

Specific questions that should be asked of the local power utility include:

- What are the characteristics of the electric power that can be supplied at the user's site—

e.g., voltage, frequency, and their tolerances?

- Can the utility provide an independent power source at the facility?
- What possible problem areas are there? Inquire about power availability and outage occurrences. If additional power is required later on, will the utility be able to supply it, and how long will it take to have new service put in? Have there been brownouts during hot summer months?
- Ask about local weather conditions. Does the area suffer from heavy thunderstorm activity, high winds, or heavy icing? Can the utility suggest any precautions to protect against downtime due to those phenomena?
- Are there other frequency generating devices in the area that would affect computer performance?

In addition to talking to the local util-



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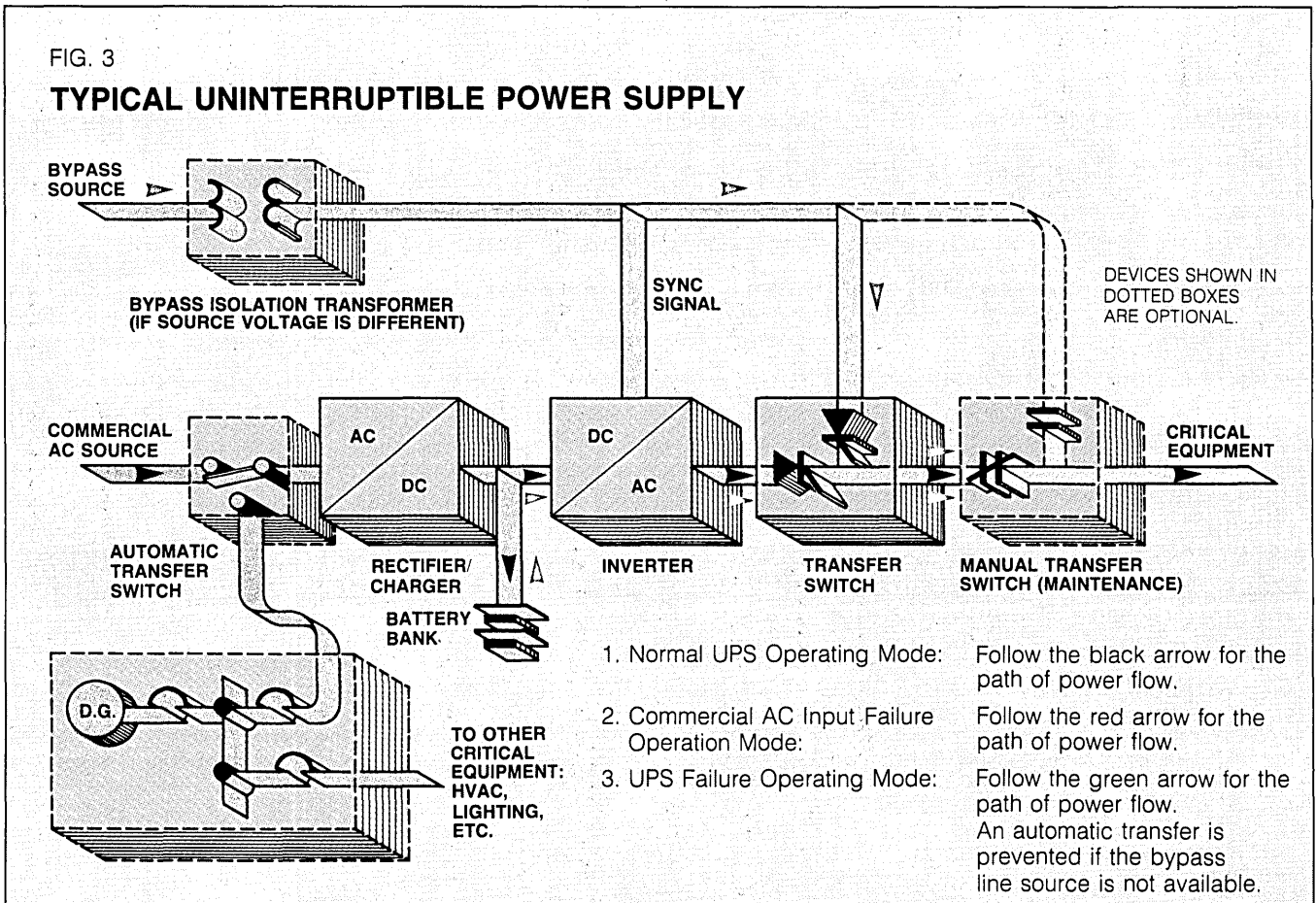
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Perhaps the first item to be considered in the design phase is the amount of expansion you have to allow for.

FIG. 3

**TYPICAL UNINTERRUPTIBLE POWER SUPPLY**



1. Normal UPS Operating Mode: Follow the black arrow for the path of power flow.
2. Commercial AC Input Failure Operation Mode: Follow the red arrow for the path of power flow.
3. UPS Failure Operating Mode: Follow the green arrow for the path of power flow. An automatic transfer is prevented if the bypass line source is not available.

ity, it's a good idea to consult with another company in the area that has installed a computer system and see if they have had any power-related problems.

This information should also be entered in detail into the planning manual. The format in Fig. 1 makes it easy to enter computer equipment and electric utility data. There should be a Computer Power Requirement entry for each piece of equipment; then the power requirements for the complete system can be compiled.

**DESIGN, TRADE-OFF STUDIES**

Perhaps the first item to be considered in the design phase is the amount of expansion you have to allow for. This directly affects the space allocated to the computer installation and its power and air conditioning requirements. Planning for expansion is difficult but necessary; it is quite possible to double electric power requirements within two years.

The most important factor to consider in the design phase is the impact of commercial AC line aberrations on the operations of the computers. There are standards set by the Computer and Business Equipment Manu-

facturers Association (CBEMA) on the acceptable tolerances for computer power sources. The steady-state voltage tolerances for industrial power as defined by CBEMA are + 6% and - 13%. Typically, tolerances on transient voltages allow dips or surges not greater than  $\pm 20\%$  for a duration of 30 milliseconds or less. Most computers will not tolerate a loss of voltage beyond 15 milliseconds. The acceptable frequency tolerances are  $\pm 0.5$  Hz. Input power aberrations beyond the tolerances specified by the computer supplier can cause input/output errors, loss of data, calculation errors, memory loss, shutdown, and even internal component or equipment damage.

As is well known, commercially available power is generally not suitable for computer systems. What's needed is an interface system that modifies or conditions the incoming power. These systems accept commercial power and deliver acceptable power to the computer system. Some can provide continuous power during a commercial power outage. Electrical data compiled in the format shown in Fig. 1 can be used to design a power conditioning system and specify its components.

There are several electrical and electronic devices on the market that condition electric power. They fall into two major categories: power enhancement equipment and power synthesis equipment.

Power enhancement equipment modifies and improves the incoming power wave form by filtering, clipping, isolating, and regulating the voltage. Power enhancement can be provided by spike suppressors, isolating transformers, voltage regulators, or a combination of some or all of these.

Power synthesis equipment uses the incoming power as an energy source from which it creates a new, completely isolated output power wave form. This regenerated wave form complies with the CBEMA tolerance requirements regardless of the variations in the source. Power synthesis can be provided by static semiconductor inverters and rotating machines (motor generator sets). The static semiconductor inverter is powered by DC, which is obtained by rectifying the normal incoming AC power source; the output of the inverter provides power to the computer. If a floating DC battery bank is added in the DC stage to provide power during a total outage, the device becomes an uninterrupt-

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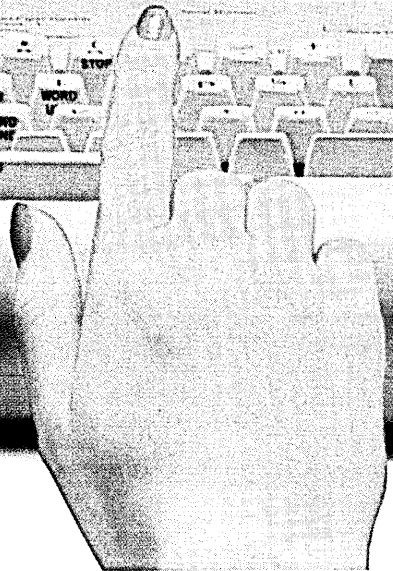
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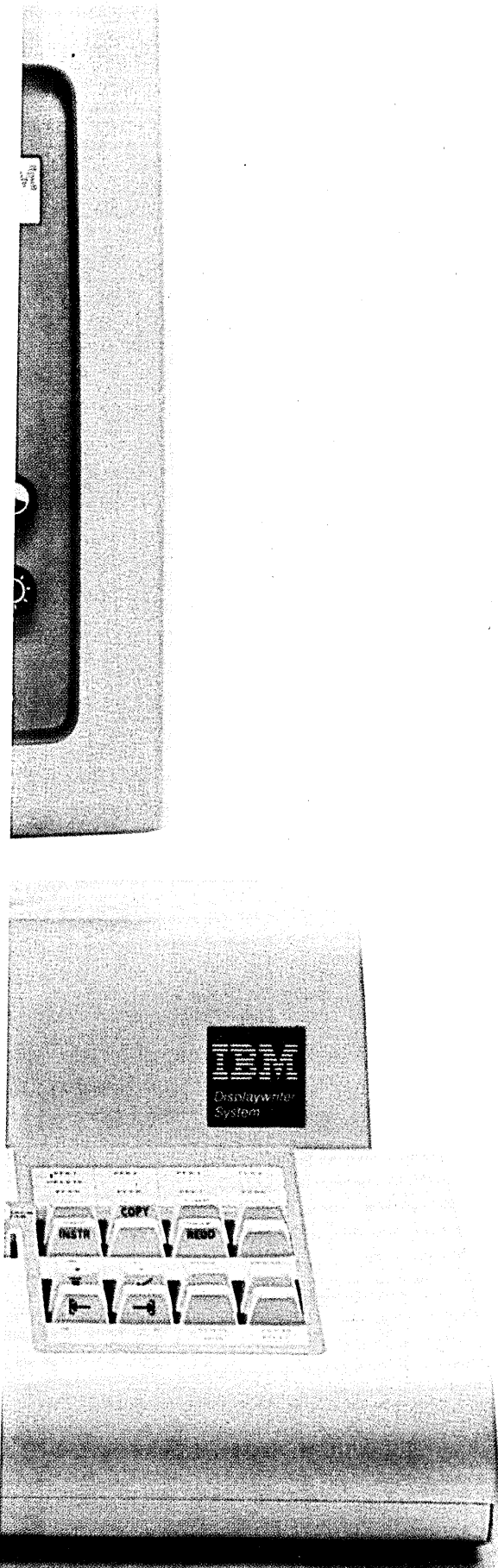
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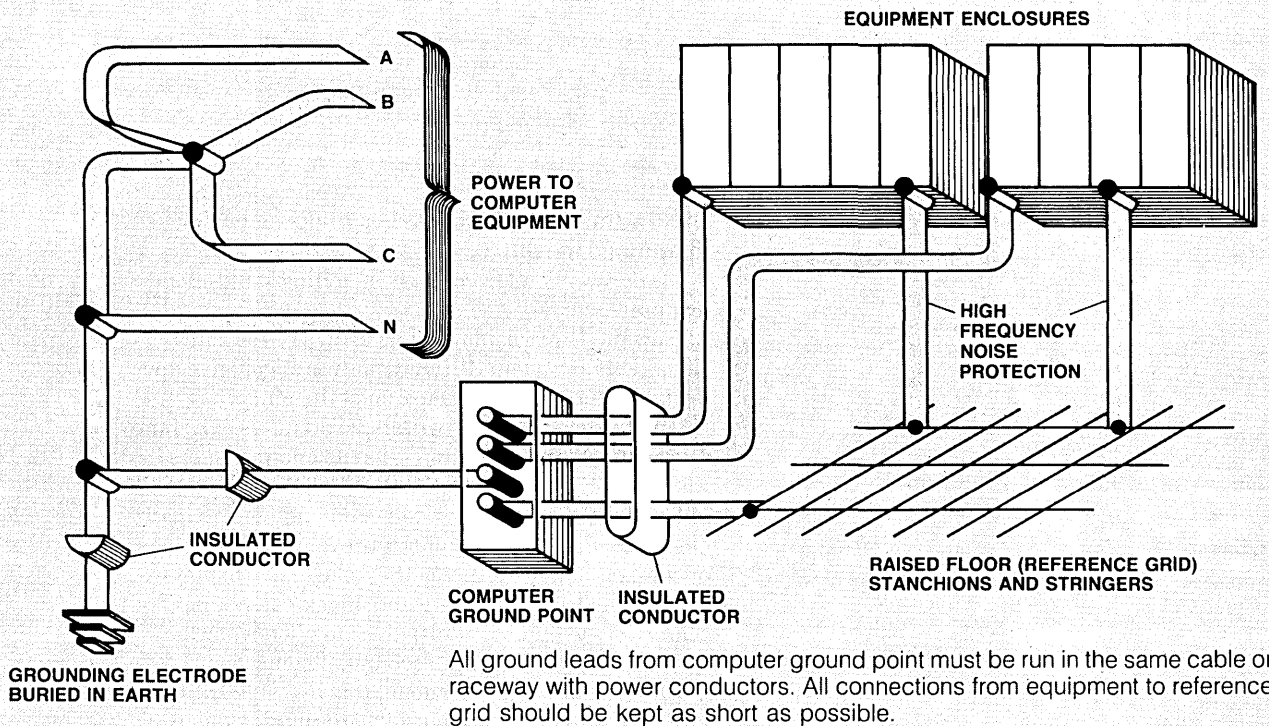
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# An installation problem that has to be addressed early is the grounding of computer equipment and the electrical power distribution system.

FIG. 4

## GROUNDING A COMPUTER SYSTEM



ble power supply (UPS). Fig. 2 lists the power conditioning devices on the market and the protection they provide against commercial line aberrations.

It is obvious that for critical computer systems, a UPS is preferable. For noncritical computer systems, however, it may be cost effective to use a combination of spike suppressor, shielded isolation transformer and voltage regulator.

A typical solid state reverse-transfer UPS consists of four major components: a rectifier/charger, a battery bank, an inverter, and an automatic bypass/transfer switch (see Fig. 3). Functioning in three basic modes, these devices effectively isolate a critical system from all types of incoming power disturbances. In the normal mode, commercial power is delivered to the rectifier/charger stage, where it is converted to DC. It charges the battery bank while supplying regulated DC power to the inverter. The inverter converts DC power to AC, shapes the AC sine wave, and regulates its voltage, providing clean AC power through the transfer switch to the critical load. In the event of a commercial AC line failure, the critical systems continue to be supplied by the inverter, which, without switching, obtains power from the battery bank. The battery bank continues to supply

power to the inverter until an orderly shutdown can be accomplished, or the emergency generator comes on-line, or commercial AC power is restored.

In the event of an inverter failure, or if the overload, inrush surge, and short circuit happens during the availability of commercial power, the automatic transfer switch will connect the equipment directly to the commercial source. Upon restoration of acceptable inverter output, the transfer switch will return the equipment to the UPS.

Although UPS provide clean power to critical systems even during a brief incoming power outage, the installation team should review their limitations in areas such as overload capabilities, inrush capabilities, unbalanced load capabilities, effects of leading or lagging load power factors, and no-break transfer capability.

Electrical power systems for computer rooms are generally designed by consultants and installed by electrical contractors. The installation has to meet the requirements of the manufacturer, the National Electrical Code, and applicable local codes. The computer itself is usually installed by the supplier or its subcontractor, in cooperation with the owner. The computer room design normally incorporates a raised floor to provide the

raceway for power and control cables associated with computers, and peripheral equipment.

An installation problem that has to be addressed early is the grounding of computer equipment and the electrical power distribution system. To provide noise immunity, the computer supplier normally requires an isolated single point ground not attached to building steel or water pipe. The power distribution system must be grounded in accordance with NEC safety requirements. Both requirements can be achieved with some early planning. Fig. 4 gives some guidelines for proper grounding.

### SEPARATE GROUNDING SYSTEMS

Our company learned the hard way that separate grounding systems are important. When a main computer center was added to an existing building, the utility provided a new power service. A grounding electrode was added at a service entrance. The power was brought to a power island containing the power enhancement equipment—spike suppressor, shield isolation transformer, and voltage regulator—that supplies the power distribution units (PDU). The computers are powered from this distribution panel. The computer system

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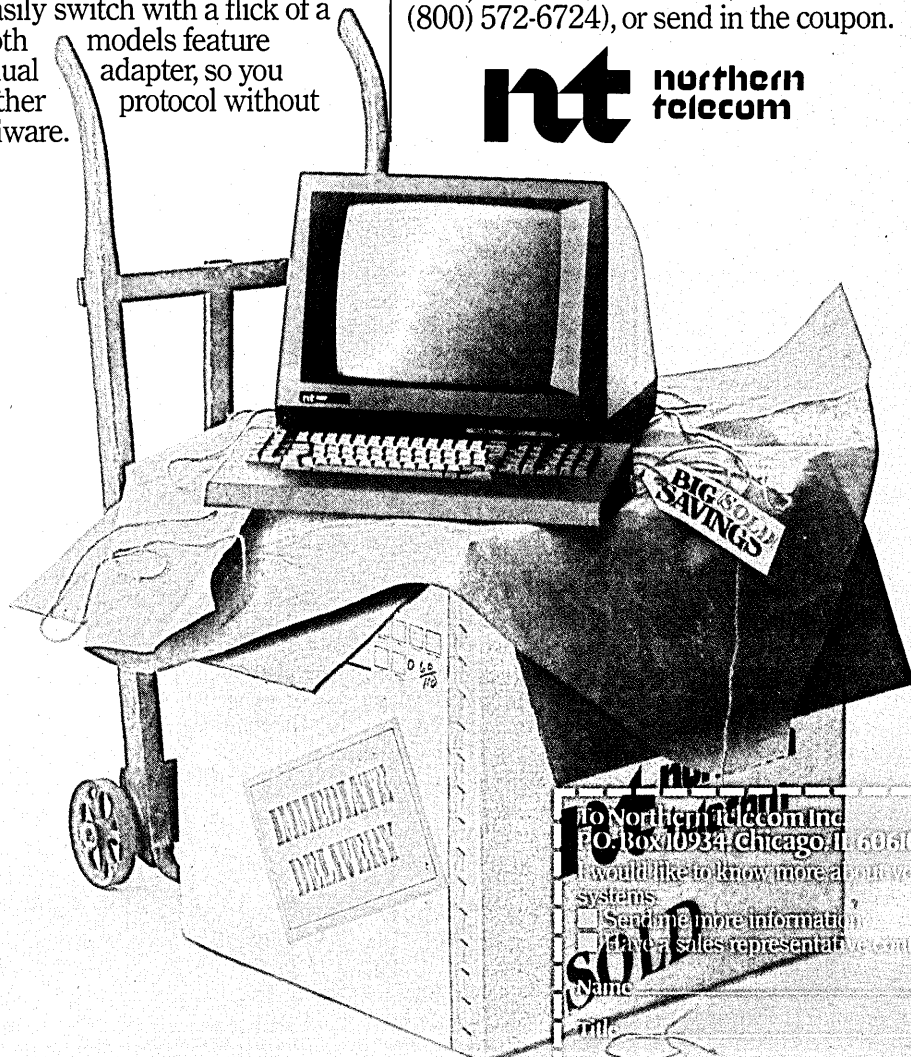
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## Make sure the floor is high enough to prevent current and future cabling from blocking air flow.

### ELECTRIC POWER WAVE FORM ABERRATIONS

**Voltage aberrations** are variations in the incoming line voltage above or below its nominal value. They are classified according to duration.

Long-term aberrations last at least 15 minutes. Examples are:

**Line droop** due to the voltage reduction caused by the electrical resistance of the cables. The user at the end of a long line will experience a somewhat lower than nominal voltage.

**Blackout**, which occurs when the line voltage drops to zero and remains there. This can be caused by a fallen power line, failure of the distribution transformer, and/or a circuit breaker trip.

**Brownout**, which results when the local electric utility reduces the available voltage on a commercial line.

Intermediate voltage aberrations last from a few cycles to a few minutes. They are normally caused by a user on the line starting or stopping a large motor, auto-

matic changing of taps on distribution transformers, or an electric fault clearing process on the line.

Transient voltage aberrations usually have durations of only a few cycles. They are caused by electronic switching devices, electrical commutating devices, or lightning.

**Frequency aberrations** occur when the line frequency maintained by the utility varies. They are normally within the frequency tolerance ( $\pm 0.5$  Hz) of the computers. Standby diesel generators, however, are difficult to maintain at a constant 60 Hz.

**Noise aberration** is created by unwanted electrical signals superimposed on a useful wave form. Two types of noise are transverse- and common-mode. Transverse-mode noise always exists between a pair of electrical conductors, whereas common-mode noise appears between line conductors and ground.

was installed on a raised floor, providing a reference grounding grid for the computer equipment. Initially, this grid and the computer power distribution panel were connected to the existing grounding grid, which provides a ground path for the rest of the building's electrical equipment—HVAC, lighting, etc. This resulted in computer malfunctions and disturbances. The solution to the problem was an isolated ground conductor tying the reference ground grid and power distribution panel ground to the added ground rod at the new service entrance.

Proper grounding, of course, is just a part of the procurement and installation process. Following are some general guidelines.

- Check all vendor purchase orders to assure that proper receptacles and connectors are ordered for each piece of equipment.
- Use extra length on each cable, in case equipment has to be moved.
- Make sure the floor is high enough to prevent current and future cabling from blocking air flow. Typical floor heights are 12 inches to 18 inches. Don't coil power or data cables under the raised floor; this also blocks air flow.
- Air conditioning equipment and computers should be fed from separate power sources. The power for all computer equipment should, if possible, come through a single power panel.
- Mark each breaker to indicate which device it protects.
- Provide automatic restart capability for all equipment. This is another lesson our company learned from experience. One of our main computers is unattended over week-

ends. When a power failure occurred, the computer equipment restarted, but the air-conditioning equipment had no automatic restart capability. The resulting high temperatures caused extensive equipment damage.

- Add extra outlets in the computer room for equipment that is not hardwired, such as CRT terminals and printers.
- Remember the human factor. Noisy power panels in an office, or a large air conditioner just beyond an adjacent wall, are unpleasant at best.

● If a UPS with an emergency generator is to be used, don't neglect its special installation requirements. A large battery bank is quite heavy and must be adequately supported. You must also provide proper room ventilation to alleviate any potential buildup of hydrogen released from the batteries.

The new modular power distribution centers specifically designed for computer rooms are worth considering. They are designed to monitor the power and sound an alarm when necessary, distribute bulk power via individual circuit breakers to computer equipment, and provide additional convenience receptacles and a single computer ground bus. \*

D. B. Bhagat is a supervising electrical engineer at Burns and Roe, a New Jersey-based firm that designs and constructs fossil and nuclear power plants. H.E. Brandmaier is manager of Burns and Roe's user assistance department. J. E. Ford is manager of the firm's computer operations department.

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Baltimore, MD	Oct. 12	Montgomery, AL	Nov. 10
Birmingham, AL	Nov. 9	New Haven, CT	Nov. 9
Boston/		New York, NY	Oct. 12
Westwood, MA	Nov. 2	New York, NY	Nov. 9
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Chicago/		Pittsburgh, PA	Nov. 1
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Detroit, MI	Nov. 3	Richmond, VA	Oct. 11
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## IDMS/R Automatic System Facility.

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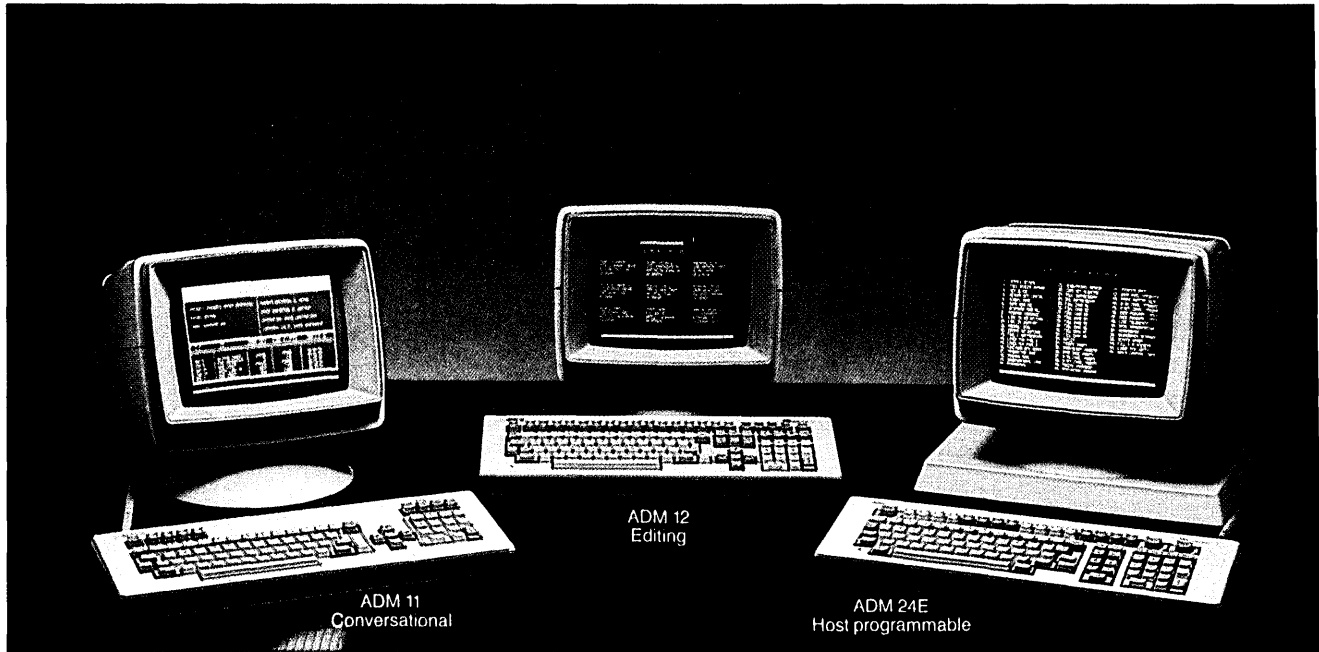
For more information on this unique facility, to attend a seminar or for a demonstration see the page adjacent.

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Our new generation of High Touch terminals brings an elegant new touch to our American



6' coiled cable lets you put the keyboard anywhere.

Dream Machine (ADM™) tradition. The family features three new ergonomic terminals designed to meet the needs of OEMs and end users alike: The ADM 11, ADM 12 and ADM 24E.

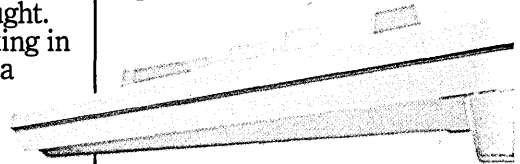
There is more to ergonomics than simply tacking on a few fadish features as an afterthought. That's why we put our thinking in up front. And came up with a whole new way for terminals to relate to humans.

No aspect of terminal design escaped our deepest consideration. Or reconsideration. Dozens of little touches add up to the convenience and comfort of High Touch. For example, we put the power "on/off" switch and contrast control knob in front where they're easy to reach.

The monitor not only tilts and swivels, it stops positively in almost any position.

The clean, crisp display features a large character matrix on an easy-to-read green or amber non-glare screen—made even easier to read by the hooded bezel. Screens are available in 12" or 14" sizes.

Our uncluttered keyboard, with its logical separations between key groupings, improve your efficiency. The low-profile, DIN-standard keyboard is not only tapered, its angle of tilt is easily adjusted for maximum operator comfort.



Low profile DIN-standard keyboard with adjustable tilt.

The Selectric® layout with its sculptured keys makes data entry easy and efficient. And we placed the *control* and *escape* keys close to the alphanumeric keys, where people just naturally expect to find them.

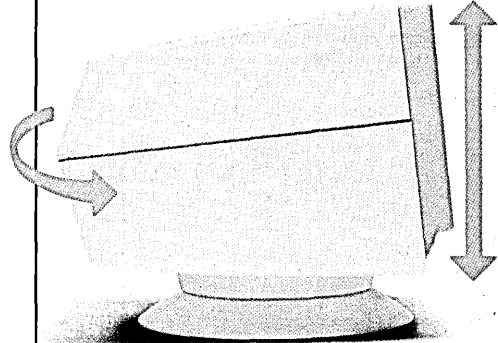
The ADM 11 is a High Touch conversational terminal that accepts data continuously at 19.2 kilobauds. It features separate cursor control keys logically arranged in a cross for ease of use. Four modes are provided for the printer interface: page print,



	ADM 11	ADM 12	ADM 24E
Programmable Function Keys	4 (Shiftable to 8)	16 (Shiftable to 32)	16 (Shiftable to 32)
Non-Volatile Function Keys	Optional	Standard	Standard
Function Key Legends on 25th Line	From Host	From Host	Standard Non-Volatile
No. of Pages of Display Memory	1	2	2 or 4
Page Configurations Plus 25th message/status line)	24 lines by 80 characters	(2) 24x80 or (1) 48x80 or (1) 24x158	User-Definable up to 96x80
Scrolling	Standard Scrolling	Smooth, Jump or Horizontal Scrolling Split Screen	Smooth or Jump Scroll Split Screen
Transmission Mode	Conversation Mode	Conversation or Block Mode	Conversation or Block Mode
Editing	Limited	Full Editing & Protected Fields	Full Editing & Protected Fields
Visual Attributes: Reduced Intensity, Blink Blank and Reverse Video. Underline also on ADM 12 and ADM 24E	3 Embedded 1 Non-Embedded	5 Embedded or Non-Embedded, plus Full Screen Reverse Video	6 Embedded or Non-Embedded, plus Full Screen Reverse Video and Highlight
OEM Flexibility	Modifiable Set-Up Characteristics	Modifiable Set-Up Characteristics & Personality	Modifiable Set-Up Characteristics. Add to Program in ROM or Down-Line Load in RAM (56K ROM or RAM. Plus up to 22K Display Available) Room for add'l Logic Boards.

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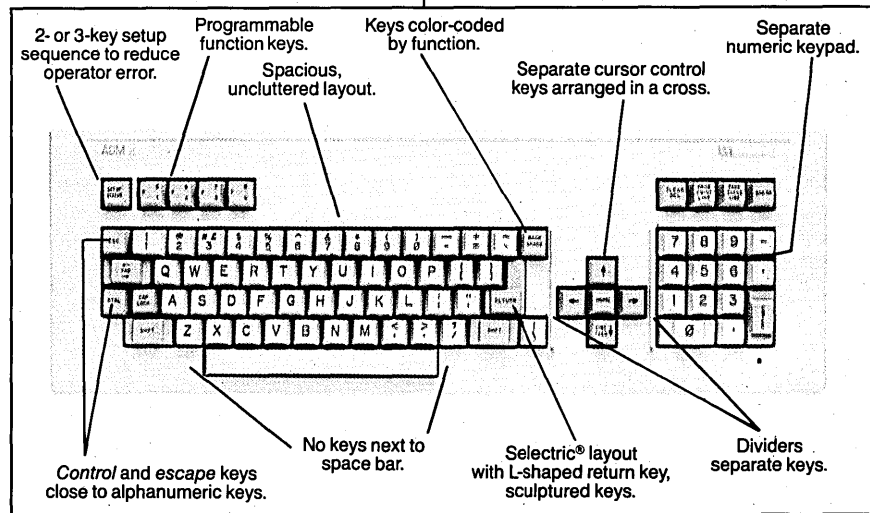
And that's just one more reason they're called the American Dream Machines.

ne print, transparent print, and display and print. There are four programmable function keys (shiftable to eight). And two levels of setup mode to reduce errors while still giving the operator maximum flexibility.

For a High Touch terminal with editing and more, choose the ADM 12. It features five non-embedded attributes. Embedded mode can also be selected for existing applications. And 16 programmable non-volatile function keys (shiftable to 32). The display can be configured as two 24 x 80 character pages, or one 48 x 80 page, or one 24 x 158 page. The terminal runs in either conversational or block mode.

Or choose our top-of-the-line ADM 24E which features a moveable 24-line window you can see to look at 48 (or 96) lines of memory. The ADM 24E also offers plenty of additional space for OEMs, with up to 56K ROM or RAM available for add-on programs. Plus up to 22k display RAM.

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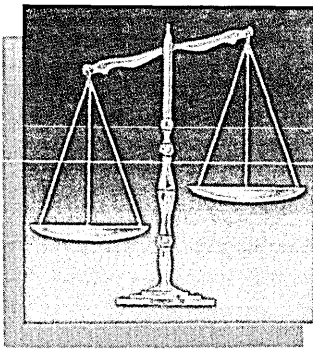
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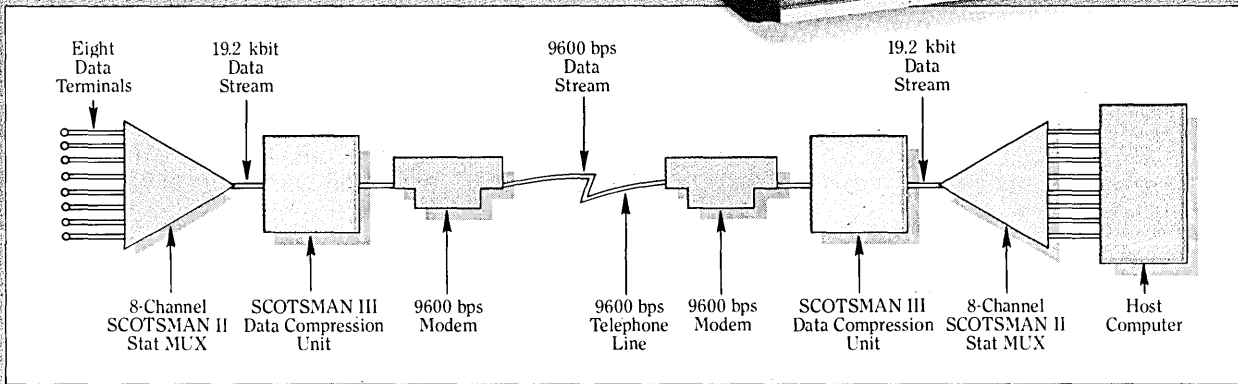
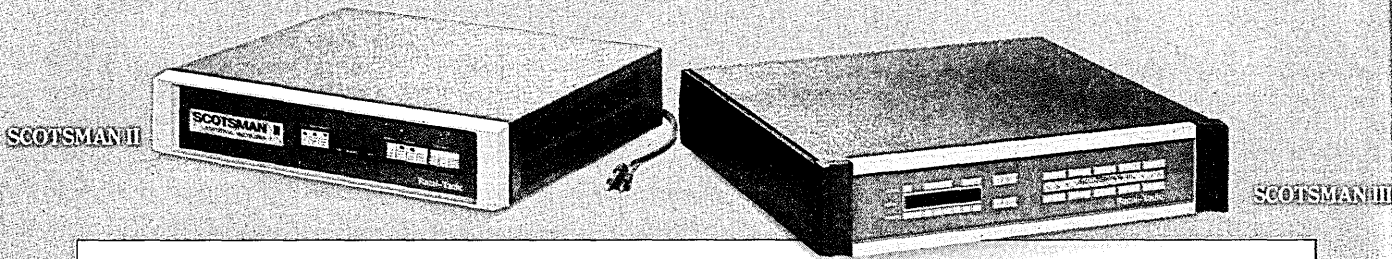
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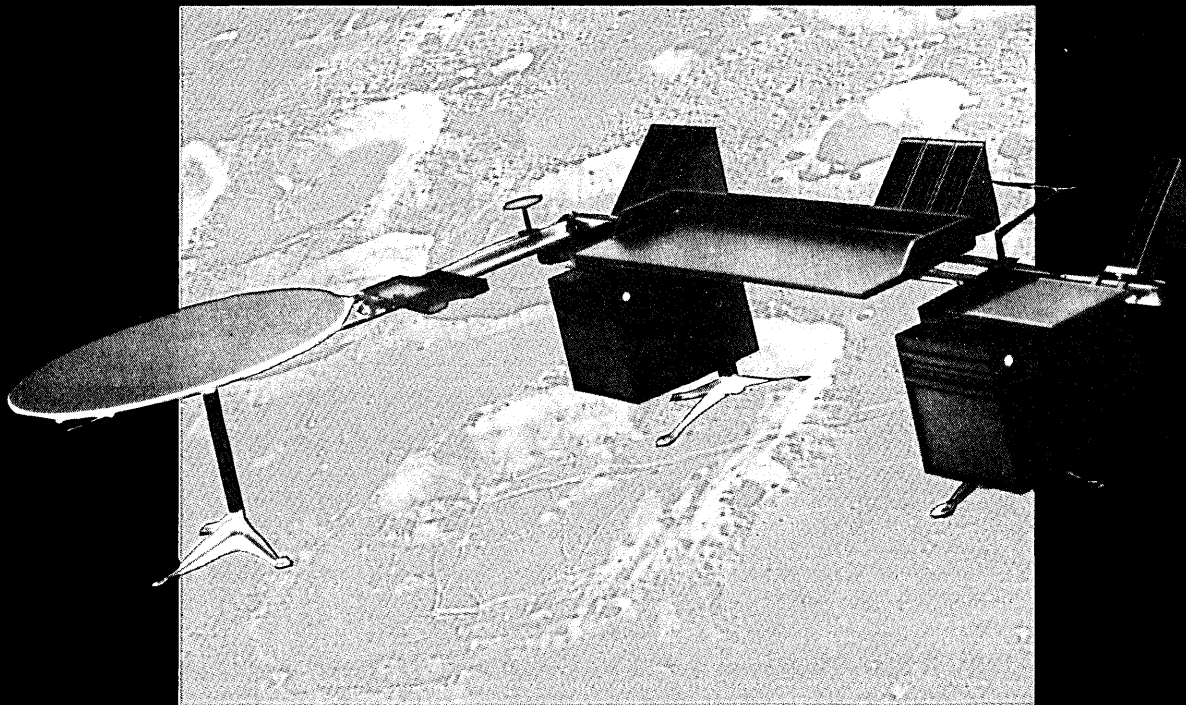
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Functionality is integral to the Burdick System from Herman Miller.

by Sarah Person

In case you haven't noticed, there's a new look to today's office. It's not French Provincial, Danish Modern, or Early American. It's Early Automation—the newest furniture frontier.

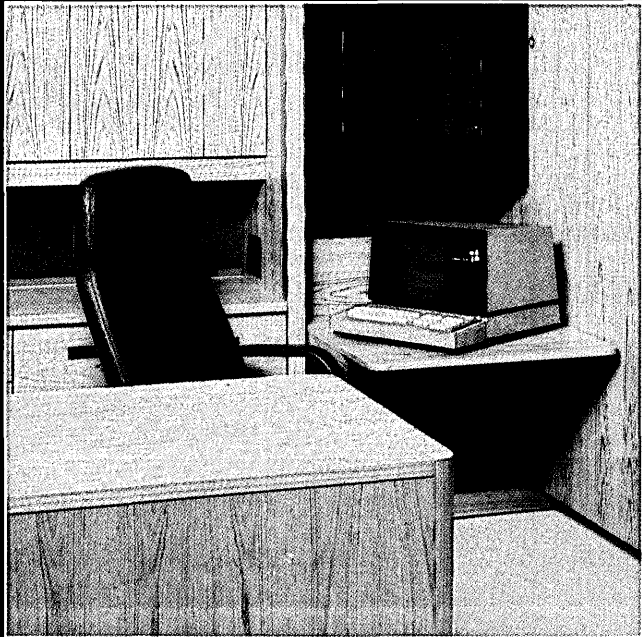
The sleek new style is subtle but sturdy, compact but comfortable, emphasizing all those ergonomic niceties that the Europeans have slowly taught us to appreciate. Tailored around the various computer systems that are being plugged into offices throughout corporate America, the furniture is specifically designed to be both hardware and hu-

man compatible. So it's not just a question of fashion but of fit.

"Fundamentally, it has to do with everyone being a different shape," explains Nils Diffrient, a designer of office furniture for Knoll International and Sunar. "When you have a very intense job staring at a screen all day, [you] will wear out. So you have to adapt the furniture to the individual, not the other way around."

Automated office workers, rejoice—someone is at last paying more attention to the personal side of computer use. Until recently, very few U.S. vendors heeded those human factors when designing their

**Primary design considerations are dictated by the functional level of the job and terminal usage.**



The Banker's Series System by Harvey Probbler Inc.



Open and shared workstations from Steelcase Inc.



IBM's Synergetix Personal Computer workstation.



The Activity Center Modules from Harvey Probbler Inc.

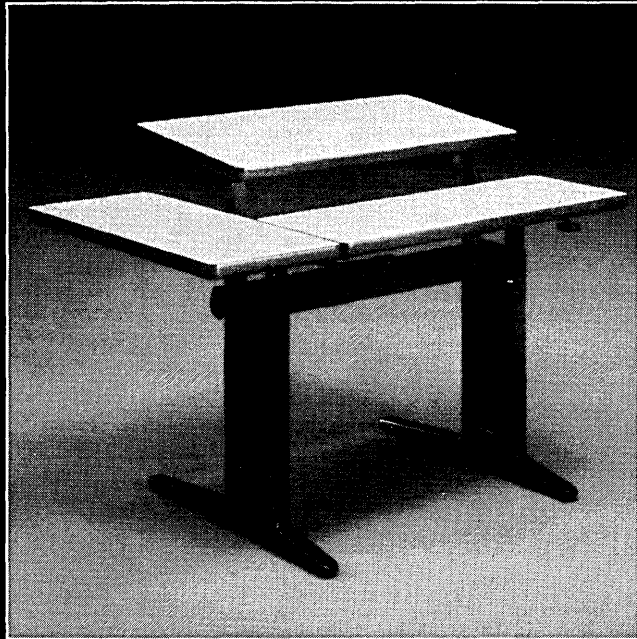
hardware systems. But the movement of technology to the desktop forced a new awareness of the need for equipment that is ergonomic as well as efficient.

These lessons were not lost on furniture firms, which came out of the woodwork to fill the ergonomic gap left by derelict suppliers. The

furniture industry, which has suffered from sagging sales, was grateful for this new business opportunity. While there are no firm figures on market size, Stephen Channer, executive director of the Business and Industrial Furniture Manufacturers Association (BIFMA), reports that the office automation furniture market

“is the fastest growing segment of our industry.”

Attempting to compensate for the design deficiencies inherent in many office automation systems, furniture makers started to come up with new furniture lines to help smooth over the technological troublespots, such as nonadjustable



Dual-surface adjustable table from Westinghouse Inc.



"High touch" is the design approach at Knoll Int'l.



Dedicated terminal station from Herman Miller Inc.



Steelcase's Series 9000 adjustable keyboard tray

chairs. Such deficiencies were corrected much earlier in Europe, where labor unions demanded that more attention be paid to potential health hazards in the work place. Much of the current ergonomic design theory for furniture, in fact, comes from West Germany. Making use of this expertise, many U.S. fur-

niture firms have hired German designers to work on their new line of office wares.

At the forefront of the ergonomic movement, West Germany has legislated into law stringent safety requirements for dp and office products. Last January new standards for office automation furni-

ture also went into effect. "That was really what got [U.S. furniture] manufacturers in tune with the worker," declares Charles Mauro, a chair designer who also heads his own firm, Human Factors Design Engineering.

Furniture makers may have to be even more tuned in to the office worker if hard and fast rules get

## "We're trying to maximize the potential of operator time by minimizing discomfort."

handed down by the government. The National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) have both assumed major roles in instituting guidelines for ergonomically designed office furniture. "OSHA is becoming to the office what it once was to the factory," says Rick McKeon, a facility consultant with Herman Miller, a leading furniture manufacturer.

### MEASURING UP TO THE MANDATE

But it won't only be the furniture makers who will have to meet this new ergonomic mandate. Computer suppliers and their end-user customers may also have to measure up. Legislation proposing health standards for all aspects of the computerized office, such as vdt radiation guidelines, is currently pending in various states, including California, Illinois, Maine, New Jersey, New York, and Oregon (see July, *News in Perspective*, p. 56).

Speeding along a fast technological track, Americans are just now becoming aware of some of the more personal aspects of the automation age. Popular books such as John Naisbitt's *Megatrends* have helped further this awareness. Capturing the computer consciousness of his American audience, Naisbitt writes, "The more high technology around us, the more the need for the human touch."

That statement must have gone over big in the furniture industry. It certainly did at Knoll International, where vice president of systems George Wilmot explains his company's credo: "We believe that you need to balance high tech with high touch to make the total work environment more comfortable."

Comfort is the key to Knoll's design strategy. To overcome some of the intrinsic ergonomic flaws in OA equipment, Knoll focused on furniture that would enhance vdt screen visibility while providing for keyboard and seat adjustments. Changes in seat position are necessary to accommodate different terminal use needs and patterns.

Knoll's desks come with easily pulled out drawers that stow the keyboard after use. The furniture has an overall soft look that reflects the company's concern with blending high tech with high touch.

Like Knoll, most major furniture makers are integrating ergonomic concepts into their office designs. The current design features of some office furniture, however, will become obsolete within the next year or two as systems producers begin tailoring their wares to ergonomic needs. Most manufacturers, for example, already offer detachable keyboards.

Monitoring these trends closely, furniture designers are already anticipating the

styles for the future—the office of the future, that is. "We know that right now we'd better have adjustability and tilt," explains Herman Miller's McKeon, "but we also know that in several years those features will be outmoded. A furniture line can't be so dedicated that it becomes obsolete. We have to build the future into our designs, and we know that flexibility and the concept of retrofit will be of primary importance."

Flexibility at all levels is indeed the byword at Herman Miller, which uses the Facilities Management Institute (FMI) in Grand Rapids, Mich., and its own research center to brainstorm furniture fashion for the future. The company's Action Office furniture, for example, accommodates different levels of terminal usage. Modular components allow for flexible arrangements of furniture, integrating various levels of terminal and manual work.

FMI senior research associate Mike Wodka says that the primary design considerations are dictated by the functional level of the job and terminal usage. "When you spend 25% to 30% of your time at a terminal, ergonomics becomes crucial," he maintains. "Postural support, the height of the table in relation to the chair, the height of the screen, and the physical arrangement of the terminal and manual components are critical."

While most managers are spending more time at the terminal, the heaviest users are still the secretarial and support staff. Ergonomic considerations are nevertheless still factored into management-style furniture. For one thing, desks should be designed to accommodate the low-profile terminals that many managers prefer, since they can be easily tucked away when not in use. Managers also need furniture that will allow them to have quick and easy access to the terminal for such things as meetings, where screen visibility is important.

Management's sporadic use of terminal facilities poses a special problem to furniture makers. "When a terminal is used only 20% of the time, you have to rethink configurations," explains FMI's Wodka. "Mobility becomes of primary [importance], and the furniture goes through another transition phase."

But it's still at the lower echelons where ergonomics can have a real impact. What we're talking about here is productivity. Offering an interesting twist on a Marxist theory, ergonomic specialists believe that happy (physically comfortable) workers are productive workers. IBM, a recent entrant in the furniture field, also believes that "when a worker is more comfortable, that leads to increased productivity," says Larry Sadler, national sales manager for workstation products in IBM's Systems Supplies Division.

Herman Miller's McKeon puts this productivity issue in perspective: "The major corporations are fully aware that to survive, they must function at the level of their competitors. It costs them a lot to find and keep good employees who are skilled in their fields, and work conditions have become one more aspect of that competitive environment."

Steelcase, another major force in the furniture industry, has spent a lot of time probing the productivity problem. "Basically, we're trying to maximize the potential of operator time by minimizing discomfort," explains Don Corell, director of research at Steelcase. One way to achieve those dual goals is through chair design—something Steelcase knows plenty about. The company's current Series 9000 and Ultronic 9000 chair lines are the result of years of research.

Steelcase has also zeroed in on other ergonomic concerns. "We've also emphasized keyboard adjustments," reports Corell. "We think that display manufacturers will make the necessary accommodations with screens, but that keyboard adjustments will be a major factor."

Meanwhile, some other companies in the furniture trade are tackling office automation needs from an even more pragmatic point of view. Where, for example, do you stow the clutter—all those disk drives and printer paper? Harvey Prober thinks it has the answer with its German-designed Action Center Modules. The sleek, soft-edged furniture features convenient storage facilities, as well as a modular approach that accommodates various levels of terminal usage.

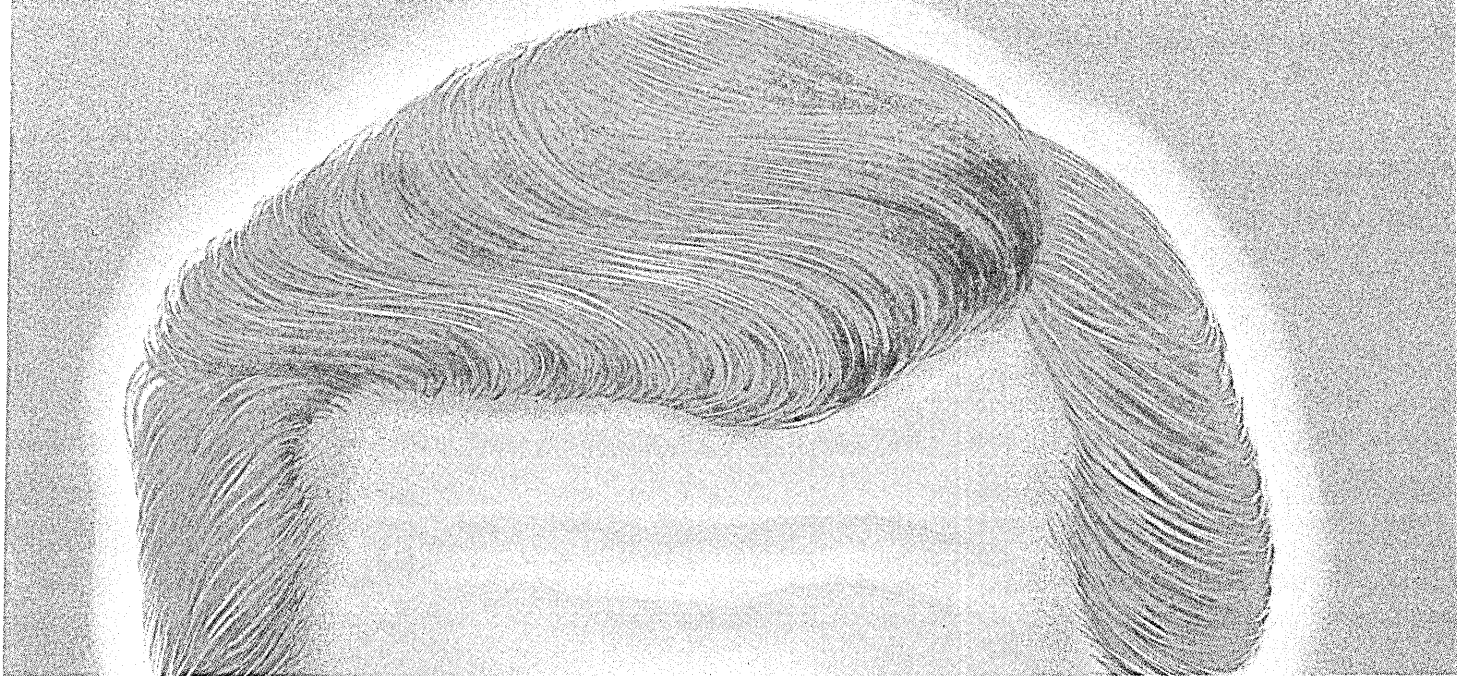
One company in a prime position to integrate furniture trends with technology is the inimitable IBM. The computer giant, which unveiled its first furniture product—the Synergetix furniture line—in August 1982, followed up last April with the Synergetix personal computer table.

While the Synergetix line is geared for the heavy user, the personal computer table is also attracting customers at the consumer level. "We're seeing the demand in the home marketplace as well," Sadler says.

Computer furniture for the home? Could this open up still another new furniture frontier—Furniture for Fun and Games or Furniture for Financial Figuring?

And while there's a lot of musing about the furniture of the future, there remain some troubling questions about the office technology of today—some that can't be solved by quick reupholstery jobs. Says industry designer Mauro: "Primary design considerations really depend on the user group. With executives, the main issue is software, not furniture. If you have a computer that's fundamentally poorly conceived, no amount of furniture will help." \*

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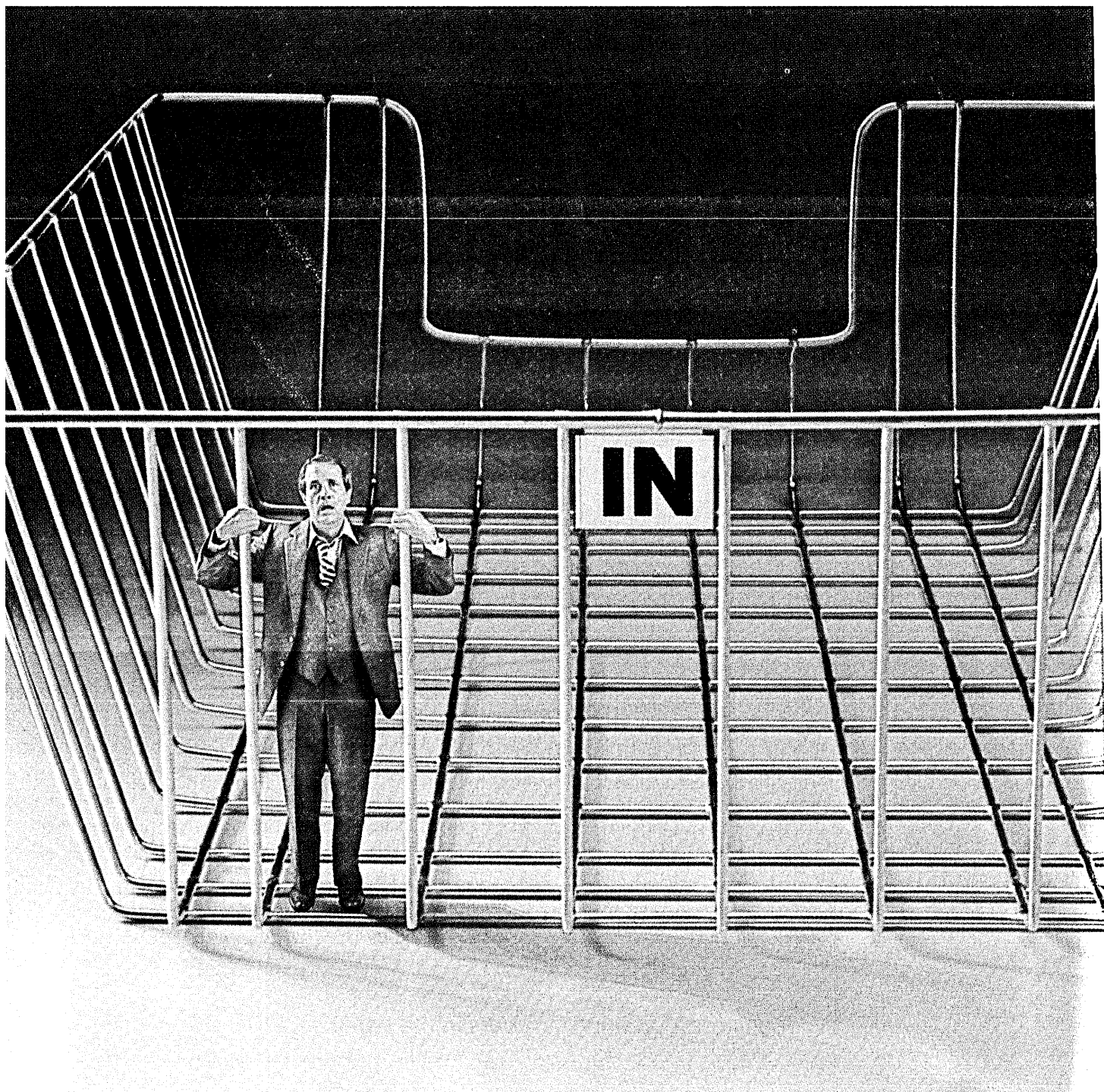
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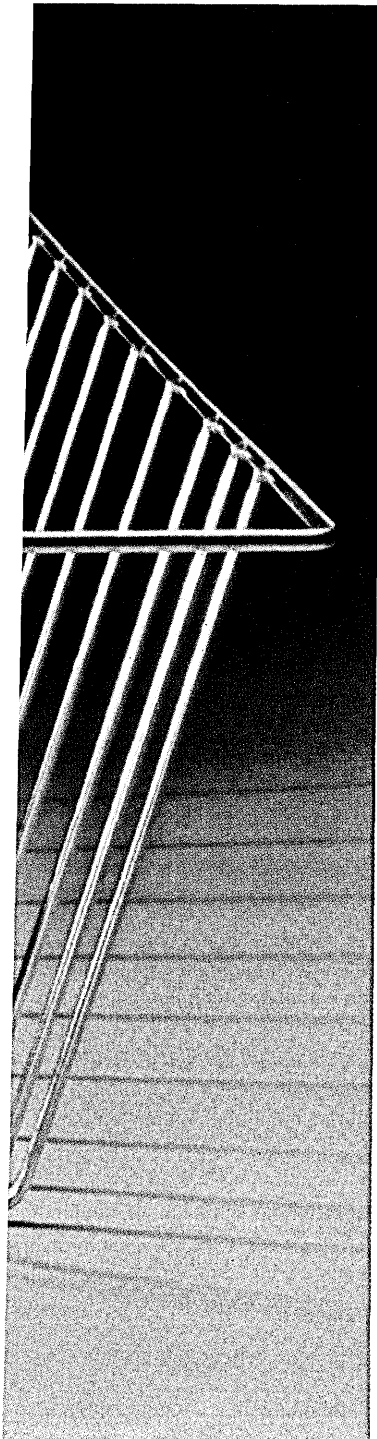
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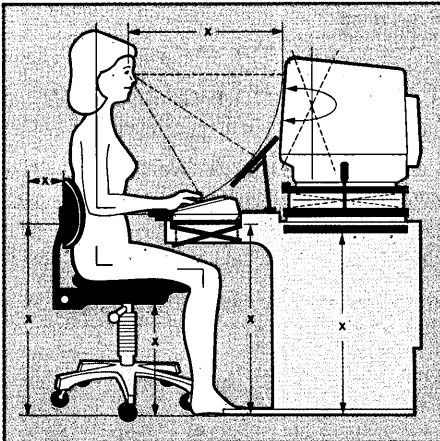
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a Generation ahead.

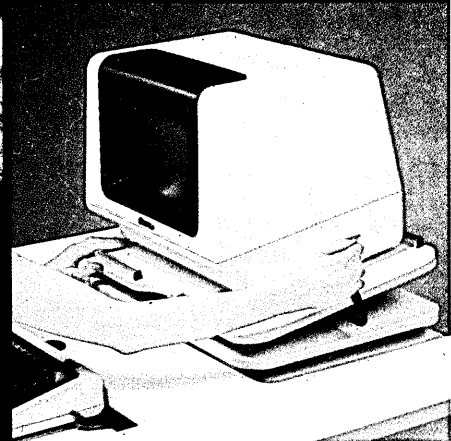
# BIOTEC™ addresses the human variable...



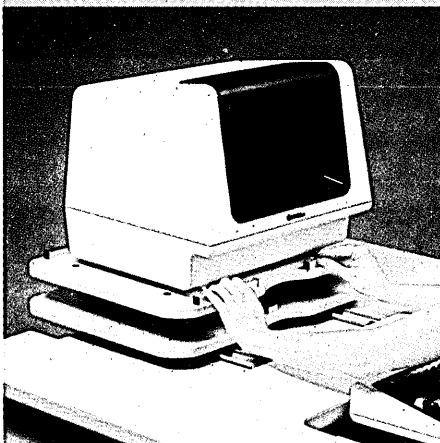
BIOTEC ergonomically designed VDT furniture allows universal adjustment for correct operator posture and comfort thereby reducing fatigue.



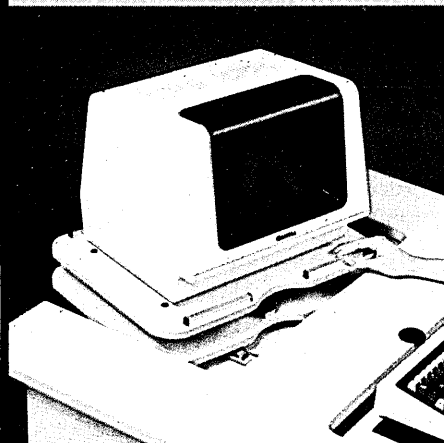
Operators of differing statures adjust the height of the VDT, while seated, to maintain proper line of sight...especially critical for persons wearing bifocals.



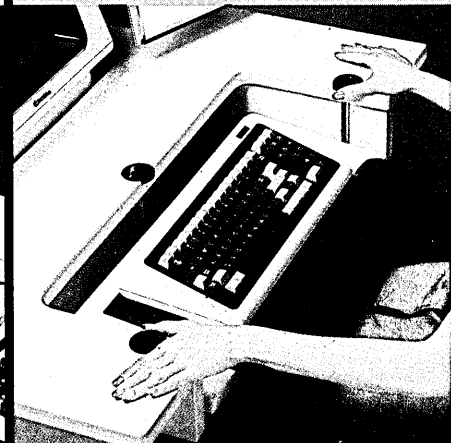
Glare and reflection are eliminated by tilting the VDT. Variances in viewing angle are also accommodated.



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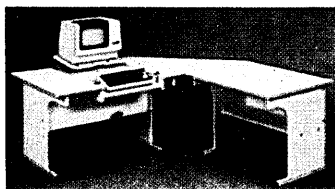
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CIRCLE 72 ON READER CARD

**Despite advances in storage techniques, removable disks are still with us. So is the problem of contamination.**

# TO CLEAN A DISK

**by Joseph M. Ludka**

In its brief, 30-odd-year history, commercial data processing has witnessed a remarkable succession of mass storage technologies, each promising at first to replace those that preceded it. Fixed disks were to have eliminated removable disk packs, which were to have done away with magnetic tape, which was to have replaced the primordial punch card. Even if no new data storage method has completely dominated dp systems, the cost of storing one bit of data has dropped by several orders of magnitude.

And yet, technology's headlong rush has not eliminated a nagging problem for the user of removable disk packs—contamination of disk surfaces by small airborne particles. While head-to-disk distances and track-to-track distances have been reduced to boost storage densities, the need to care for exposed disk surfaces and eliminate such particles has increased proportionately. In 1963, a typical particle caused the reassignment of a single track of data. In 1983, the same particle wipes out the equivalent of 118 tracks.

Although disk technology in removable packs has improved considerably over the years with new oxide formulations and surface coatings, the contamination problem remains for many users. Despite the onslaught of fixed disks, disk packs now account for 45% of all installed 14-inch drives. Looking into the future, market researchers project that removables will still account for a 20% share in 1987. The cleaning of disk packs, then, promises to be the dp staff's chief method of preventing problems with removable disks.

It wasn't always that way. Engineers used to assure users that contamination was no problem and that disk pack cleaning was not required. After all, the line went, alternate recording tracks were provided that would take care of any messed up tracks, whatever the reason. Problem solved? Sure, until the supply of alternate tracks on a particular platter surface was used up, after which the drive simply stopped. This was generally the way users were introduced to the "Big C," contamination. Like playing pool in River City, it led to trouble, big trouble.

How to solve the problem? Simple. If the packs were leased, one simply called the vendor and requested replacements. If the packs were owned, however, things were a little more difficult. The bad pack could be set aside and replaced with a new one, but if data had to be transferred between the two, other means were necessary. Usually a customer engineer would reach for his trusty tongue depressor and bottle of 91% isopropyl alcohol, and scrub away the problem.

That procedure often worked, at least temporarily. For while the engineer helped you recover data from the bad pack, he was also introducing additional contaminants to it that further damaged its surface.

Such problems drove the market to fixed disks that, sealed hermetically, effectively eliminated the contamination problem at the expense of higher overall storage costs and a lesser degree of flexibility. Removable disk makers responded with improved reliability in their products and the pitch that disk packs could be used to back up fixed machines. Digital Equipment, for instance, is understood to have sold more than \$300 million in removable disk drives last year with even more expected this year and next.

Others, such as Prime, Data General, Wang Labs, Tandem, Perkin-Elmer, Texas Instruments, Calma, Honeywell, Burroughs, Four-Phase, System Industries, Computervision, and NCR, continue to market removable systems to new and existing customers. Many vendors in fact question the "return" of removable disks. To them, removables never went away in the first place.

But the need to improve reliability and performance of removables has triggered a number of studies and tests that generally conclude that contaminated disk packs play a prominent part in disk failures and that regular disk pack maintenance can substantially extend mean time between failures (MTBF).

DEC, for instance, devoted 15 months to a study of regular disk pack maintenance and found it so beneficial that it is promoting the service among its customers. System downtime and emergency service calls were reduced substantially while system throughput was enhanced.

Other firms have found regular pack maintenance a boon in upholding the "up-

time guarantees" of their maintenance programs. The vendor guarantees the customer's system will remain operational for as much as 99% of each month, and guarantees an almost immediate response to service calls. Credits are issued to customers in the event the vendor misses its contracted guaranteed performance level.

Still others, including Control Data, continue to evaluate the long-term positive and negative (if any) effects of continued pack maintenance. The prognosis seems to be that regular pack maintenance will soon become as common as regular system preventive maintenance.

## **NOT A GENERIC PROCESS**

While studies to date support Digital's conclusions about the benefits of disk maintenance, they also have concluded that pack maintenance, per se, is not a generic process. There are many ways to service packs; while some produce excellent results, others may worsen existing problems. Many difficulties stem from the fact that some less-than-professional firms have hurt customers, rather than help them, by their shoddy methods. This mandates that vendors and users make certain of the qualifications of firms representing themselves as disk maintenance specialists before they entrust valuable disk packs and data to them.

Drive and pack manufacturers share in the confusion about right and wrong ways to maintain disk packs. They, too, have alternately benefited or been burned by one or another disk cleaning firm. Their advice to customers is often based on their most recent experience with a good or bad result. One company advised customers that it would only permit customer pack cleaning by firms on an "approved" list. It admitted, when pressed, however, that no such list existed.

To gain an understanding of disk maintenance, vendors and users should take time to evaluate all types of inspection and cleaning, including actual tests with problem packs, to separate bad suppliers from good ones. Maintenance firms generally fall into three categories, with several subcategories, as follows:

*Inspection only.* This group espouses the '60s philosophy that packs still require no

## Instead of asking a company how they clean packs, buyers ask "How much?" That can lead to disaster.

cleaning, but should be inspected periodically for irregularities, coating deterioration, tolerance failures, and contamination buildup. We're asked to believe that an inspector can actually detect a 20 microinch contamination buildup. Do you believe he can? Can you?

These vendors also maintain that head crashes are predictable through perceivable deterioration of the disk surface. Unfortunately, most crashes are spontaneous, and no amount of previous inspection will predict or prevent a crash. Head-to-disk interference, or contact, can be noted, but it is found only after the actual contact has occurred, and the inspector can only judge the severity of the contact. If the contact marks are severe, a crash has already occurred.

Inspection only also provides no preventive benefits. Contamination-caused disk errors can't be eliminated unless and until the contaminants are removed, and that requires positive action. One can repair or replace the pack, but that carries the same high costs as other forms of corrective maintenance.

**Dry wipe.** This method is comparable to inspection only, except that a "dry wipe" contamination removal method is used. That, or the disk surfaces are spritzed with compressed air in the hope that contaminants will be blown away. Dry wiping entails wrapping a piece of cloth or tissue around a tongue depressor and scrubbing the disk surfaces. This compares with wiping the windshield of a car with a dry cloth, rather than using a liquid cleaning agent. It's also similar to wiping eyeglasses without breathing on them first. At best, it smears contaminants around. At worst, it can scratch the disk surfaces and cause permanent, costly damage. And the low pressure of a compressed air spritzer, compared to the 140-MPH air flow of the air bearing on which the R/W heads fly, makes spritzing childish and completely useless.

**Wet wipe.** This approach combines

inspection with some form of wet cleaning, which is subcategorized in three ways;

- **Manual.** Here's the old '60s manual swab group, which saturates a pad-wrapped depressor with cleaning solution—91% isopropyl or alcohol/Freon combination or other combination of chlorinated hydrocarbons—and scrubs each disk surface as uniformly as possible. There's some doubt as to this method's effectiveness. Many of these practitioners still hide behind the 1960 American National Standards Institute (ANSI) 1316 pack specifications, which read, "The magnetic surface of recording disks shall not be adversely affected by a 91% solution of isopropyl alcohol (made from reagent grade isopropyl alcohol mixed with 9% distilled or deionized water by volume) when used for cleaning."

The statement has been eliminated from ANSI specifications on newer, high-density packs, but even in the '60s the statement did not address cleaning, but rather the durability of disk platters and their ability to withstand chemical cleaning.

This method can be checked out in a simple, do-it-yourself test. Clean only the top, cover disk (nonrecording) of a pack with a swab and 91% IPA solution. When you have finished, try the "huff" test used by the optical industry: breath gently over the cleaned surface. What comes into view will amaze you!

- **Mechanical.** This group mechanizes the manual swab technique. Saturated pads or cloths are placed on holders that move slowly and radially across the disk's surfaces as the pack rotates slowly. Results are about the same as with manual swabs, except better contact with all surfaces is made. But since the pads can only move into the pack and back out, they tend to "snowplow" the loosened contaminants toward the inside of the surfaces and leave them there. Breath tests on these surfaces after cleaning can often show

poor results.

- **Brushing.** This group is similar to and sometimes mistaken for the previous one. An automatic cleaner equipped with a series of brushes rather than pads is used with a proprietary cleaning solution. A primary advantage here is that the brushes make multiple passes across the rapidly rotating disk surfaces, dispensing filtered solution evenly on each pass. This enables the solution to emulsify and lift contaminants from the surfaces. The dirt is then spun from the disk surfaces, leaving the pack residue-free and ready for immediate reuse. Heated air helps complete the drying process of the pack.

Chemical action, not scrubbing or rubbing, is responsible for the cleaner's success. Proper cleaners and solutions will even remove heavy petrochemical (oil) contaminants. The oil removal test has been recognized as the best way to test a cleaner's capabilities.

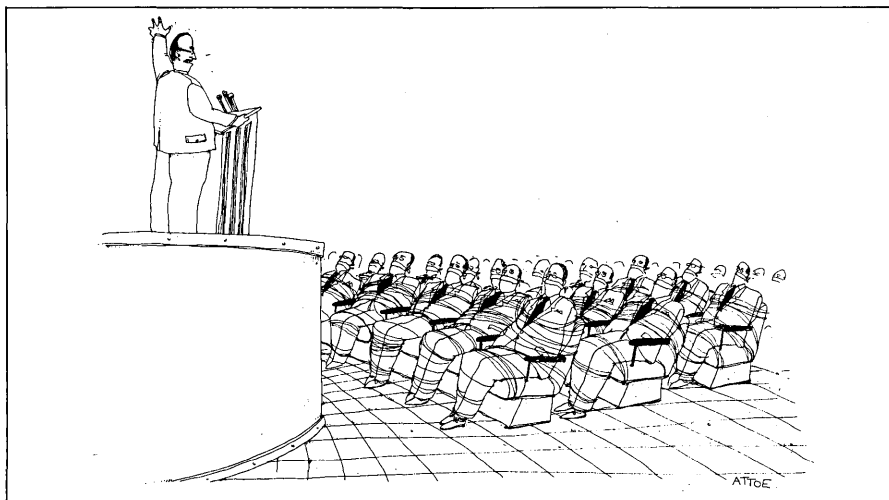
### LUMPING METHODS TOGETHER

A great mistake for vendors and users alike is to lump all forms of disk cleaning into a single, generic group. Instead of asking a company how they clean packs, buyers ask "How much?" That can lead to disaster. "How" determines the effectiveness of the cleaning.

Make sure you know what you are paying for when ordering disk pack maintenance services. Choosing a vendor means using common sense and then some. Briefly, one should deal only with professionals who make disk pack maintenance their primary business. Ask for customer references and check them out. Check out the suppliers' credentials, regardless of recommendations. Ask for and watch a demonstration of the suppliers' services, if possible using one of your own problem packs. Become familiar with the specifications and recommendations for the particular packs your shop uses and see to it that a potential vendor can meet the product's requirements. In sum, get to know your equipment's needs and shop carefully.

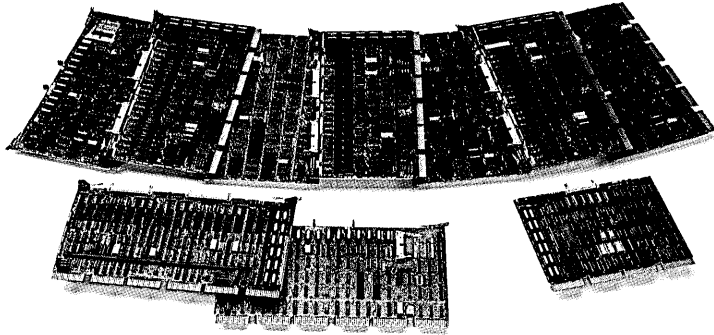
Periodic disk maintenance can and will generate remarkable improvement in performance and reliability of your system. Fixed disks may be here to stay, but a conscientiously maintained disk pack is tough to beat, whether used for primary or backup storage. \*

Joseph Ludka is founder and president of Randomex Data Maintenance Inc., Signal Hill, Calif. He has worked in the computer industry since 1961 and has been active in the removable disk media field since 1968. His previous positions include director of marketing with CFI Memories and president of Athana Corp.



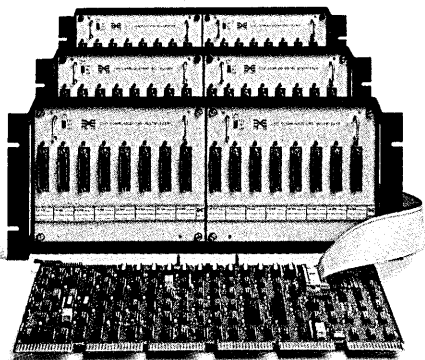
CARTOON BY STEVE ATTOE

# Five reasons why DEC users should buy Emulex communications controllers.



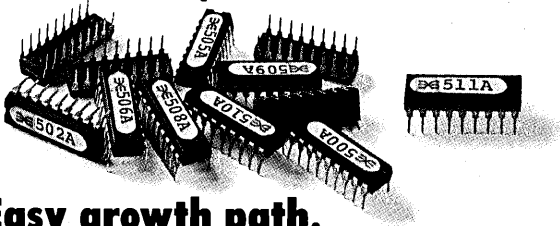
## Broad product line featuring our new DMF-32 emulation.

Nobody covers LSI-11, PDP-11, and VAX-11 users' needs like Emulex. More than 15 software-transparent controllers emulating DH11, DZ11, DV11 and DMF-32. All deliver improved line-handling capabilities, in a smaller package, at lower costs.



## More channels.

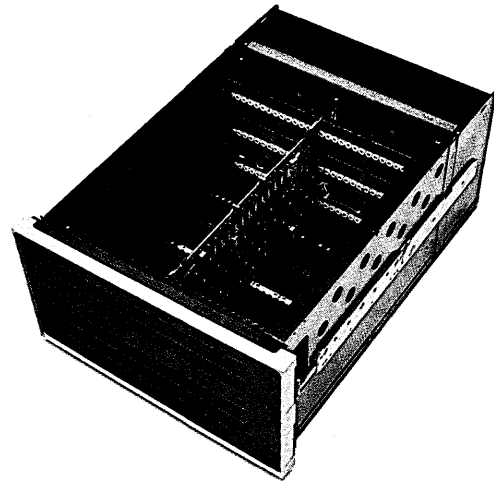
Emulex's new DMF-32 emulation is typical. One controller board handles up to 64 lines, vs. only eight per DEC module. And Emulex offers *all* lines with modem control, not just two. For even more lines, Emulex's Statcon Series is the answer. We simply add a low-cost port concentrator, so that with one controller board you can connect up to 256 remote *and* local terminals.



## Easy growth path.

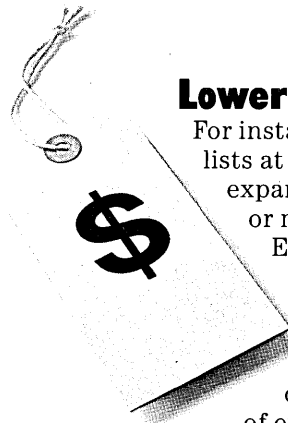
As your system grows, upgrading is simple with Emulex controllers. Just change PROM sets. Example: DH to DMF for \$350. In addition, Emulex's advanced microprocessor architecture is consistent throughout the product line. Think of the inventory savings.

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## Fewer backplane slots.

Emulex communications controllers pack so much capability onto each board that fewer boards are needed. Take a 64-line DH11 emulation. Emulex does on one board what it takes DEC to do on 36. Think of the savings in rack space, to say nothing of price.



## Lower prices.

For instance, a DEC DH11 controller lists at \$8,950 per 16 lines, with expansion chassis costing \$3,000 or more. Compare that to Emulex's CS11/H at \$4,500 for the first 16 lines and \$3,000 for each additional 16 lines. At 64 lines, you suddenly have savings of about \$23,000 and a lot of extra slots to boot.

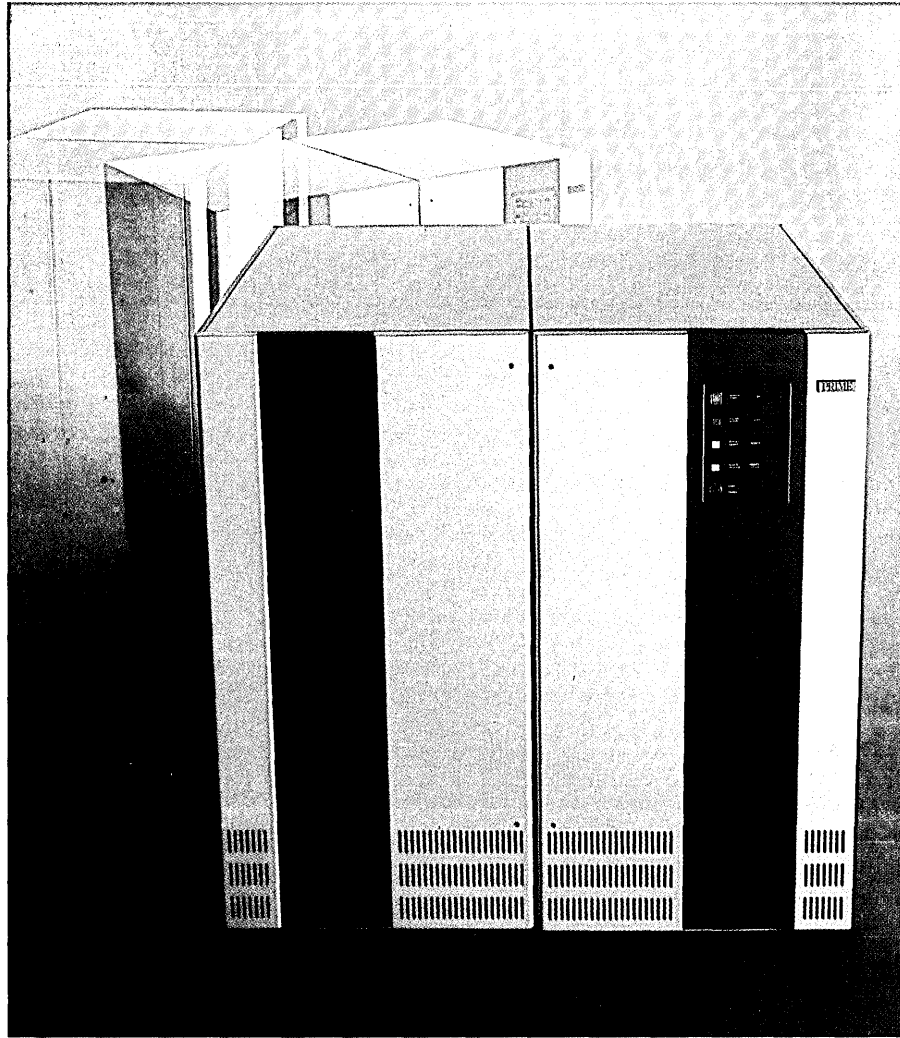
Don't speculate with your communications controller dollars. Invest in Emulex. Phone toll free: (800) 854-7112. In California: (714) 662-5600. Or write: Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626.



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**Exporting has become an exercise in frustration for U.S. vendors doing business overseas.**

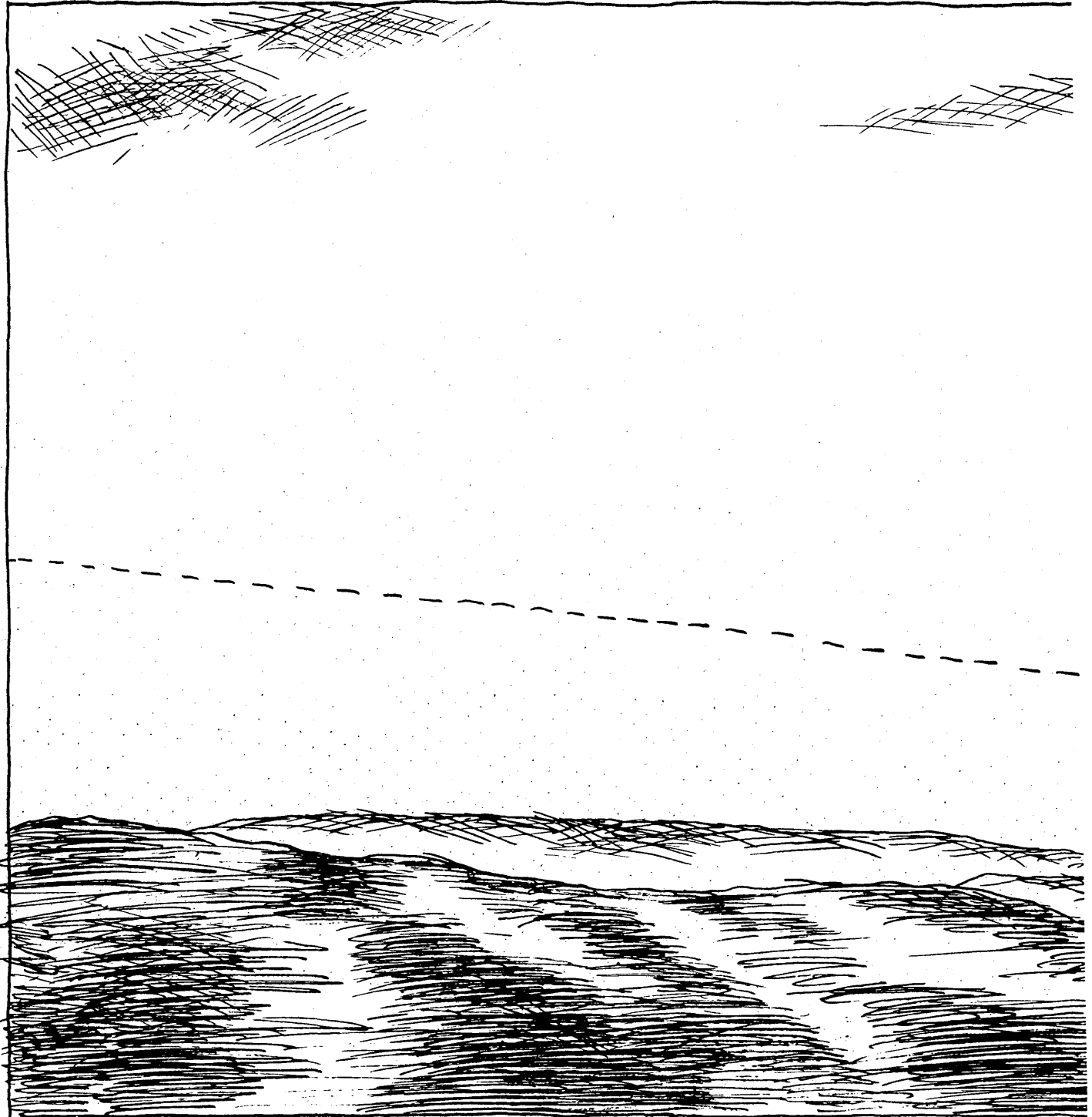
**by Willie Schatz**

First, the good news. Let's say you've already cut yourself a healthy piece of real estate in the high-tech jungle over here. Like any worthy capitalist, you want to expand your horizons and do some business over there.

Now, the bad news. Sometimes you can't get there from here.

Welcome to the world according to the Export Administration Act (EAA). That planet is divided into two factions. On one side is the Reagan Administration, which is determined to prevent the wrong products—critical high-technology wares—from falling

# THE HITCH IN HIGH-TECH TRADE





into the wrong hands, as it believes the EAA mandates it to do. On the other side is business, which insists that not only are the wrong products getting into the wrong hands through no fault of its own, but the right products can't even get into the right hands. Not only that, getting those wares to the right place takes forever.

"You almost always get the export license to send your product overseas," says a knowledgeable source at one of the nation's 10 largest dp companies. "But it takes so damn long to get it that you're at a real competitive disadvantage.

"When you're going head to head with an overseas competitor, the customer

will say, 'Everything is good, but you can't tell me whether we can work it out for another two months because you don't know if you'll get the right license.' The length of time it takes and the uncertainty whether the U.S. supplier can do what it says are clearly intangible factors in the customer's decision. He doesn't know if he's going to get the product when he needs it. He's not sure if he can get the service. And he has no idea if he can get the spare parts."

"We had difficulty selling overseas all the time," complains Rep. Ed Zschau (R-Calif.). In 1968 Zschau founded System Industries, a Silicon Valley manufacturer of disk memory systems for minicomputers.

When he left his job as president to run for Congress in 1982, the firm had 550 employees and annual revenues of more than \$60 million.

"We didn't have an office of export control," says Zschau. "We'd let the accountant handle the forms because he was good with numbers. We'd screw up and not fill them out right. Many times our quarter would be worse than we'd forecast because we didn't get out a shipment we thought we would. For the little company, it's really a big problem.

"There was nothing we could do. We did our best to expedite the license application. We tried to get to know the [Department

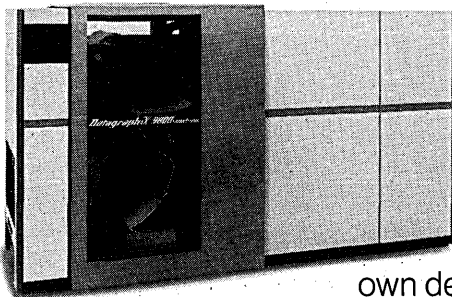


ILLUSTRATION BY BRAD HOLLAND

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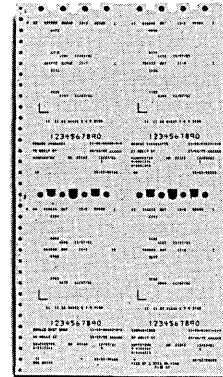
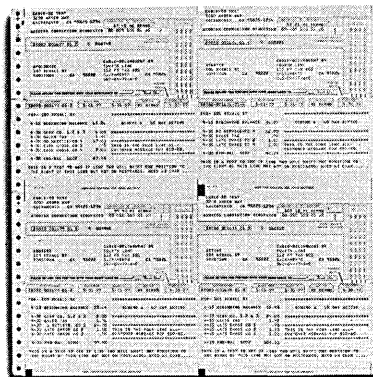
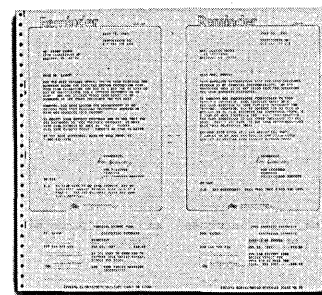
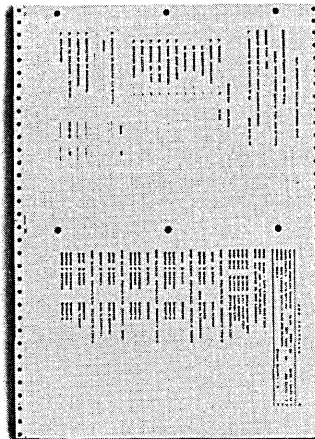
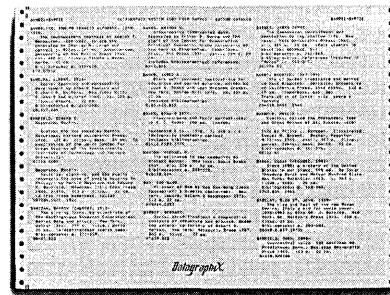
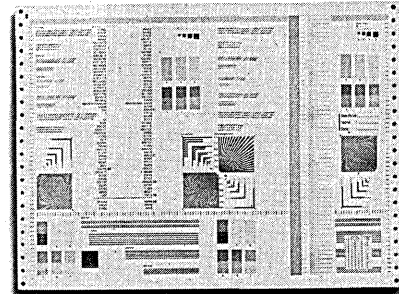
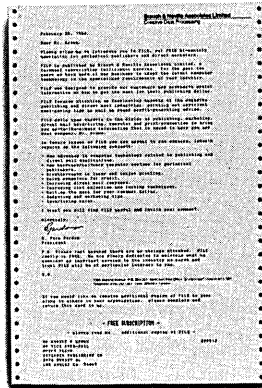
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## FROM TRICKLE TO FLOOD

It's not true that détente occurred several million years ago. It only seems that way.

It must seem even longer to the high-tech firms that were doing a booming business with Russia and friends. Way, way back then, in the early- to mid-'70s, no one thought a lot about transferring technology to potential adversaries. The rule more or less was, if it's good business, do it.

They don't play that way anymore—not legally, anyway. The flow of officially sanctioned technology has been stemmed to a trickle. Not surprisingly, there's a flood of unofficial technology transfer. There's gold in them thar silicon chips. Just how much was documented in a November 1982 report by the Senate Permanent Subcommittee on Investigations. The study cited 11 cases in which the Soviets begged, borrowed, stole, or bought U.S. technology, either directly or through intermediaries.

"There has been a substantial lag in public and official appreciation of the national security implications of the new technology," Santa Clara County deputy district attorney Douglas Southard told the subcommittee. Referring to the theft of chips by the very successful president of a parts distribution firm, Southard said, "This type of greed is not unusual in the context within which he worked: Silicon Valley, a prime example of capitalism on the rampage. Everyone wants to become an overnight millionaire and money flows like water, tempting the otherwise honest citizen to scramble to get his share of the pie."

Not surprisingly, the U.S. government is mad about the gold rush and madly trying to stop it. The question is how to do it. The Department of Commerce is trying through its export control program. The Customs Service is trying via its ballyhooed Operation Exodus, which could hardly be termed a success. The Department of De-

fense is trying to stop everything and blaming Commerce for stopping nothing.

"A lot of people are confused on this issue," says Rep. Don Bonker (D-Wash.). "It's not a question of the export license process as far as getting technology out of the country is concerned. It's the illegal and covert activities that are doing it."

"We've gotten all the blood we can out of the export control turnip," contends Rep. Ed Zschau (R-Calif.), founder of Silicon Valley's System Industries. "You hear testimony from [Assistant Defense Secretary] Richard Perle and his national security people about the so-called hemorrhaging of technology and about how the Soviets treat our technology as their national resource."

Forget the turnip. The ones really getting squashed are the high-tech companies trying to sell their wares overseas. To be sure, no honest soul wants to risk the health and welfare of the republic for a few bucks. But enough of this DoD hypochondria, already. Let an honest company make an honest living.

Some of those honest livings may soon be made in China, as a result of the administration's recent decision to liberalize the rules for the export of dual-use high-tech equipment. The sale of military equipment will be barred, but the rules allow vendors to assume they can ship their products unless told otherwise.

But that's only the legal aspect of doing business with the East. It's on the illegal side where, according to what Robert McDiarmid, former head of Santa Clara County's organized crime unit, told the *San Francisco Chronicle*, "there's just a horrendous amount of money to be made."

And when money talks, technology walks.

W.S.

of] Commerce people and make them feel sorry for us. They should have, because we were being hurt. We eventually always got the license. But it was an incredible hassle."

Even the Department of Commerce (DoC) admits that not all is right with its world. It claims that 80% of its export licenses are granted in 30 days and 90% are issued in 60 days. It also alleges the average processing time is 30 days and dropping.

### CONTROL FEVER AT DOC

"We are trying to control too many things," a DoC source concedes. According to the Commodity Control List (CCL), there is plenty to keep an eye on. The book runs on ad nauseum for 800 pages. The items in it aren't necessarily forbidden fruit for overseas buyers. They just have to be carefully scrutinized.

"We're doing better and better," the DoC staffer says. "We've put a great deal of resources and effort on improving our en-

forcement techniques. Everybody agrees that the situation has improved tremendously."

Well, not everybody. Not the House. Not the Senate. And certainly not the high-tech industry. Thus is joined the battle of what to do with the current Export Administration Act, which was enacted in 1979 and was scheduled to die at the end of last month.

The EAA is the first legislative attempt to balance two diametrically opposite objectives: stemming the flow of militarily critical goods and technologies to potential adversaries and maintaining an environment conducive to free trade. Before the '79 Act, exports came in a poor second to protecting our shores from whatever menace was rampant at the time.

It all began with the Export Control Act of 1949, which shut down practically all trade with Eastern bloc countries. Two years later the Mutual Defense Assistance Control Act, AKA the Battle Act, made it clear that exporting was a privilege to be enjoyed with-

in the strict confines of defense strategy. This act's chief legacy was to codify a multilateral process among Western nations to coordinate decisions on what is controlled and how those controls should be implemented and enforced.

The foundation for this process was—and still is—the Coordinating Committee, or COCOM. It is this informal group of NATO countries (minus Spain and Iceland) plus Japan that decides how to control exports to protect their mutual security. Part of the problem, according to many in the U.S. high-tech industry, is that this system has not exactly evolved into equal protection under the law.

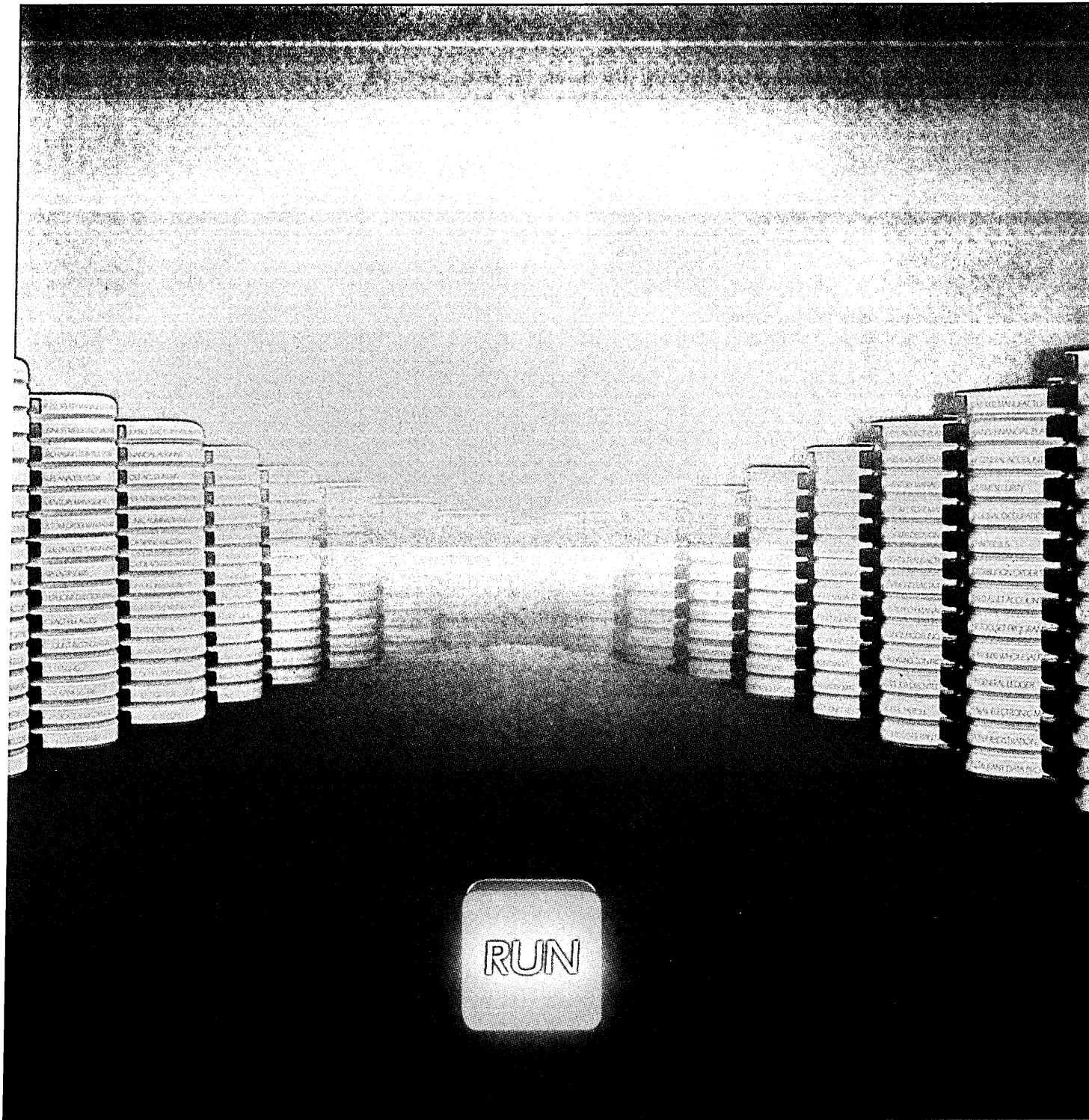
A series of export laws spanning 30 years culminated in the 1979 version of the EAA. Despite strong pressure from DoD to expand its role as overseer, Commerce maintained its preeminent position. Deadlines were specified for licensing decisions, licensing procedures were established, and applicants were permitted to obtain information relating to their cases. The act also required that an impact analysis be done before any control was implemented.

Under the act, controls could only be imposed for three reasons: to protect national security, to further significant foreign policy objectives, or to protect the domestic economy in times of short supply. All presidentially imposed controls had to fall within one of those three areas. Thus ended controls by presidential fiat.

But the fun had just begun. One pipeline controversy, two grain embargoes, and countless delayed shipments later, it's the same old song. The administration wants more controls; high tech wants less. The administration wants DoD to watch over more materials; industry wants the agency to keep its eyes closed. The issue of foreign availability is still foreign to many. Attempts to enforce U.S. control decisions extraterritorially have not thrilled our COCOM partners. As the number of restricted items rises, so do the applications to send them overseas. As a result, it's taking longer and longer to get a product out of the country.

"EAA assumes that the freedom to export is a right, to be abridged only under specific circumstances," wrote Congress's Office of Technology Assessment (OTA) in last May's update on *Technology and East-West Trade*. "At the same time, EAA grants the Executive sweeping powers to define these circumstances and places the burden of proof in questionable cases on the potential exporter. The Executive power is offset primarily by nonbinding provisions designed to limit its use; i.e., EAA requests, but does not enforce, Executive self-restraint. This is the root of much of the controversy which has





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## "The Military Critical Technologies List is the size of the New York phone book and worth a lot less."

recently surrounded export administration."

"Licensing requirements and the burden of controls have continued to grow for both government and the exporting community," the House Export Task Force notes. "American exporters have suffered increased costs due to licensing requirements and sales losses due to licensing delays. U.S. firms have been characterized as unreliable suppliers because of the unpredictable and often arbitrary nature of export control decisions, especially in the area of foreign policy controls. Excessive use of unilateral controls and insistence on the extension of U.S. law and control decisions extraterritorially and retroactively has caused heightened tensions between this country and our allies in Europe and Japan.

"In spite of the costly burden of export controls, there has been no measurable improvement in the safeguarding of sensitive technologies from diversion to the Soviet Union and its allies."

So, having come this far, where do we go from here? The administration would just as soon play a pat hand. The House and Senate have each proposed a new deck, although the strong suits would be different. The high-tech folks just want to be able to get their products to the boat on time.

### COMPETING AGENCIES, MOTIVES

"If government policy seems in disarray it's because several agencies and several motives are competing," says Rep. Don Bonker (D-Wash.), chairman of the House Subcommittee on International Economic Policy and Trade. "We've invariably found that foreign policy controls and sanctions don't work. Ultimately it's our businessmen who get hurt.

"People aren't satisfied with the administration of the program because the process itself is unduly complicated and we're doing too much. Commerce doesn't have the staff or resources to do the job efficiently. The result is a lot of delays, a lot of uncertainty, and a lot of missed opportunities."

While that may be true for most U.S. businesses, it certainly isn't the case for the computer and business equipment sector. According to the Computer and Business Equipment Manufacturers Association (CBEMA), America continues to maintain a positive balance of trade in computers and business equipment with all major geographical areas, except Japan and Taiwan. CBEMA also projects the 1983 trade surplus to be \$6.7 billion. That's hardly a meteoric rise above the 1982 figure of \$6.6 billion, but when the rest of the U.S. business world is staring down a \$70 billion hole, no one's complaining.

The news wasn't all good, however. The first quarter positive balance of trade

dropped by 1.7% last year to \$1.569 billion in 1983. The trade deficit with Japan increased 44.8% to \$443.6 million, and it went up 117% to \$26.5 million with Taiwan.

Exports of computers and business equipment to all countries in the first three months totaled \$2.92 billion—up 11.7% over the comparable period in 1982. The 1983 forecast is \$12.3 billion, up from the 1982 total figure of \$11 billion.

So if business is this good, what's so bad about the EAA? With numbers like that, someone at DoC and DoD must be doing something right.

"It would be most unfortunate if this EAA is extended," Bonker contends. The Washington Democrat has done his damndest to make sure it isn't by introducing H.R. 3231, the Export Administration Amendments Act of 1983. The bill proposes several key changes in the 1977 EAA, almost all of which are strongly supported by the high-tech community.

The bill would: 1. forbid the President from imposing export controls extraterritorially; 2. no longer require licenses for exports to COCOM countries so long as the exported item is multilaterally controlled by those countries; 3. no longer deny export licenses solely on the basis that the item contained a microprocessor, provided the microprocessor could not be reprogrammed or altered for possible military use; and 4. require the administration to give greater consideration to the foreign availability of items targeted for export controls on national security grounds.

What more could industry ask? Well, for one thing, all the high-tech folks would love to dump the contract sanctity provision. That stipulation says export controls for foreign policy purposes could not be imposed on existing contracts without congressional approval (except in cases of nuclear weapons testing, acts of aggression, terrorism, or gross human rights violations). In short, a contract is a contract except in those four instances. It's the way the administration may count to four that worries industry.

The Senate didn't seem too thrilled about extending the 1979 act, which has taken a beating the closer it gets to extinction. S. 979, the Export Administration Act Amendments of 1983, considerably strengthens the President's foreign policy sanctions hand and allows DoD review of certain West-West licenses for militarily significant items that, as agreed to by the Secretary of Commerce, present a danger of diversion to adversary nations. It also transfers the enforcement of EAA to the Customs Services. It does, however, have a much stronger contract sanctity provision than H.R. 3231 and, like the House bill, shifts the burden of proof in foreign availabil-

ity assessments to the government.

The administration, which introduced a bill that went absolutely nowhere in Congress, "has a strategy of delaying and delaying until extension is inevitable," Bonker complains. "If we don't remove these impediments, the U.S. stands to lose in what is a growing shift in world trade to electronics and telecommunications.

"That is where the real competition is going to be in the future. It's already intense and competitive. American business can compete, but not with one arm tied behind its back. That's what the EAA does."

If a supplier can live through the license application process, the rest of the way is easy. And cheap. Tariffs on computers, peripherals, and semiconductors have been slowly dropping in the U.S., Europe, and Japan. Since 1979, American duties on computers have fallen from 5.5% to 4.7%. Tariffs on peripherals have been reduced from 5% to 4.4%; semiconductors have gone down from 4.9% to 4.2%. EEC rates on all three product categories have also decreased from 7% in 1979 to 6% this year. Japanese computer duties have fallen from 6% to 5.3% in five years; peripheral charges have been cut from 15% to 6%; and semiconductors have dropped from 8% to 4.2%.

### JAPAN TRADE TRUCE

As a further sign of a trade truce, the U.S.-Japan Work Group on High Technology Industries is trying to right some of the wrongs between the two nations, especially regarding semiconductors. The Japanese are expected to come up with specific proposals to increase the U.S. semiconductor presence—now just under 10%—in the Japanese market.

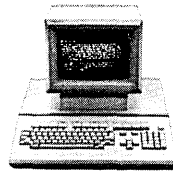
"Yes, we've been through this before," says Hedija Karvalis, a Japan specialist at DoC. "Not much had been happening for the previous 18 months. But this group has made real progress and we're expecting the Japanese to implement the group's recommendations."

So if you can get it there, you can sell it there, maybe even in Japan. Not even industry disputes that. But first you've got to get it there. And getting it there is hardly half the fun.

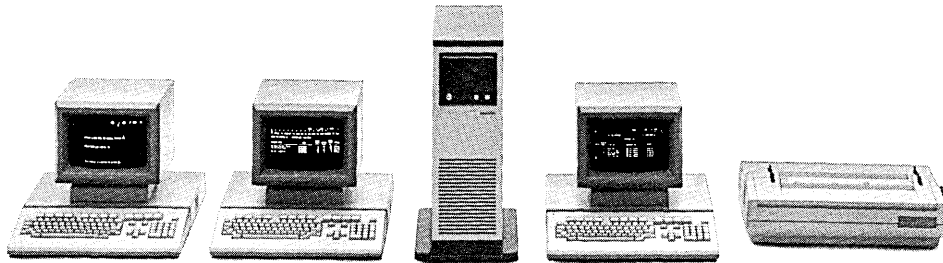
"Any act is only as good as the regulators who implement it," comments Lloyd Kaufman, CBEMA's director of international development. "More than 50% of a company's success or failure in getting a shipment out on time depends on the attitude of the regulators. It's an attitudinal problem.

"The language in the '79 act changed the attitude about exporting from a restrictive, defensive one to a positive, healthy one. We were very happy with it. But it still de-

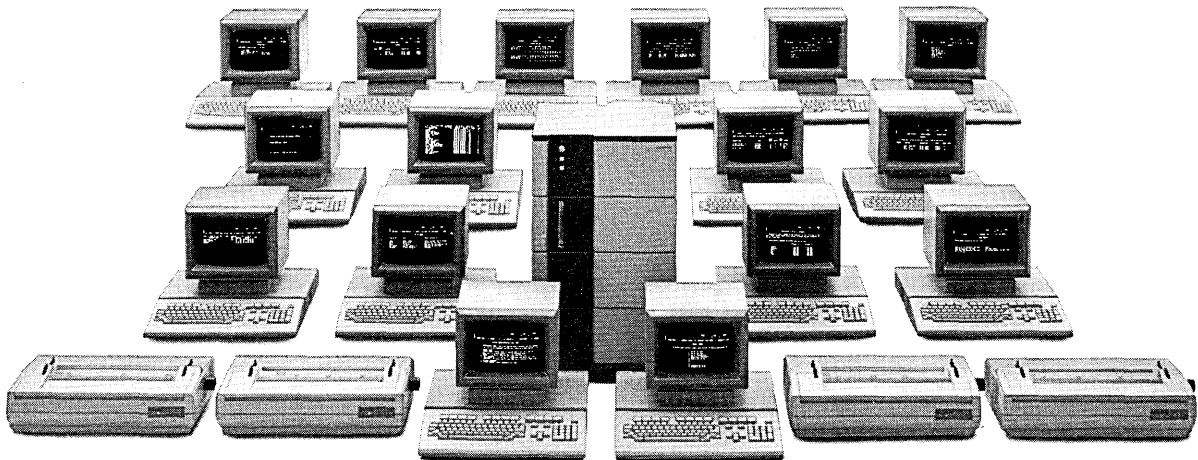
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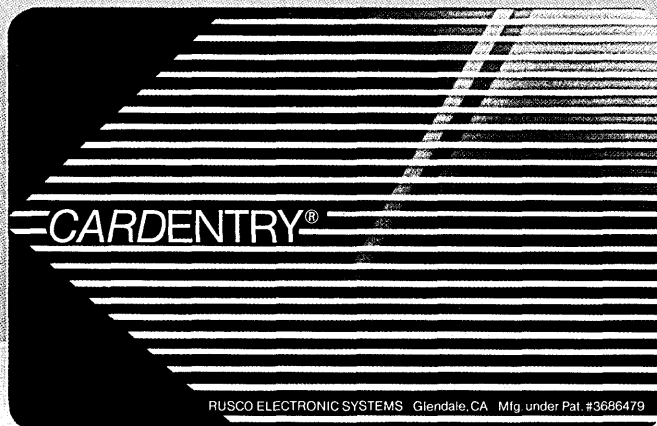
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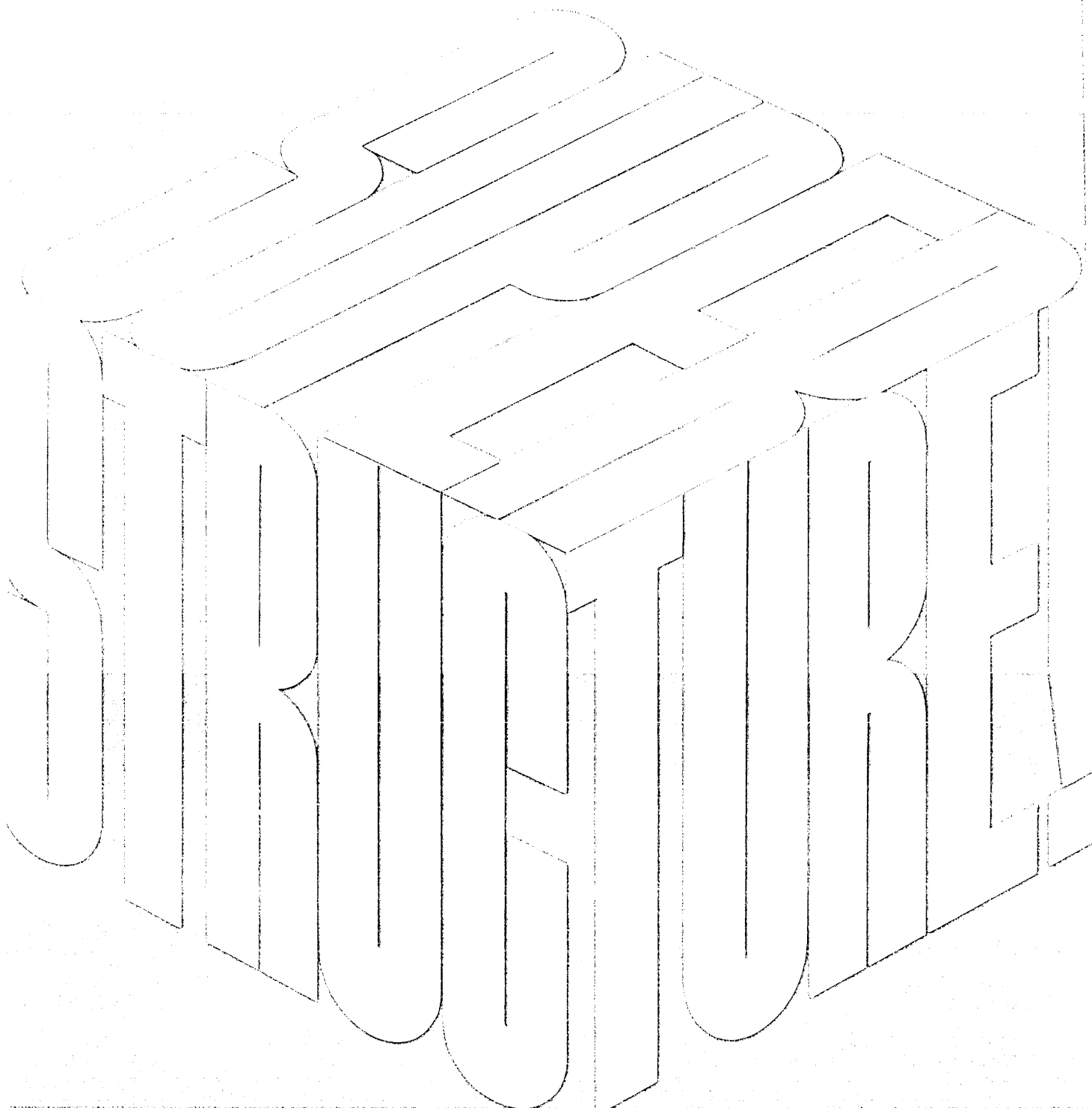
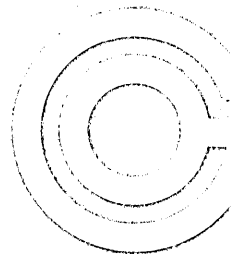
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## "We've got to overcome the inherent unreliability of national security and foreign policy controls."

depends on the regulators. It takes a long time for a high-tech company to get into a country. All that work can be ruined in a hurry. And if DoD gets an expanded role in controls, it's going to make it harder on industry. You've got freaks over there who want to hold up everything."

Maybe not everything, but certainly every item on the Military Critical Technologies List (MCTL). As part of the '79 act, Congress required DoD to create the MCTL, with the idea that it might serve as a standard for judging the effectiveness of Commerce's CCL in restricting the export of militarily significant goods and technologies. The rumor is that the MCTL is substantially completed, but no one knows for sure because it's classified. The only way to find out what's on it is to try and ship something. If it gets stopped and it's not on the CCL, it's on the MCTL. If H.R. 3231 passes, the two lists would be combined by 1985. But that may not make life much easier.

"We only need to control things essential to the national defense," asserts J. Fred Bucy, the president of Texas Instruments. "And the only products you need to control are those that have know-how built into them. You can put on a few pieces of paper the products critical to national defense. And you can put on two or three pieces of paper a real, effective critical technologies list."

Bucy examined this issue for the Defense Science Board in 1976. He said then, and says now, that export control should focus wholly on know-how and the capabilities the products confer and not on the end products of know-how—except for the few critical items with direct military implications.

Bucy defines technology as "the specific know-how required to define a product that fulfills a need, and then to design and manufacture it." He also stresses the difference between products and technology: "The impact of exporting products is very different from that of transferring technology. Export of products satisfies only short-term needs. It does not fulfill future requirements, whereas transfer and export of design and manufacturing technology confer capabilities on the receiving country to satisfy both present and future needs."

"The MCTL is the size of the New York phone book and worth a lot less," Bucy says. "It's a bastardization of the concept of critical technology. The bureaucrats have taken a clear concept and turned it into a two-inch-thick document that's absolutely worthless. What we need is a philosophical control system." That might work—if all the great minds could think alike. There's more than enough philosophy to go around right at this moment.

At DoD, they see Red everywhere. If it's close, they want it to stay home. "It is better to wrongly control than to wrongly license," Assistant Defense Secretary Richard Perle told the *Washington Post*. He called H.R. 3231 "lopsided and insensitive to national security."

"Perle and [assistant secretary for trade administration Lawrence] Brady think it's better to stop too much than too little," asserts CBEMA's Kaufman. Bonker describes the Pentagon's thought process as being "intent on controlling virtually everything."

Commerce doesn't want to be quite so restrictive. Undersecretary Lionel Olmer, a former Motorola executive, defends his department's licensing control efforts and its enforcement of export curbs. He sees no need to transfer the latter job to Customs, as the Senate would do. Call him the voice of tranquility in some mighty angry seas. It remains to be seen if his voice will be heard inside the walls of the White House and Pentagon.

Out there on open water is the high-tech industry, waiting for someone to tell it which way the current will flow. Hoping for smoother sailing, industry would have Congress and the regulatory agencies believe that it just wants to go about its business. On shore are the COCOM partners, who, while complaining that they can't get their orders on time, never hesitate to turn that trouble into a competitive advantage to take away sales.

"We are unique in the severity and rigidity of our licensing process," laments a highly placed source in a leading computer

manufacturer. "Foreign policy controls work against us. We've lost a lot of business with no notice of cancellation. National security controls work against us. If DoD gets an expanded role in those controls, you're talking a routine six-month delay. No way a customer's going to put up with that."

"Unilateral controls on items available elsewhere don't work. Why are we going it alone? Why are we doing this to ourselves? We've got to overcome the inherent unreliability of national security and foreign policy controls. Every time we go to bat with a foreign competitor for a sale, we step up with a two-strike count against us."

Is it really all that bad? Not according to Rep. Zschau. He's one of the few who has seen both sides.

"I hate to hear industry argue that they're disadvantaged because they can't ship stuff and the allies can," Zschau says. "I think they're really gilding the lily. They're exaggerating. If we were always stopping shipments for foreign policy reasons, people could begin to doubt whether to count on us. But you can count on one hand the number of times the U.S. has broken contracts for foreign policy reasons."

So what's it going to be? Neither Congress, the administration, nor industry knows for sure. "We need a very refined critical technologies list," contends CBEMA's Kaufman. "We need precise definitions of what's restricted and what isn't." Needing this list is one thing, getting it is another. The question still is how much industry will or must give up to get there from here. #



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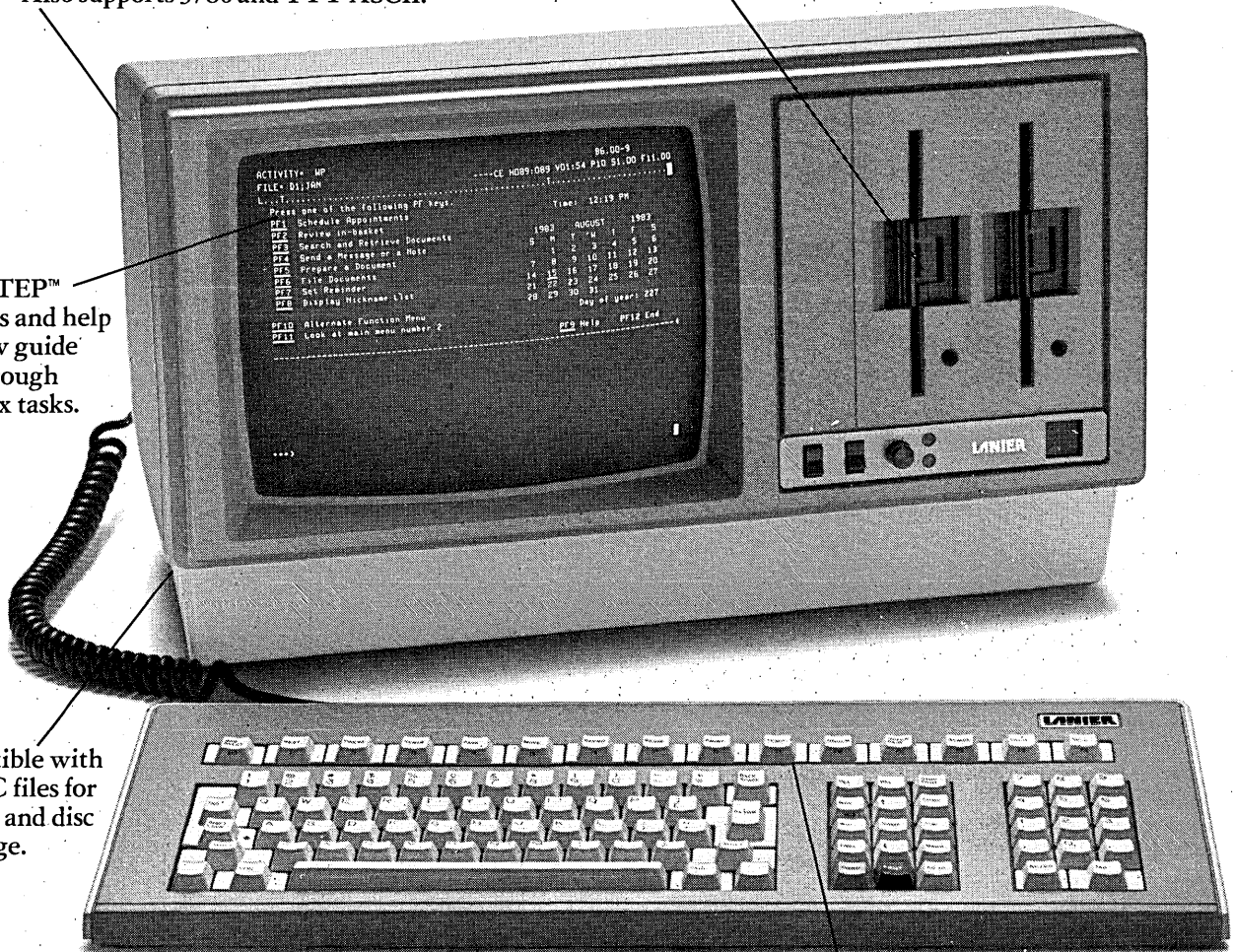
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**It's rough sailing for Europeans trying to cross the Atlantic with their dp wares.**

# BREAKING INTO THE U.S. MARKET

by Paul Tate

Anyone who has tried it will tell you, selling sand to the Arabs does nothing for your self-respect. "Selling high-technology products to the U.S. gives you a similar feeling," quips David Broad, chairman of the British Microcomputer Manufacturers Group (BMMG).

Despite all the talk of a free and open market, it takes a brave and determined outsider to win export deals for data processing equipment and services in the States. The casualty list of European companies that have tried and failed is legion. These European crusaders have been so persistent because like dp firms everywhere, they know they must find success in the U.S. if they want to become a significant international force.

"We must export to survive," explains Rod Saar, marketing director of the U.K. peripherals firm Newbury Data Recording, which has just launched a U.S. export campaign. "Around 55% of the world market is in the U.S., and if you want to establish yourself in this industry you have to have a presence. The home markets in Eu-

rope just are not big enough to support an organization that is reaching critical mass."

The European data processing industry would dearly love to have more success in the American arena. A look at Europe's current position in the world market soon shows why.

Not only are individual European markets small, but they are also heavily dominated by foreign-owned companies, predominantly from the U.S. In fact, the European Economic Community (EEC) contends that the European-based electronics industry does not cover even half of its domestic market. A European company, therefore, has to find other markets to tap to help give it the revenues necessary to achieve the economies of scale needed for survival. Third World markets are no solution in the short term, and Japan, to a large extent, is a closed book.

The balance of trade figures for the European industry paint a more detailed and disturbing picture. In 1975 Europe had a

trade surplus in what the EEC calls information technology (IT) products of some \$1.5 billion. Last year it had a deficit of \$10 billion, mostly because of U.S. dominance. To trim those deficits, the EEC has come up with the European Strategic Program of Research in Information Technology (Esprit). But the Europeans will need more than Esprit to get them back in balance. Roland Hubert, a member of the EEC's Esprit team, believes this year's deficit may reach \$12 billion.

The traffic of products across the Atlantic, however, is not totally one way. There are a number of European success stories. Included in this winner's circle are Ericsson from Sweden, Philips from the Netherlands, Racal from the U.K., and Nixdorf from West Germany. Many others are trying hard to make the grade, including ICL (again), Olivetti, Norsk Data, and French computer services firm Cap Gemini Sogeti.

**MAYFLOWER SECOND SAILING** Newbury Data's Saar finds the situation almost poetic. "I call it the second sailing of the Mayflower. We have to get back out there and learn how to be aggressive."

Despite three decades of experience fighting—and more often than not losing—against U.S. companies on their own turf, the Europeans are still not overly aggressive when it comes to selling their wares. As the situation on the home front becomes more desperate, this attitude is changing.

Embarking on an export drive in the U.S. was often misguidedly seen as a solution to what was essentially internal inertia. Both ICL and CII-Honeywell Bull are good cases in point. Both firms' half-hearted plunge into the U.S. market only dug them deeper into the hole.

"Europeans simply do not know how to market in the U.S.," asserts Allen Porter, European director of research company CIS. "Nor do they appreciate the need for widespread distribution systems. The trouble is that most of the distribution networks have already been tapped by U.S. companies and the Europeans stand little chance of winning them back," he laments.

Investment is another major debilitating factor. Establishing a base in the States is a long costly process, and even an impressive product portfolio is no panacea. "To be a real success in the U.S. it is not enough to have a good product, you must also have good distribution channels and lots of money," maintains Karl Schlagenhauf, managing director of German software house ADI.

The costs of setting up shop in America are indeed daunting. It is not just the sheer physical size of the country that makes it expensive to establish an effective marketing network from scratch, but all the costs associated with tailoring both the sales organization and the product to the U.S. market are also a burden. That includes everything from the size of paper used for documentation to the packaging of the product, to morale boosting sales courses and advertising.

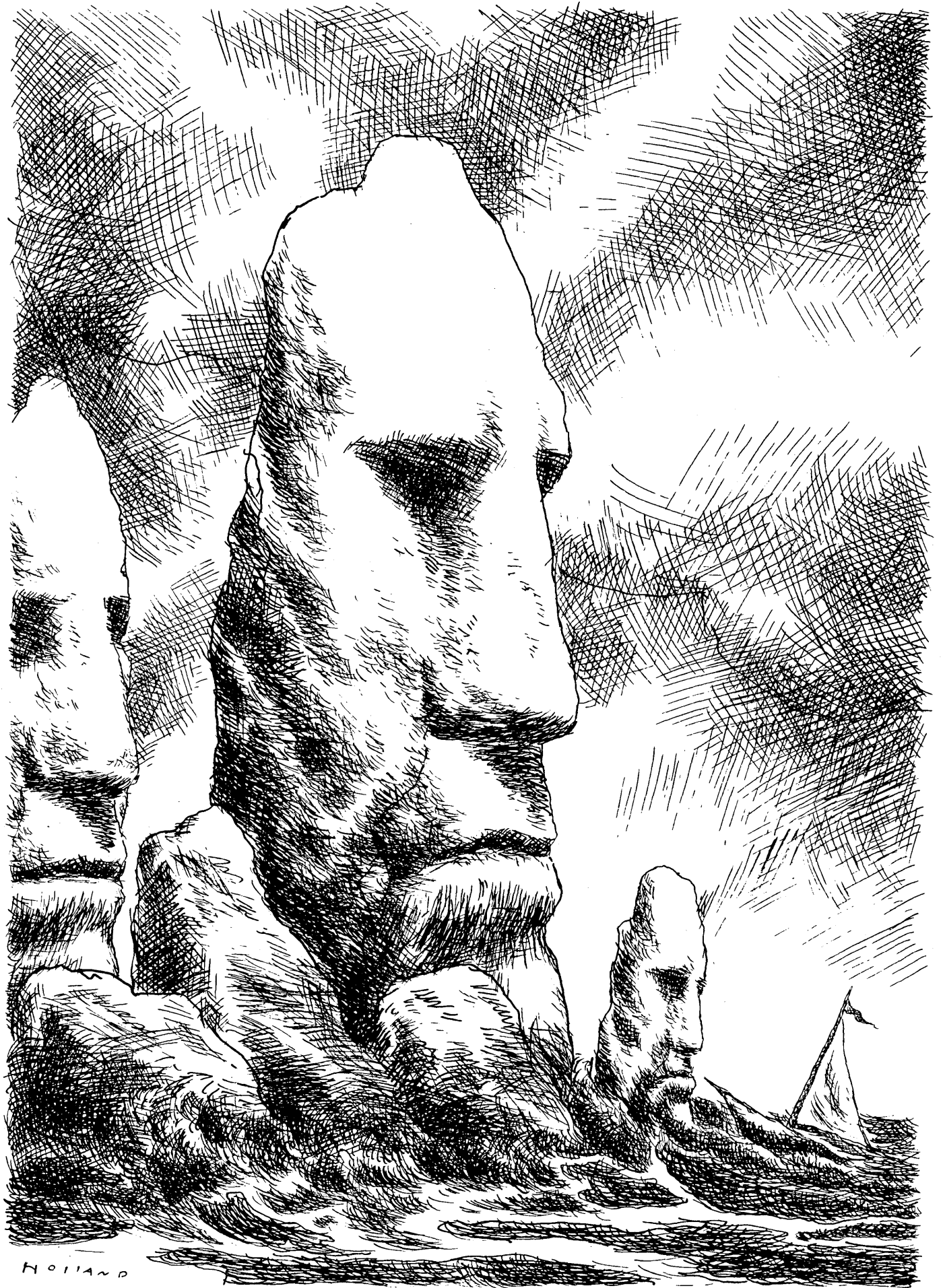
Donald Moore, the director of the British-supported Export I.T. consultancy, estimates that it costs \$15,000 per person per year to set up in the U.S. "That is a massive investment for most companies, and it must be long term," he notes.

Getting the right staff is another obstacle, since below the surface, U.S. buyers are considered a discriminating lot. "People are often fooled by the friendliness of Americans to Europeans," asserts David Morgan of the transatlantic consulting house Pactel. "But when they buy," he adds, "they buy from Americans, so it is important that exporters quickly get a U.S. content in their sales force."

Hiring that sales team, "is easier said than done," according to Morgan, who believes that Americans also like to work for American companies. "It is not chauvinism—it is partly business methods and sales style," he explains.

Supporting the sales force, or even supporting a product sold through a distributor, is an additional headache for a European company. Nightmarish stories of desperate telephone calls across the Atlantic in the early hours of the morning for spare parts or documentation are common. "A U.S. presence is essential," says CIS's Porter, "and if a company tries supporting its operation from Eu-

ILLUSTRATION BY BRAD HOLLAND



# The Europeans are shaking the foundations of their own commercial success by imposing high duties.

rope it is really in trouble. Even if the spare part does manage to get out of German or French customs, you can be sure they will lose it when it gets to the U.S. end."

Finding a distributor or partner to look after the U.S. sales side of the business is one shortcut for European companies angling for American exposure. This approach can work very well—just ask Sir Clive Sinclair, who has benefited from his lucrative links with Timex. These arrangements, nonetheless, can be fraught with problems.

French networking specialist SESA suffered, not at the hands of a shaky startup, but as a result of a change of policy at Honeywell. SESA managing director Michel Fievet believes that "credibility is very important in the American market and the best way to obtain it is to have an American name." Well, Honeywell's name was as good as any and a lot better than most. But after 18 months together, the American company, on a cutback crusade, dropped SESA.

Taken together then, the main obstacles to European exports appear to involve marketing channels and techniques, adequate investment, support, and the strain of transatlantic relationships. In fact these are about the only stumbling blocks since the formal restraints on exporting to the U.S. are of no great hindrance to a European vendor.

American import duties on computer-related equipment are an encouragingly low 4.7%, far below the equivalent EEC duties, which amount to 7% on all assembled systems and a crippling 17% on components. In line with the theory of British economist John Maynard Keynes, "Is there anything that a tariff can do that an earthquake cannot do better?" the Europeans are, in fact, shaking the foundations of their own commercial success by imposing such high duties.

The EEC's intention when setting the duties was to make imported components prohibitively expensive in order to help foster the European chip industry. But this has not happened and local IC makers now meet only 30% of European demand. This not only makes it more sensible to buy outside systems, which stifles local manufacturing and assembly, but it also ultimately makes the exported equipment more expensive. A European company that imports the components, assembles the product, and ships it out for export to the U.S., is hit with two sets of duties—the stiffest tariffs levied locally.

## CUTTING ITS OWN THROAT

"Europe is cutting its own throat with these duties," complains BMGG's Broad, who is actively campaigning to reduce levies. "It makes components more expensive than anywhere else in the world. It is driving manufacturers out of Eu-

## MADE IN AMERICA, BOUGHT IN AMERICA?

The Buy America Act (BAA) will be 50 years old this year. No fireworks are planned. We are not talking Independence Day here.

What we are talking about is a law that, at least on paper, makes life a little more miserable for foreign vendors trying to sell their products in the good old U.S.A. If you're from right here, you've got to love it. If you're from over there, you've got to hate it. You might even call it downright un-American.

But the BAA doesn't always practice what it preaches. There are ways around the 6% and 12% price advantages the act grants American manufacturers. If a country has signed the right pieces of paper, that great American tradition of egalitarianism comes into play and all suppliers are treated equal.

"All of Europe is NATO, so they don't have to worry," asserts Paul Jamushian of the Department of Defense's Office of Acquisition Policy. Well, the European suppliers still have to sweat out the contract award, but they won't get beat because of the Buy America Act.

As long as they're selling to DoD, that is. DoD has negotiated a Memorandum of Understanding (MOU) with each NATO nation that waives the provisions of the BAA. The MOUs also eliminate duties. Nev-

ertheless, the products' cost evaluation includes the appropriate tariff.

The MOUs only apply to DoD purchases. The theory is that the defense agency of each NATO country should have an unobstructed look at the best technologies other NATO nations offer, and the protectionists be damned. Non-NATO countries such as Japan don't qualify for the MOU exemption.

If a supplier belongs to a NATO member country, or one that has signed the General Agreement on Tariffs and Trade and wants to sell a computer to a U.S. government agency other than DoD, the Buy America Act does not apply. But if that supplier wants to lease the computer, then the BAA is king.

"Nobody applies GATT to leasing," says Dave Sharp of the Office of the U.S. Trade Representative. "The United States felt that GATT should apply to leasing, but the other signatories disputed our interpretation. The Europeans talk about us having limited GATT, but all the limitations stem from their unwillingness to include items under GATT. There are gaps in there, but they're all European in origin."

Got all that? Good, there'll be another pop quiz on the BAA's 100th birthday.  
—Willie Schatz

rope and hurting our exports."

As IBM well knows, however, having products that are priced marginally higher does not usually deter buyers if they want those wares. So, the effects of double duties on the volume of European exports to the U.S. are negligible. Potentially more damaging to European suppliers is the residual effects of the Buy America Act that essentially blocked outside companies from getting lucrative U.S. government business.

Passed in 1933 before the computer industry even existed, the law nonetheless proved to be a major stumbling block for foreign firms during the early years of the industry. Despite a partial relaxation, the act is still a thorn in the side of outside traders.

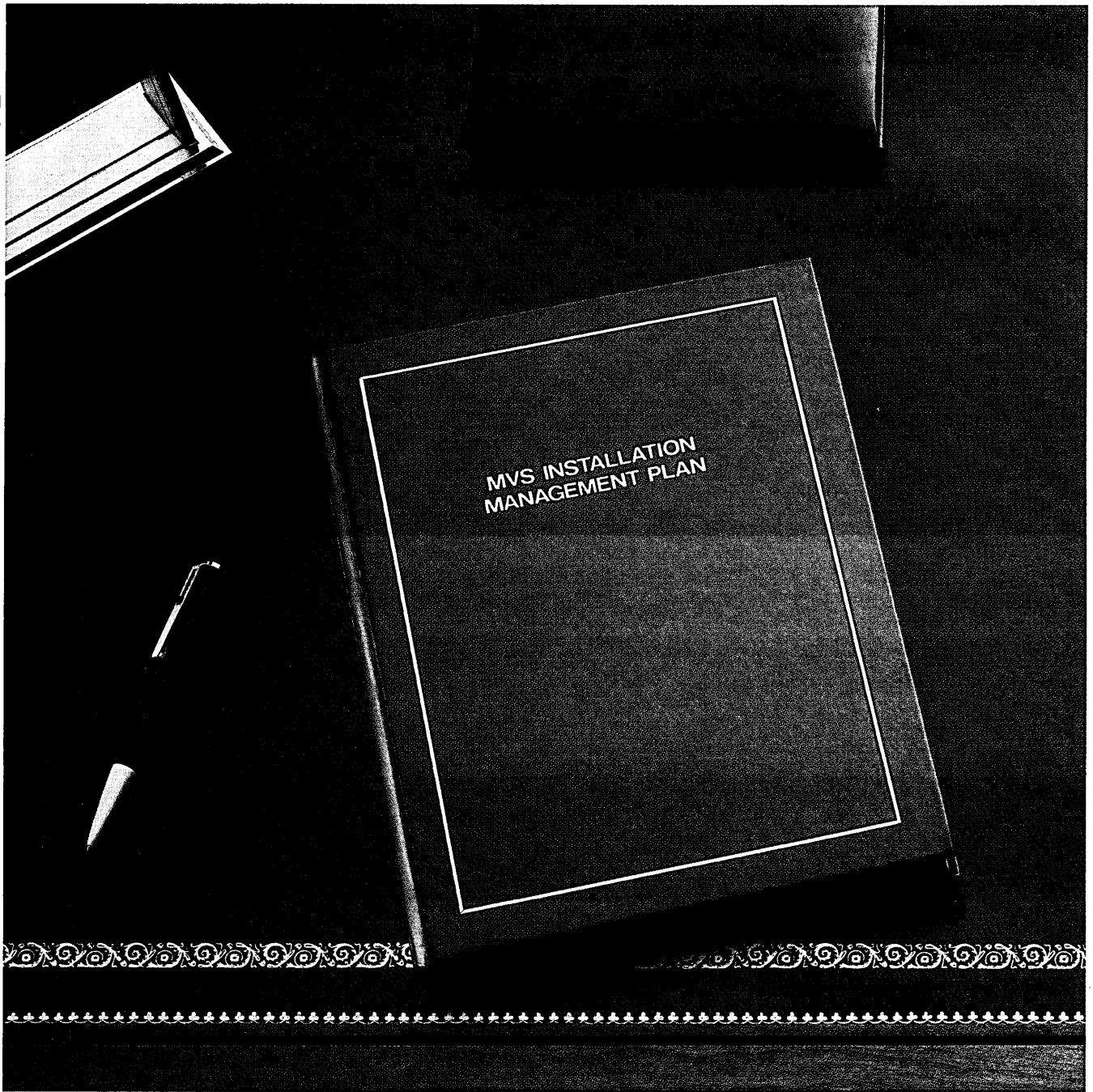
Under the original act, federal agencies could only acquire goods produced on U.S. soil. Defined more specifically, this meant that over 50% (by value) of the procured system's components had to be manufactured in the States. The feds could, however, buy a foreign-made product if the cost of the equivalent U.S.-built item was unreasonable. Subsequently construed to be "unreasonable" were prices that were 6% higher than foreign wares. (For small American businesses, or for firms in a labor surplus area, the cutoff came at 12%.)

What the U.S. politicians were trying to say in their own way was that it makes sense to buy American, if possible. While some people may call that reasonable, others claim such practices are clearly a blatant misuse of government purchasing power.

The powers that be in federal procurement did indeed begin to see things from a different perspective after a General Agreement on Tariffs and Trade (GATT) agreement on government procurement was reached in January 1981. To get in step with the new GATT code, President Reagan waived some of the provisions of the Buy America Act. Nevertheless, certain restrictions still apply, particularly to some purchases by the Department of Defense (DoD), the Automated Data & Telecommunications Service (ADTS) section of the General Services Administration, the Department of Energy, the Department of Transportation, and the Social Security Administration.

The new trade freedom, which only covers contracts over \$169,000 (or \$190,000 Special Drawing Rights), gives foreign bidders a shot at 15% more of the U.S. government procurement market than they had before, according to the British Overseas Trade Board. It still does not mean that they win those deals though, since many of the federal





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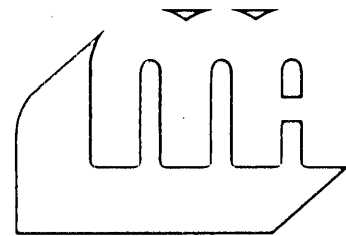
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CIRCLE 81 ON READER CARD

# Americans suffer from "a particular strain of technological arrogance."

agencies are already tightly tied to Yankee suppliers.

One of those tightly tied suppliers is IBM, which ironically cried foul when it began to feel the pinch from preferential purchasing policies on the other side of the Atlantic. Big Blue made its objections to such procurement practices public knowledge throughout Europe when it was barred from bidding on certain government contracts in the U.K. and elsewhere. Defending these protests were some industry observers who felt that IBM, given its large local investment, deserved a shot at the deals since it was as much a European company as Philips. IBM's complaints, however, were also condemned as hypocritical by European vendors, who had unsuccessfully vied for big U.S. government orders.

In vying for those coveted contracts, European companies have to contend with more than the official rules of the game. For one thing, bidding on U.S. government proposals is a long and expensive process. Short on financial resources, most European firms simply can't support such long-term sales efforts, especially when their chances of winning are slim.

## LOBBYING FOR DOD CONTRACTS

Those odds could be substantially altered, they feel, if the right pressure could be brought to bear. That means intensive U.S.-style lobbying—a tactic that most Europeans are unfamiliar with. "If you are a U.S. company wanting to sell to the government," claims CIS director Porter, "you simply hire a retired admiral or general—somebody who knows how the process works."

That theoretical admiral or general would come in particularly handy for Defense Department deals. These DoD contracts are a sore spot for many Europeans, who feel they are not getting a fair share of this booming business. Despite a few well-publicized contracts, most notably Norsk Data's recent F-16 contract, the DoD procurement picture

has changed very little, as far as the Europeans are concerned.

Nixdorf vice chairman Klaus Luft believes that more European manufacturers should benefit from DoD spending, especially since some of this lavish spending has an inherent European element. "Department of Defense spending in the U.S. is huge," Luft explains, "and the DoD has a big impact on NATO countries, so there is automatically some purchasing power from Europe added to whatever DoD decides to do."

Many of these DoD deals involve leading-edge technology—technology that the U.S. wants to keep in friendly hands. The recent disclosures about Soviet bloc acquisition of U.S. technology has clearly made some U.S. government officials antsy about any high-tech exchanges. They are particularly nervous because most of the leaks have come through European third parties dealing in the so-called "gray market."

This wariness has set off a chain reaction in Europe, where the EEC, rightly or wrongly, is equally worried about U.S. legislation that might impose extraterritorial restrictions to halt foreign technology trade with Eastern bloc countries. The fear is understandable in light of the U.S. government's use of national security to block various European ventures with the Soviets. The Yamal pipeline is a good case in point.

Although the U.S. president is likely to have only limited extraterritorial power under the proposed measures, an EEC official claims there is "more to it than what is visible in the legislation. We must act on the reality. For example, the COCOM list has been used to the same effect. The clearance process on products can take a very long time, and this can make a European company lose its competitive edge. It's a form of protectionism that could seriously hurt Europe as well as the Soviet bloc."

Meanwhile, normal dp trade between the States and Europe continues to flow at the usual pace. While Europe recognizes the need to trade with America for technology, it

also feels a need to be more self-sufficient. That self-sufficiency is one of the reasons for the EEC's Esprit effort. The five-year, \$1.5 billion initiative is aimed at building up the European information technology industry.

## BUILDING THE HIGH-TECH BASE

Europe does have a good technological base to build upon. Its record of achievements, which can be traced back to the granddaddy of computing, Charles Babbage, continues today in the new telecommunications technologies of fiber optics and videotex. And yet Europe, which admittedly lags behind in some high-tech fields, is worried that this gap will widen even further in the future.

Competent in the research realm, the Americans are also considerably more successful than their European cousins at developing and selling the end results of that research effort. The U.S., nevertheless, suffers from what one observer calls "a particular strain of technological arrogance."

Every European has encountered this egotism when doing business in the American market. When the German software house ADI took its Aladdin microcomputer relational database system to Apple, the package was immediately dubbed "Black Forest software."

"The not-invented-here syndrome in the U.S., especially in Silicon Valley, is horrible," reports ADI director Schlagenhauf. "When I arrived at Apple they told me 'You are in a place that produces the best software in the world.' Then I had to tell them about my product."

Considering all the inherent problems of marketing in the U.S., it is surprising that the European data processing industry has done as well as it has. This attitudinal impediment, however, is perhaps the most frustrating because it seems to be turning into an embedded cultural trait.

Francis Lorentz, general manager of the Bull Group in France, believes that part of the problem lies in that all-important linchpin—image. "In Europe the American dp industry has the best image. In America the European dp industry hasn't any kind of an image. American people, therefore, can not be confident in the European industry today, and this makes the cost of entry into the U.S. market higher and higher."

The good news for the Europeans is that this image problem is not insurmountable. ADI's Aladdin, which is now Apple's ProFit package, is also being released by Digital Equipment as the Info 100 and Info 300 series. Sums up Schlagenhauf: "As a European company, you can sell to U.S. buyers if you persevere, but it is a hard job convincing them."



CARTOON BY TOM MASON

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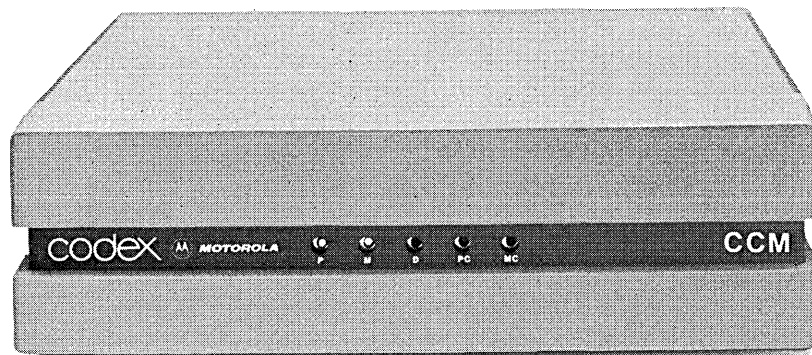
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**The explosion of microcomputers is opening doors for ambitious women, but may close some doors for the complacent.**

# WHEN OPPORTUNITY KNOCKS

**by Deborah Sojka**

For several years Lynne Thomas was a sales assistant who spent two hectic days a week keeping track of the advertising revenues of 120 television stations. Her employer, John Blair & Co., New York, is the sales representative for smaller stations around the country. Tallying who bought how many seconds of advertising time on which station, when the commercials were broadcast, and a host of other details was sheer drudgery, a thankless job leading nowhere.

Enter the IBM Personal Computer six months ago.

Now Lynne Thomas is an assistant sales analyst, highly visible to senior executives appreciative of the comprehensive sales reports produced on her personal computer in two hours. "I'm more valuable to the company," she says, clearly much happier with her newfound status.

Barbara McMullen was president of a small computer consulting firm when microcomputers turned her life around. After three years as an analyst at the Wall Street invest-

ment banking firm of Morgan Stanley & Co., she and her husband John switched to advising clients on how to use micros. They now have 12 employees and consult for a variety of international clients. Barbara McMullen teaches several microcomputer courses at two major area colleges. About 95% of McMullen and McMullen's revenues are based on microcomputers, she says, a complete turnaround from the mainframe consulting business she started with.

As the successes of Thomas and McMullen show, the microcomputer is open-



PHOTOGRAPHS BY TRACY FRANKEL

Barbara McMullen's home-grown consulting business has advanced in leaps and bounds.

## Parents don't push their daughters as much as they push their sons to study math and technology.

ing new and exciting career paths for women both up the corporate ladder and outside the corporation. In addition, micros are freeing support workers—clerks, secretaries, administrative assistants—from some of the dull, routine, grunt work, actually enhancing their day-to-day jobs. Microcomputers are helping thousands of women like Lynne Thomas move to higher salaries, professionalism, and self-esteem.

In the near future, says Mike Skitinski, vice president of office automation at Paine Webber Mitchell Hutchins, the research subsidiary of the New York-based stock brokerage, support personnel will be doing the more interesting and more valuable work currently done by professional staffers. "Maintenance of spreadsheets and large number crunching tasks will be done at the support staff level," he explains. "Having the tool available will create a downloading of responsibilities to support personnel, making their jobs more important." Skitinski noted that he had seen word processing operators advance to supervisors, and then to independent consultants.

Of course, micros are also opening up

opportunities for men, as with any booming new industry. And women have a long way to go to reach parity with men when it comes to personal computers. A survey by a well-known personal computer journal found that 97% of its readers were males, and Talmis Inc., a Chicago marketing and research firm, found that only 4.8% of 105 IBM P.C. owners were female, and only 10.1% of 217 Apple users and 11.4% of 88 Tandy Corp. micro-computer owners. Evidently, there is still a bridge missing between women and micros.

Society and cultural biases, not schools, partially explain why Jane is not as likely to play with a computer as Dick. "Girls in my school learn math just as they would any other subject," says Jane Mestrovic, math teacher, head of the computer science department at the all-girls' Chapin School in Manhattan, and computer hobbyist. "If they leave here and attend a coed school, they generally don't do as well." As for the local Apple user group meetings, "you'll see several teenage boys attending meetings, but never any teenage girls."

Kay Gilliland, a math specialist at EQUALS, a Berkeley, Calif.-based a research

and education group serving mostly educators, claims that parents don't push their daughters as much as they push their sons to study mathematics and technology. "The kids aren't going to get the training at home; it's got to be done in school." Furthermore, most educational software is still male-oriented, says Gilliland.

Even a supportive mother may not be enough to encourage a daughter's interest in computers. Consultant Barbara McMullen feels that girls just aren't as interested in computers as boys are. "Our 10-year-old son is very aware of the importance of computers," she explains. "Our 13-year-old daughter is not—not interested in the least. As far as she is concerned, computers disrupt her life and have no use. Perhaps by the time she gets out of high school, she'll see the importance. And our kids are surrounded by computers, both at school and at home."

### ONCE A BIAS, NOW AN ASSET

A cultural bias that worked against women in the past, however, is now a big asset in a microcomputer-dominated office. Hundreds of vocational



The changeover from teacher to independent investor was an enlightening process for Pat Lehrburger.



schools are turning out thousands of women typists. These women, while starting out as support workers, have a major advantage over men—not only are they proficient typists, but they feel comfortable at a keyboard. McMullen says that in her classes, she sees many more men than women who are afraid of computers, since male executives over 40 have problems with the micro's keyboard. Such clients want to learn in a completely private session so they aren't embarrassed in front of their coworkers and subordinates, she says.

On the other hand, women, even those who don't type, are not as scared. McMullen found that when a micro is installed in an office, if a woman is going to use it, and has no extraordinary difficulty learning to use it, she appreciates it much more than men do. "This is because women do more of the grunt work than men, and they are relieved to be rid of it," notes McMullen. "Women are generally glad to get automated," adds Janice Blood of 9 to 5, the National Association of Working Women. "Some are frightened, but not the majority."

In general, women are more open to

the concept of the executive workstation, whereas some men refuse to consider it because it appears "secretarial" in nature, notes Janice Miller, international president of Women in Information Processing, Washington, D.C. Microcomputers, she says, are changing the classic role of secretary in society into a new role as information processor or the "chauffeur" who drives the system.

The widespread use of micros is also providing women with a new route to financial independence. "Lots of women have a micro at home, to begin a new business, and it's a super tool for that," says Miller. "Women are also training other people to use micros, doing installations, consulting, programming, and various other types of new micro-related businesses."

Julia Johnston, director of research and statistics at ADAPSO, counts off two reasons why micros offer unique opportunities for women who already have professional status. First, women tend to go for the alternate life-style more often than men, and micros allow that to happen more easily, and second, because most women can type, things get done quicker. Many women have

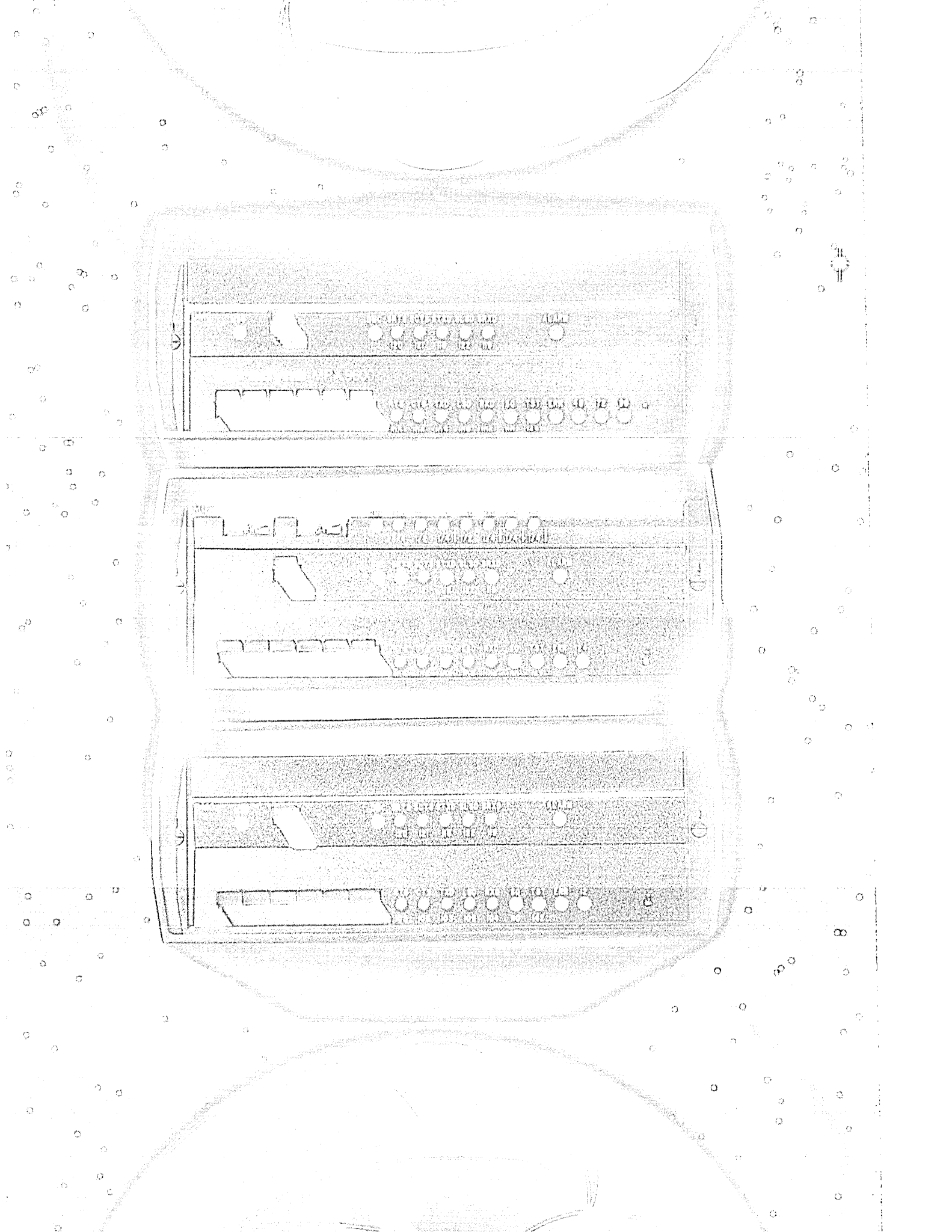
been clandestine typists for years, herself included, and micros are bringing them out in the open.

"I'm three times more efficient typing on my micro and sending the draft to my assistant," Johnston claims. "I don't have to hide my typing skills, and I have an advantage over men. You can't be maligned for doing it yourself now."

Indeed, more and more women are doing it themselves. About five years ago Pat Lehrburger stopped working full time as a teacher. One of those few, lucky people with an independent income, she began studying financial investment, talking to lots of people, and reading any literature she found on investing. She devoted most of her time and energy to this education, and then bought an Apple in October 1980. With the computer, it was much easier and faster to chart the highs, lows, closing prices, and volume of the stocks she had selected. Now, she tracks some 250 different stocks. "A few years ago, you would have needed a staff to do this," says the Hartsdale, N.Y., resident. "Right now, I'm paying the rent and groceries with this money, and I still have money left over."



Lynne Thomas is enjoying increased recognition and responsibilities since installation of the P.C.



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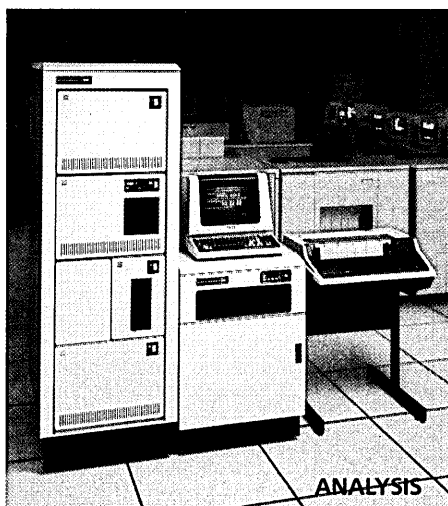
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CIRCLE 84 ON READER CARD

# "It's easier as an independent because you are looked upon as an entrepreneur."

## WOMEN SEIZE THE CHANCE

Lehrburger is typical of the many women who knew little or nothing about micros, or computers in general, before they seized the opportunity to use them. Flora Lazar's route to microcomputer consultant was rather unorthodox, but useful for the thousands of liberal arts graduates trying to figure out how to get in on the action.

Lazar, of the husband and wife microcomputer consulting firm Lazar/Greenhouse, has been consulting for just under a year. She deals mostly with small companies that face the problems of first-time computerizing. Lazar was a government major at Harvard and, according to her own assessment, was a liberal arts person whose only salable skill was writing. She got her start in computing by joining Donovan Data Systems in the late '70s as a technical writer, and was then transferred to client service, upon her request, to have more interaction with clients. Because she felt she was becoming too specialized, Lazar left Donovan Data and went to Columbia Business School as a marketing major, with plans to return to the computer industry upon graduation. She wound up with American Management Systems, and after a couple of assignments, spent nine months documenting the operation of one money market trading center to prepare it for automation. Shortly thereafter, she left to start the consulting company. She felt that the corporate environment was not for her.

Beginning the consulting firm required a lot of fast learning, although she and her husband had owned an Apple for three years. Lazar says that her strength is the business end of installing small systems, such as determining the client's actual needs. Her

husband, Lee Greenhouse, assistant vice president of videotex and computing at E.F. Hutton, New York, is in charge of the highly technical matters. She was surprised that she could take her business expertise and parlay it into use with micros.

Lazar finds her work as a woman consultant difficult and challenging, but it was much harder in the banking environment, where she was the only woman. "It's easier as an independent because you are looked upon as an entrepreneur," she asserts. "It's easier to be successful on my own."

Lazar did not consider herself a mainframe expert, but there are a number of women with broad dp backgrounds who have gone on to independence with micros. Edith Windsor had worked in the mainframe environment at IBM for about 16 years, and retired some 10 years ago. Now, she uses an IBM P.C. to write programs for sale, and does some consulting, mostly for friends, out of her home. With IBM, Windsor worked on systems architecture in the development division, and at one time was responsible for corporate language strategies. She retired early, played with the stock market for a while, but stayed somewhat removed from computing.

When she heard about the P.C., she bought one immediately, and began using it as an applications software writer. "The P.C. has more power than the mainframes I worked on in '58," Windsor says.

In addition to new microcomputing careers in consulting and programming, women have a booming opportunity in training. A little over a year ago, two former Xerox corporate staffers, Ed Newman and Jim Griffin, cofounded Computer Learning and Support Services Associates, Wilton, Conn.,

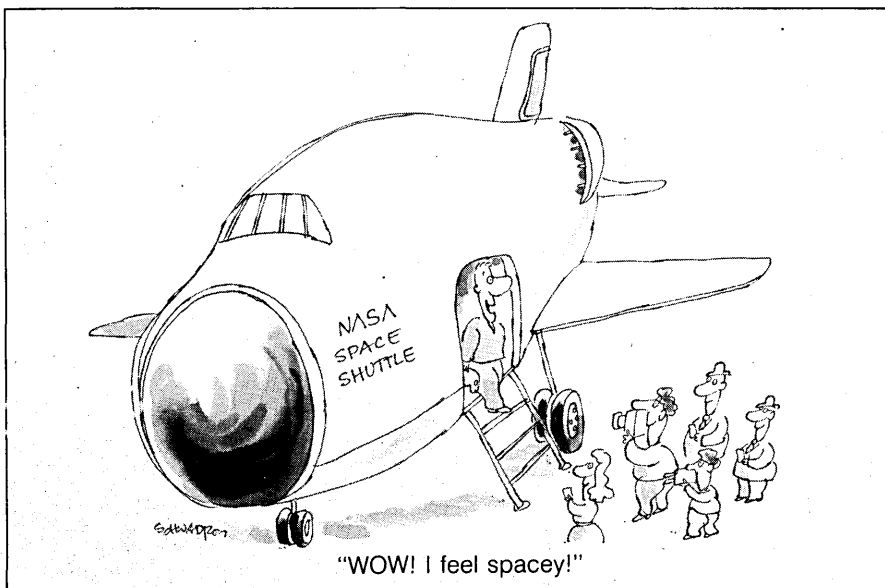
an educational, training, and "strategic consulting" firm. More women than men are training people to use micros and other office automating gadgetry, according to Newman. "The brighter women who embrace technology are becoming indispensable to senior management." Women use these new technologies more than men do, he estimates. "Women's affinity toward technology helps them move ahead."

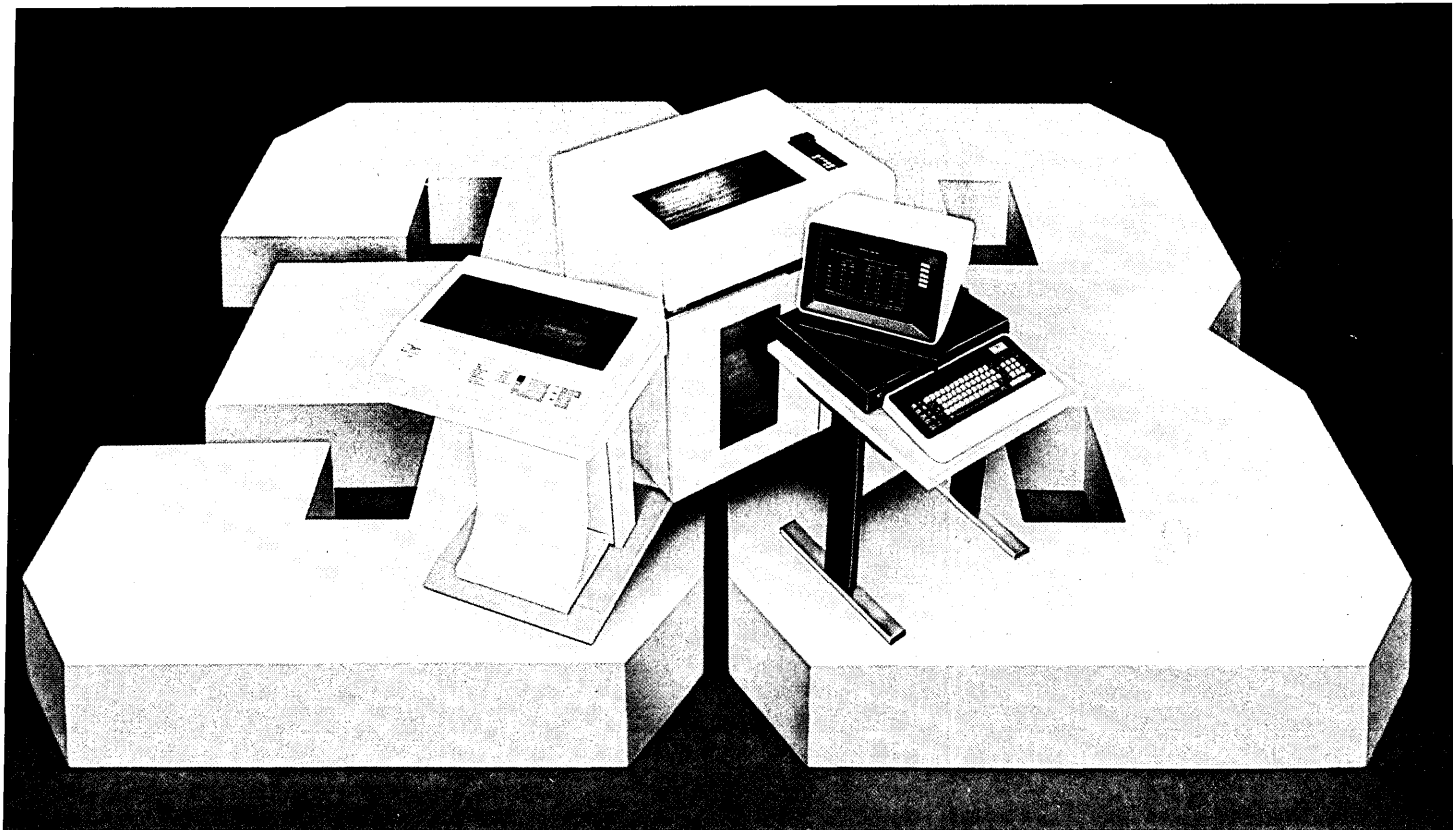
## MERELY SURVIVAL INSTINCT

That affinity is sometimes merely survival instinct. Microcomputers are the driving force behind office automation, and the trend to replace typewriters and telephones with computers may actually reduce the number of women needed as secretaries. Furthermore, the lower level management jobs that many women aspire to may disappear as executives are better able to assist themselves in looking through computerized files. "Functions are broken down into small tasks and the larger view is reduced by specialized work [such as data entry]," notes Blood of the National Association of Working Women. "You're left with a sea of workers who don't understand how their small tasks relate to the overall job. If people are contained in these jobs, there's no chance to advance." She predicts a widening gap between women and the top of the corporate ladder. "There will be a few highly successful women in the high tech field, while the masses are left behind." Adds consultant Windsor, "Some bright and aggressive women will grab on and take advantage of the opportunity, but I think that for the most part micros will make the split greater between bosses and secretaries." As Joanne Hauck, a managing editor at Curriculum Concepts Inc., the educational materials publisher, notes, "The job of data entry is still a boring one, where, in most cases, the support person turns over the information to the boss, who then makes a decision based on the data."

In some cases, women are their own worst enemies. "Some older women have a fear of being replaced by computers or of not being trained to use them because it's harder for senior office workers to find new jobs," explains Blood of 9 to 5. "A number of women in support capacities don't want job enrichment or growth," alleges Newmann of CLASS Associates. "They like the old way of doing things and prefer to keep it that way."

In the end, though, what is most important to keep in mind about women and micros has little to do with culture, society, or the educational practices of public and private schools. Being a woman is not grounds for success or failure in any business, but, if you have brains, you can get to the top before anyone notices you're a woman. ■





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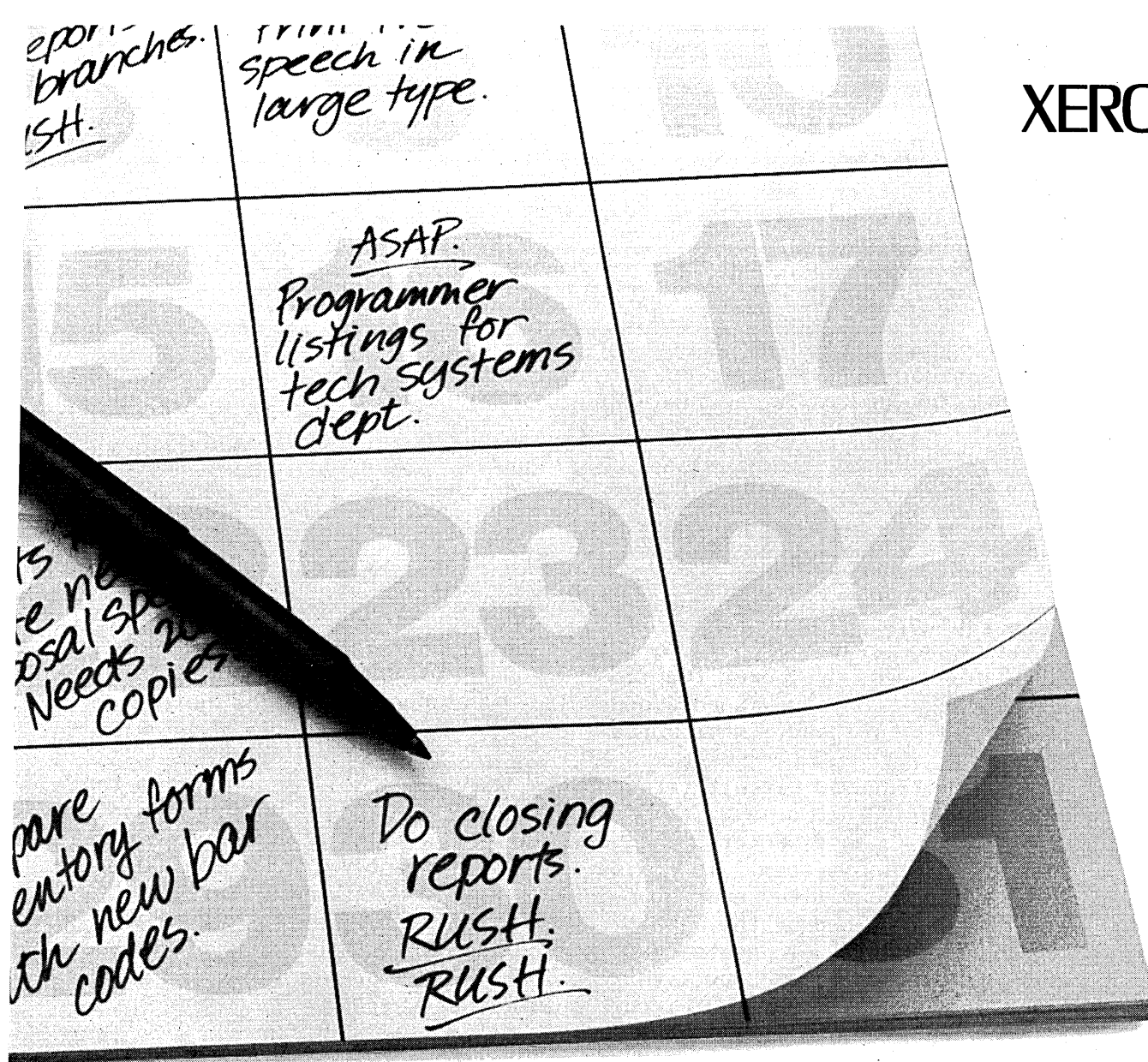
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# **SCIENCE/SCOPE**

The first electro-optical use of a flexible machining system will be for manufacturing large numbers of ultra-precision optical housings. The new Hughes Aircraft Company "flex-fab" system is a combination of nine computer-controlled milling machines connected by carts that are pulled on an endless chain towline built into the floor. Each machine has 68 different tools to choose from. Altogether there are 612 tools available, enabling flex-fab to do the work of 25 individual machines. At first, flex-fab will machine aluminum chunks into housings for TOW antitank missile systems with an exactness to one thousandth of an inch. Soon, design engineers will be able to ask flex-fab to build parts, thus eliminating the need for blueprints.

Among many innovations built into the new AMRAAM missile are a special safety mechanism and a high-power coaxial cable. The safety device will prevent the missile from exploding when subjected to fire, yet will not be activated by the high temperatures generated by burning fuel when the missile is launched. The new cable handles much more power than conventional cables and yet costs about one-tenth as much. Hughes designed and developed the Advanced Medium-Range Air-to-Air Missile for the U.S. Air Force and Navy.

Very High Speed Integrated Circuit technology will be introduced in a system that lets U.S. Army and Marine Corps units automatically report navigation data and their locations to command centers. Hughes VHSIC chips will be used in the Position Location Reporting System. The chips will significantly increase communications and encoding capability, and reduce vulnerability to jamming. The VHSIC program is being conducted by the Department of Defense to develop chips that will give military electronic systems a tenfold increase in signal processing capability. The high-speed, compact VHSIC chips will be more reliable and will require less power than integrated circuits now in use.

The improved Phoenix missile has passed severe environmental testing by the U.S. Navy and demonstrated that the air-to-air weapon will operate reliably throughout its intended lifetime of service. No failures were recorded during 600 hours of severe vibration and exposure to temperature extremes. Up to five failures were allowed before results would have been judged unsatisfactory. (A failure would have been any fault in the missile's internal systems that would have prevented it from being launched.) The test was the first in a series of evaluations to certify the new-generation Hughes AIM-54C for service with the fleet. The improved Phoenix is the principal long-range, radar-guided missile for the F-14.

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**A number of companies are working to make voice recognition a part of office automation.**

# IF WE COULD TALK TO THE TERMINALS...

**by Edith Myers**

Is voice data entry finding its way into the office?

Most studies of the subject say it will arrive by the end of this decade. Observers see it coming in time frames ranging from two to 25 years. A few say the time is here.

Research in speech recognition by computer has been going on in U.S. laboratories for some 20 years. Products began to creep into the marketplace in the early '70s, primarily in such applications as inventory taking, materials handling, and point of sale transactions.

"It's still predominantly an industrial market," says Daniel F. Fink, marketing manager for Intel Corp.'s speech products activities. "But, as performance gets better because there are products in actual use and problems are seen and solved by engineers, it will broaden."

On the vendor side, who are the players? It depends on how you count. J. Michael Nye of Marketing Consultants International, Hagerstown, Md., tracks them on a weekly basis. He counts 58 companies working on discrete speech recognition devices (recognition of one word at a time) and six working with connected (recognition of a series of words) or continuous (as in speaking naturally) speech recognition.

Research is under way at IBM and Bell Labs at many major universities. Neither IBM nor Bell is talking product yet; but Nye, who was a founder and officer of Threshold Technology Inc., a Delran, N.J., firm which was the first in this country to market a voice recognition product, notes that Thomas Martin, a former Threshold president, has been hired as a consultant to Bell Labs, and, "you know they didn't want him for his knowledge of telephones."

Intel's Fink says IBM and Bell Labs have accounted for the lion's share of the research money spent in this country on voice recognition but adds that they "traditionally don't take a product to the marketplace until that marketplace has matured to a point where they can expect a pretty good return." He notes that "no company in the voice recognition market has had a roaring success that would be analogous to the PC market."

John Allen, vice president of Kwip Technology Corp. of Ottawa, Ontario, Canada, a company that has an executive workstation incorporating voice recognition, believes smaller companies are "leapfrogging the IBMs because they don't have the multi-bureaucracies or the capital requirements of a superstructure."

The chip makers, most notably Texas Instruments, Intel, and Motorola, are certainly paying close attention to voice recognition in terms of research and, in some cases, products.

Leon Lerman, Lockheed Missiles & Space Company Inc., Sunnyvale, Calif., president and founder of the American Voice Input/Output Society, counts five voice recognition vendors among the society's corporate sponsors (individual members are all users). They are Threshold Technology; Interstate Electronics Inc., Anaheim, Calif.; Intel; Votan, Fremont, Calif.; and Verbex, Bedford, Mass., a subsidiary of Exxon Enterprises.

Lerman's organization, now some 400 strong, is expected to grow to 1,000 members in the next two years. Current applications represented include quality control inspection, inventory control, assembly line, and medical and hospital systems. The office isn't represented yet but feelings are it will be soon.

Vendors would like to hasten the day.

Bertram Weinstein, director of forward planning for Interstate, said his company is "beginning to uncover them [applications for the office]. A number of our customers are looking at office automation." Interstate sells board level voice recognition products to such customers as Keytronics, Spokane, Wash. (keyboards) and Lear Siegler (terminals) who Weinstein believes are beginning to penetrate offices.

Will Wagers of Scott Instruments, Denton, Texas, which was first with voice data entry products for micromputers, says, "We're always looking for new applications for the current state of the art." As for the field of office applications though "it hasn't taken off yet." Scott is working, however, with some Apple dealers in an effort to achieve voice control of the VisiCalc spreadsheet program.

Texas Instruments is perhaps the most enthusiastic booster of voice recognition in the office. TI has been demonstrating its voice recognition capability with its professional computer since its introduction in January of this year. It has been conducting demos around the country since that time, including crowd pleasers at the National Computer Conference and Comdex Spring in Atlantic City.

## **DEMOS DRAW BIG CROWDS**

"You only have to get as close as you can to a trade show booth where a speech recognition demo is going on to learn fast how high the interest is," says one follower of the technology. TI's demos were a case in point.

The TI unit has both voice recognition and voice response, with the latter capability drawing heavily on technology developed for the company's famed Speak and Spell. It can recognize a maximum of 21 seconds of

## Initial applications for speech recognition in offices will probably be in back-office tasks.

speech at the rate of one word per six tenths of a second—generally, 35 utterances. A TI spokesman said it has the ability to take words out of context if there's a need to search for a particular word. He said TI has designed the capability as a way to use existing software. The company's demo shows the device running the popular integrated program, Lotus 1-2-3. "It's a great way to access computer data without training," says the spokesman.

Chris Seebach, president of Verbex, is another vendor who believes the time for speech recognition is now. "We're working on office applications in places where users would need their hands for sorting pieces of paper or other things—where they wouldn't be able to stop what they're doing and type." He sees initial applications for speech recognition in offices coming "in back office types of things."

He says his company's Verbex 3000, with a price tag of \$17,900, is the "only continuous speech recognition device in the world today." It has a 360-word vocabulary that Seebach says will be expanded to 500 words by the end of this year.

He believes speech recognition has a future in executive workstations and particularly likes its potential for use over the telephone. He said his firm's Verbex 1800 already can handle speaker-independent queries over the telephone when they're limited to digits plus four or five words.

Threshold Technology, the granddaddy of speech technology producers in the U.S., is operating currently under the handicap of Chapter XI proceedings, but president Bob Beckman hasn't lost his enthusiasm for the technology.

He says his company is completing development on a system capable of recognizing a vocabulary of more than 1,000 words or phrases. The system will also be able to recognize unlimited strings of connected words, "virtually in real time, from the user's perspective." The 16-bit microprocessor-based system, enhanced by custom circuits that free the main chip for speech processing, "will be equivalent in cost to an intelligent terminal," he says. Threshold plans to introduce the system when it is out from under Chapter XI.

Beckman sees "significant potential" for speech recognition in the office in three major areas: speech verification (verifying the owner of a voice); speech control of such office devices as the telephone and PBX; and computer access via single utterances that can cause functions to initiate and/or interact.

Catherine Muther of Votan sees the greatest office potential for voice recognition in the extension of capabilities outside the

office to employees on the road.

In August, Votan added speaker-independent recognition capabilities to its line of voice products. The capability is available in a variety of configurations: the V6040 Development System, which provides a single voice channel with serial interface; the MV6060 Voice System, which provides single voice channel, multibus interface, and expansion capabilities; the VMS6004, a four-channel Voice Management System; and the V6100 and MV6100 board sets. The initial STR (speaker independent recognition) vocabulary includes the digits 0 through 9 and the words, yes and no. Custom vocabularies are available and can be developed in any language.

Kwip of Canada, a subsidiary of Nexa Corp., a Canadian conglomerate of high technology companies, may be closest to fulfilling the dream of a voice-controlled executive workstation. Kwip's John Allen says the company has developed a dozen prototypes of such a workstation, utilizing Scott Instruments voice boards, which it is demonstrating and which it intends to license to third parties for eventual manufacture and distribution. The workstations allow voice access of personal, corporate, and external database information. The stations don't use voice exclusively; they can also be activated by touch or by a standard keyboard.

The prototypes are IBM P.C.-driven, and Kwip is working on a version for the Apple. Prototypes currently are in beta test at "reference accounts" (accounts to which Kwip can refer prospective licensees), including the Continental Group in Chicago and the Canadian government.

### "THEY'RE COMING TO US"

The prospects are there. "They're coming to us," says Allen. "We're already talking to potential licensees in Spain, Italy, and Brazil."

Consultant Nye believes that producers of workstations who aren't thinking in terms of speech recognition capabilities are "missing the boat." He admits to being one of the optimists watching the field. A frequent speaker on the subject of speech recognition, he likes to start his talks by showing a replica of a large finger and a large button, calling attention to the fact that "the finger and the button are on a collision course." The button, of course, represents a keyboard. "Why continue to add function keys when you can do the same thing with a single vocabulary word?" He sees the future of voice recognition in the office as being tied to the capability's incorporation into existing equipment. "Standalone is expensive. You've got a secretary with a word processor. Why not add a chip set or a board and add

the voice option? All the building blocks are there, now."

Nye believes 90% of the problems facing acceptance of voice recognition in the office are rooted in human factors. "You've got to sell value. Just selling the capability is like selling matches to smokers when cigarettes haven't been invented."

Fink of Intel sees it as an "expectation model" problem. "When crts with keyboards first came out, keyboards that looked like typewriters met people's expectations. Those that didn't failed. With voice recognition, the expectation is based on human-to-human communication. Expectations are extremely high. None of the equipment made to date can meet that model. We have to learn more about what the technology is all about and adjust our expectations down as the engineers are adjusting the capability up."

The notion of high expectations is just one of many stumbling blocks cited by vendors and researchers. Dr. Alan Biermann of Duke University, Durham, N.C., says, "The demos are impressive but the technology falls down when a voice changes when people are tired. He sees "robustness" as the big problem. He defines this as "getting a good word execution rate without trying too hard." But, he believes we'll see "some nice applications in the office by the end of this decade."

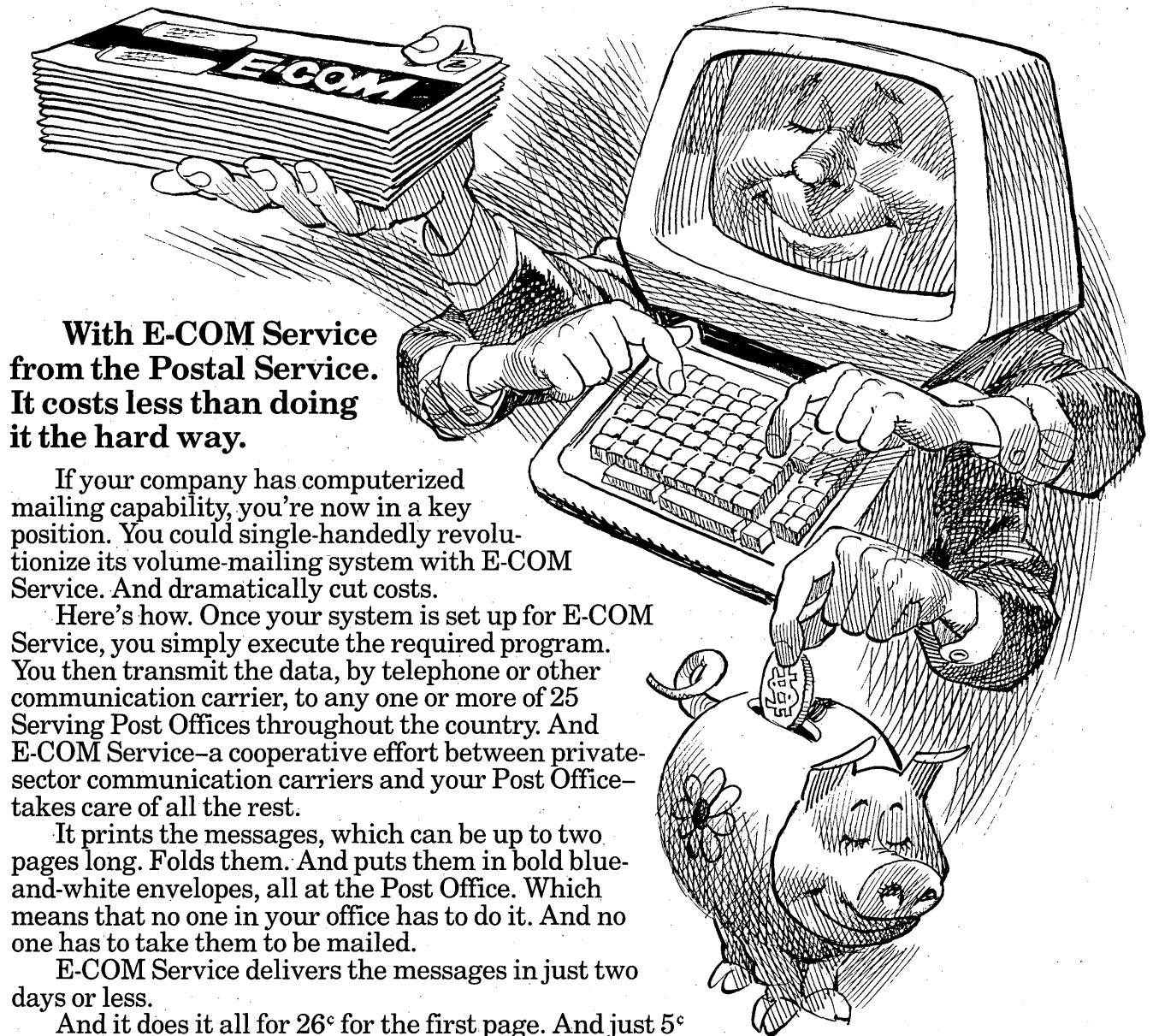
Dr. Robert Mercer, a manager of speech recognition research in the Yorktown Heights laboratories of IBM, lists a number of barriers to achievement of the full potential of speech recognition in the office. His group is working on an experimental dictation system that would provide real-time speech recognition to eventually produce a document of first draft quality. "We've quite a ways to go," he says.

### PROJECT EMPHASIS SWITCHED

The IBM project began nine years ago as one using continuous speech recognition, but in 1981 emphasis was switched to discrete recognition. Utterances, however, are not simply matched on a word-for-word basis. "The system has an expectation of what the next word isn't going to be, based on a prior examination of a huge number of office memos. It also can make firm previous decisions about a word, based on words that follow it."

Dr. Mercer says he has no idea when the goals his group is working toward will be reached, but he does know what needs to be overcome. "There is a problem with microphone placement," he says. "Current products use a microphone on the head. There is a high signal-to-noise ratio and a deep breath can effect it. We considered a lapel microphone but problems come up with turning of the head and coins jingling in pockets."

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## "Why continue to add function keys when you can do the same thing with a single vocabulary word?"

Mercer's group is working for a 15-minute training program but hasn't attained that yet. "Humans know what to expect [in speech] from people from the North, South, East, or West. We have a mental model. We're trying to give one to the system."

Vocabulary is another problem cited by Mercer: "We're working on a 5,000-word vocabulary including the most used words from 1 million office memos. We hoped for a 95% to 96% hit rate and got 92%. We have to either increase the vocabulary or tailor it."

Generally, speech recognition by computer involves use of templates. For speaker-independent recognition, more templates are needed. For direct speech to text, Beckman of Threshold Technology believes "the templates should be thrown away. You should be able to teach the machine to listen to the way you speak direct from what you say, rather than from searching from memory." He says some artificial intelligence

will be needed, particularly in the recognition of context.

Kurzweil Speech Systems, founded by Raymond Kurzweil, inventor of the Kurzweil Reading Machine for the Blind, is a company that claims to rely entirely on artificial intelligence techniques for speech recognition. Within two years, the company expects to be able to produce a voice-activated typewriter that will go from speech to text with little or no typing. The company has substantial backing from Xerox, which plans to market its products.

Whether the techniques are AI or template matching, software is the key to the effectiveness of voice recognition systems. Allen of Kwip says his firm's "sophisticated" software is what enables users of Kwip's workstation to access those various databases. Fink of Intel believes speech recognition in offices will only become economical "when the software is reduced to silicon,"

which won't happen until the marketplace determines what is needed. Right now, market needs are far from well defined. As Mercer of IBM puts it, "we're not sure if anyone out there needs what we're developing."

### PREDICT GLOWING FUTURE

Glowing market predictions for speech recognition abound. The latest from Creative Strategies International, San Jose, talks about a compound annual growth rate of 90% and a \$500 million market by 1988. Beckman of Threshold doesn't quite buy that. "I believe it will be post-1990 before it hits the \$500 million mark. Even that won't happen unless someone hits the mass market with something in the \$50 to \$75 range."

As for voice recognition in the office, enthusiasts are tempered by doubters. Steve Lynch of NEC America, which has a number of voice recognition products on the market, believes, "use of voice recognition in the office is senseless right now. But, down the road, if the capability is there at the chip level in quantity prices, that could change." If this happens his company is ready. "All of our systems already incorporate some kind of microphone."

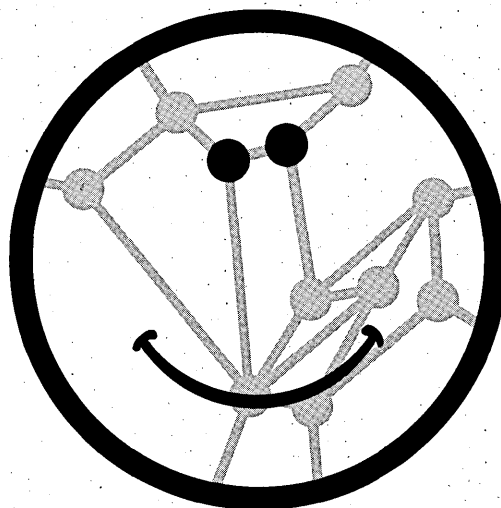
Mike Ludlow, vice president of marketing, Digital Sound Corp., Santa Barbara, which makes peripherals for DEC systems that include sound compression, doesn't think recognition technology is ready for the office yet. "We'll incorporate that technology when the cost/reliability problem is licked. Right now vendors are claiming 97% to 98% reliability. We find it's below that and we want 99%. We'll wait for that." Digital Sound sells its peripherals to organizations working in speech recognition research including Bell Labs, MIT, and Texas Instruments, "so we know what's going on," says Ludlow.

Mike Cheiky, vice president of development for Santa Barbara Development Laboratories, Santa Barbara, has a similar attitude. His company markets an executive workstation it bills as "mouseless and keyboardless," and which doesn't have voice recognition capabilities although it does promise "voice control." The recognition is done by a secretary," says Cheiky. "When the technology improves, we'll incorporate it [voice recognition]. They've been promising breakthroughs for more than 10 years but I don't feel anything workable is commercially available today."

Ted Nelson of Datapoint, San Antonio, Texas, is even less enthusiastic. "I think voice recognition will progress trivially over the next five, 10, or 20 years but what is really important in office automation is clarity and ease of use."



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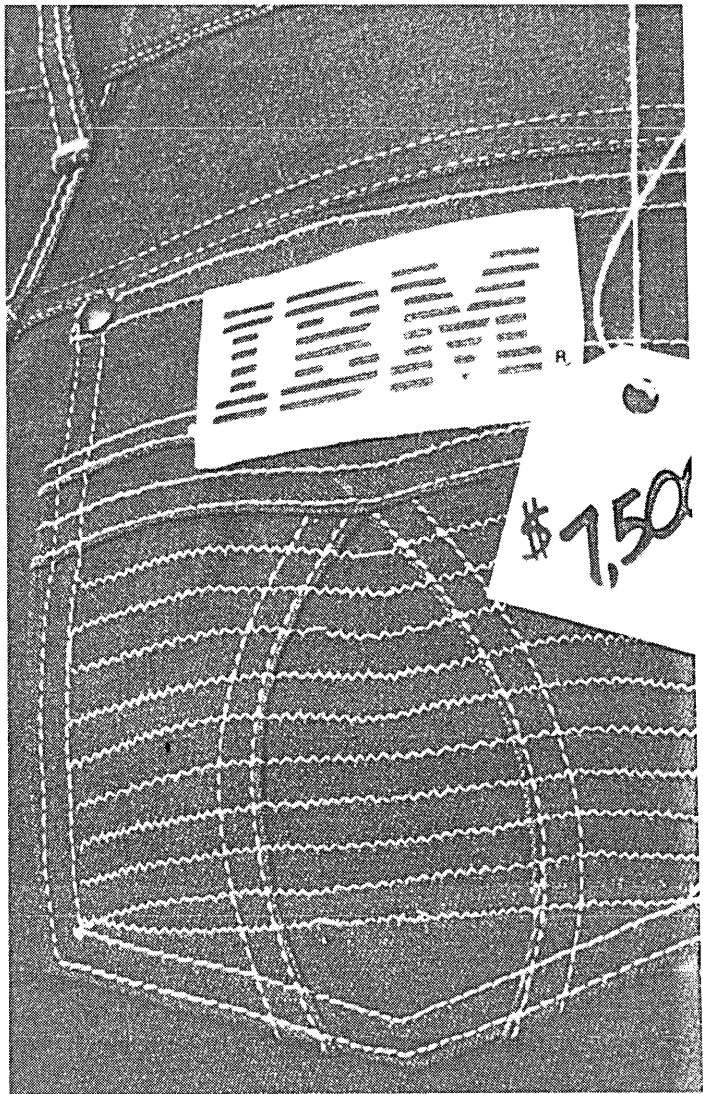
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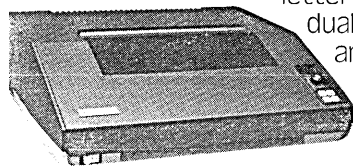
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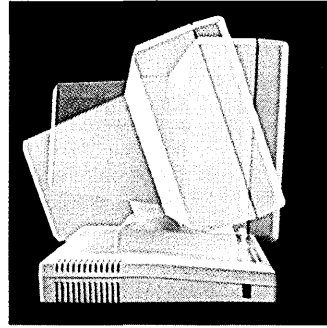
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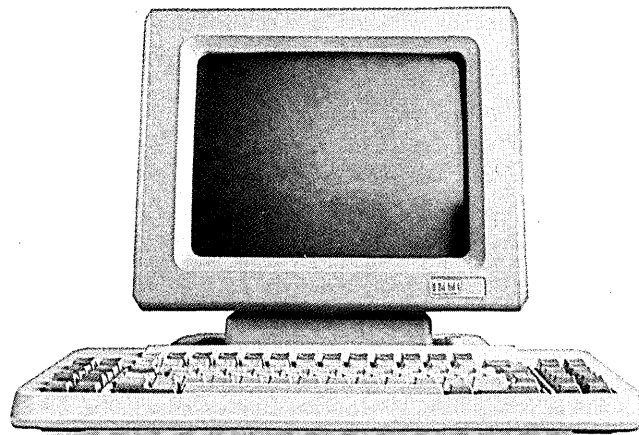
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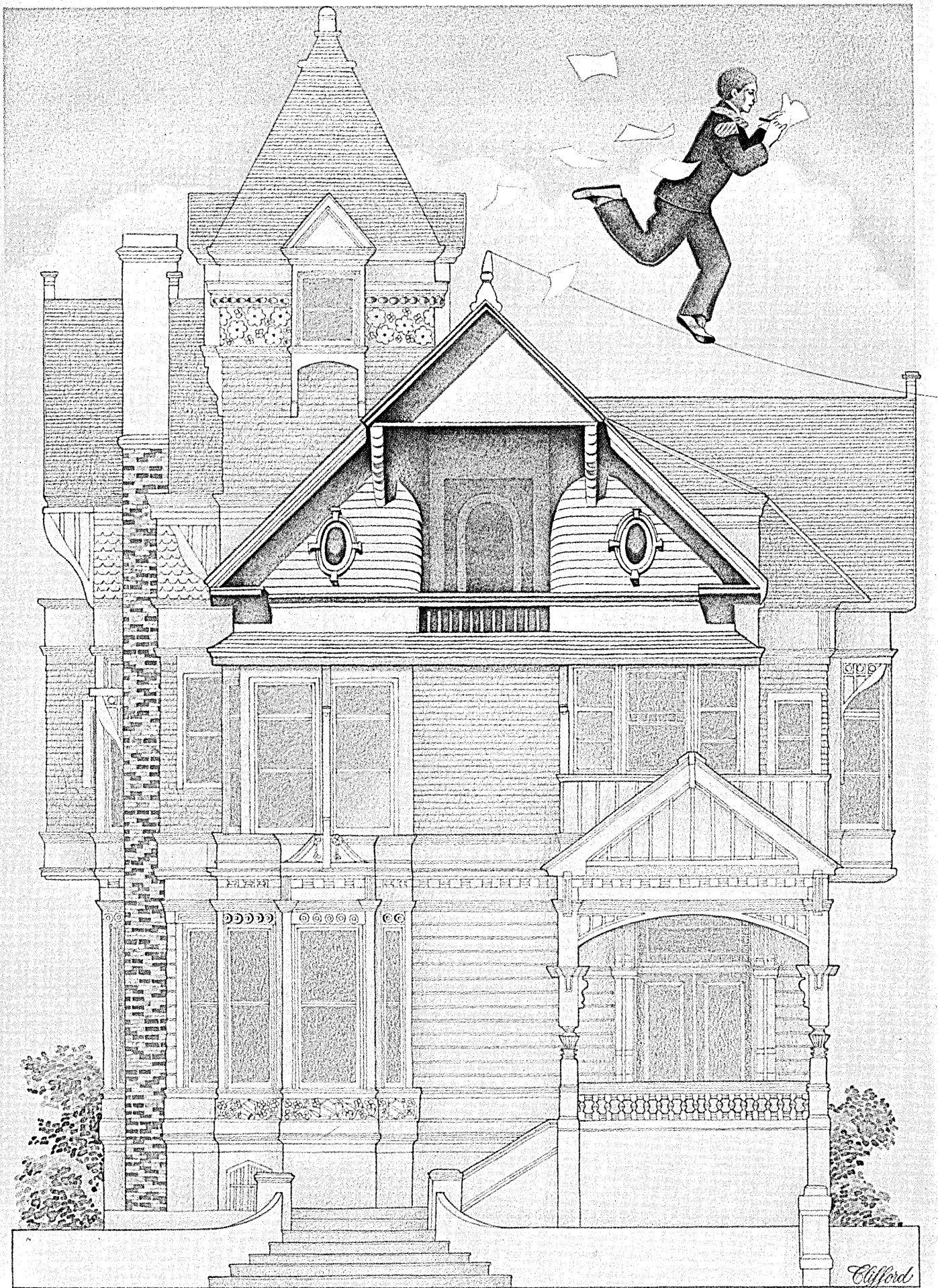
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## by Irene Shain Nesbit

Two facts of life in today's MIS organizations are the growing inventory of old applications and the rapid spread of microcomputers. Both are major concerns for data processing executives. Micros just keep multiplying and are increasingly difficult to manage, and the list of obsolete applications gets longer and longer.

No one is pleased with the situation. The ceo looks at MIS and sees continually expanding budgets that don't buy as much as they should. Simultaneously, the users are out there spending money to get their own computers. What are they using them for? Aside from spreadsheet applications, no one seems to know.

These two problems have a common solution. Among the many old application systems an installation runs, there are probably several that could be redesigned and written for microcomputers. This usually means taking an old system, written in COBOL, and replacing it with a mix of packages and custom code—using BASIC, Pascal, or even the COBOL that is now available for microcomputers. It also means that the dp manager achieves two important results: a needed application gets modernized, and a micro performs a real, justifiable job.

There are other advantages. The dp manager gains a new and probably swifter way to update old systems. Last but not least, the approach offers an opportunity for him to assert greater control over the ways micros are used in his organization.

Although trying new technology has hitherto involved a fair amount of risk, small computers are changing the equation. The costs and potential pitfalls of a micro migration are minimal compared to system development with a new supermini and state-of-the-art software. Moreover, micro migration can be tried very gradually. One application at a time can be moved, until everyone feels comfortable and experienced enough to accelerate the process.

The first step is to identify applications that qualify for migration to a micro. There are several points to consider:

*Old age.* Every installation has application systems, running in production mode, that are suffering from obsolescence. They were designed five, 10, or even 15 years ago, and software typically has a working life of only 10 to 15 years. After about 10 years, an application begins to be outmoded and difficult to maintain. In today's shops these applications are generally batch systems, producing output with a scheduled frequency. They may have been upgraded along the way with an interactive front end, but in essence they are batch systems. Some even run on ancient hardware, with old operating systems.

The worst thing about aging applications is that they're cumbersome to operate. File interfaces are crude (if they exist at all), and the support of outdated operating systems, emulation modes, or hardware is burdensome. Many applications contain manual steps imbedded within the automatic process-

ing flow, and these steps generate errors and headaches for everyone. It is not uncommon for shops to keep an old keypunch machine on hand. All of this creates extra costs. Running an old system has some of the same drawbacks as running an old car.

Everyone suffers under these circumstances—maintenance programmers, data entry staff, operators, and users alike. Outmoded input processes cause errors. Users complain about the errors, slow interfaces, and lack of needed information.

For example, I recently analyzed a delinquent-account-collection application that was originally intended to provide late payment information for a department manager. The input process was so unwieldy that the output was never timely or accurate. A clerk was spending about 20 hours a week trying to correct the data and update the account status. The input was still being corrected and recorrected after payments had been sent in; the system was usually two to four weeks behind the actual account activity. It had become a system that made more work for the department instead of supporting the jobs that had to get done. It had been written in 1974 and still ran on a 360/50 that the MIS staff wanted to junk.

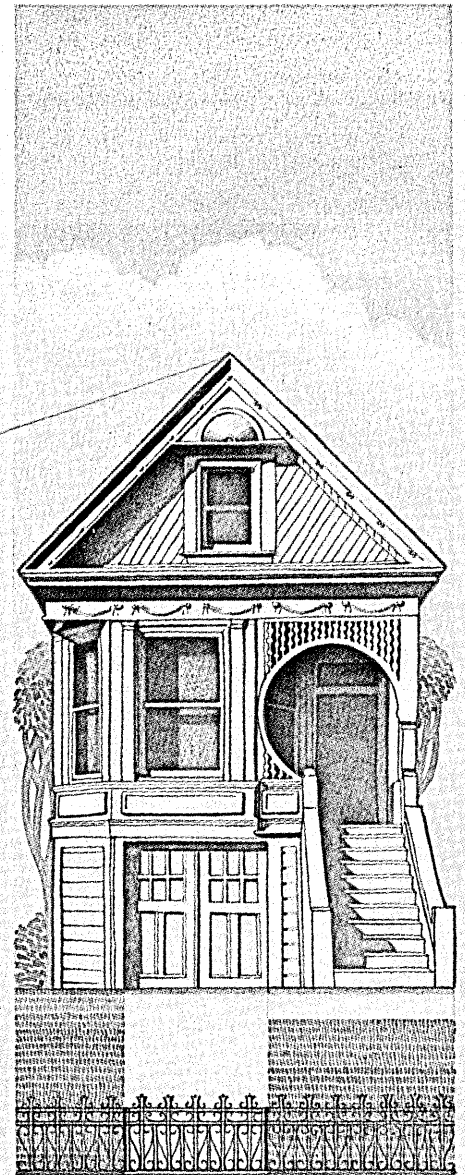
### FINDING THE RIGHT TARGET

*The right size.* This aging target application must, of course, be of a size that can fit on a microcomputer. Microcomputers are small machines, but the size is less limiting than you might expect. The IBM P.C. XT can be equipped with 512K of memory. That is a machine large enough to do real work. The 360/30 had only 65K of main memory, the 1401 only 12K. Many old systems were originally written for machines that were smaller, or not much larger, than current microcomputers. While a micro is not a 3083, it is a machine with enough memory and storage capacity to satisfy many applications.

To determine if it is feasible to move an application to a micro it is necessary to quantify the elements involved. First, look at the data. The size of the files and records must be defined. How many files? How large are the records? If there are 10,000 records of 3,000 bytes each, a micro is probably a poor solution to the problem. However, if there are three files, each containing a thousand 500-byte records, the micro's size will not be a problem.

Even applications that exceed this size may be candidates for a move. Many existing mainframe files bulge with historical and extraneous data that can be more efficiently managed through an improved file design. A double sided, double density diskette holds 320K bytes. The fixed hard disk on the IBM P.C. XT can go up to 20MB. If a system is well designed, that is a decent amount of storage available for data, programs, parameter files, additional data, and historical information.

In the case of an application we designed for a large media company, three months' worth of data fit comfortably on one



**The system is old, it is difficult to maintain and use, and no longer matches the needs of the business. What to do?**

**MOVE IT TO A MICRO**

# The worst thing about aging applications is that they're cumbersome to operate.

diskette. The user maintains a neat collection of diskettes, one for each quarter of the year, one for semiannual data, and another for the yearly summary. It is all stored in a small box, with backups and extras kept in the desk. On the replaced mainframe system the quarterly data had been appended to the current data file; the resulting five-year file was huge, and seemingly impossible to put on a micro. But with the file divided into logical quarterly segments, the application fit perfectly on a micro—with the added benefit that the data became more manageable and accessible to the user.

The size of the program also affects the migration decision. Large programs with thousands of lines of code may be too big for a microcomputer. The amount of code, however, is not necessarily an accurate calibration. The lines of code may have multiplied over the years because of patching, fixing, and enhancements. A redesign may result in a far smaller program. If a program is a legitimate monster, though, it's probably not a good candidate for migration.

*Connectivity and interfaces.* Most systems interact with other systems. When you're considering moving a system, all its connections and interfaces—to other files and to other programs—must be assessed.

In most old applications, interfaces and connections have grown haphazardly over the years. Sometimes, the interfaces to other systems are simply file transfers or updates. As new systems were developed that needed data from an older system, the interface was simply patched in. These interfaces are generally not sophisticated. Upon inspecting the collection system we discovered that the interfaces were relatively simple: changes to an address file were input to the old application, and the application itself sent weekly totals (only 20 numbers in all) to a different system. Prior to investigation it was assumed that there were many more connections, and larger volumes involved, than was actually the case.

In addition, old applications generally lack informative documentation. The interfaces that were established after the original development was completed are usually documented poorly—if at all. It takes some detective work to define the connections, the procedures, and the processing cycles. It would be nice to find old systems that are clearly documented, with the dates and descriptions of enhancements. But like the Cubs winning the World Series, that will hardly ever happen.

Each day new product announcements offer greater sophistication and efficiency in the way micros talk to mainframes and minis. There are boards, modems, and software designed to make a micro a 3278.

And over 40 local networking products are now available. These products must of course be evaluated within the context of the application requirement, but many of them propose sound, simple solutions to interface and connectivity problems. If you take the time to gain a practical understanding of these issues, you can successfully move an application with significant interfaces to a micro.

*The users.* Not surprisingly, the users who are most enthusiastic about this kind of migration are the ones who have microcomputers. They are already literate and sophisticated. They can take the responsibility for "housekeeping" chores, connectivity procedures and other tasks related to a special system. They are also the users who are most vocal about the obsolescence of the existing application—not because it runs on a mainframe, but because it is no longer functional or informative.

## CHOOSE USERS WHO CARE

If you have a choice when you're picking an application to move to a micro, choose users who are knowledgeable and sophisticated. We did a system that was to be the responsibility of two clerks who were naive and uninterested. In fact, they were almost resistant to the entire effort. Partly because of their attitude, everything about this project became difficult—defining requirements, acceptance testing, and especially training. In the end they learned and the system is now operating successfully. But if you can, work with users who care.

*Business functional mismatch.* The best candidates for migration are applications that are truly outdated in terms of the business requirements. Earlier technology often imposed a rigid design that no longer matches the operating business structure. These systems take lots of work to maintain and generate few benefits. Applications that are functional mismatches need to be redesigned promptly.

Users complain about old systems in very general terms, saying "it doesn't do what we need." It is important to define the mismatch: the functions that are missing, the need for more timely reports, etc.

One application migration was clearly necessary because the old system was designed for a business entity that distributed products only during weekdays. The business shifted two or three years ago and became a seven-day-week operation—and none of the applications could handle Saturday or Sunday activity. That was an easy and obvious mismatch to identify. Some are more subtle. A good analyst will define the functions and requirements that must be automated for current business needs.

## PUTTING THE MICRO TO WORK

If you've found an application that qualifies for migration—it is old, the size is right, the connectivity and interface issues can be solved, the users are appropriate, and the business functions are a mismatch—you're now ready for step two: figuring out how to get the micro to do the job.

*Requirements.* A changed application deserves a fresh design. New functions and processes must be identified, defined, and described. The delinquent account-collection application mentioned earlier needed to be completely redesigned. The information being reported was useless and the input processing had to be made efficient and timely. Another system that was rewritten for a micro was designed with a special auxiliary file to contain frequently changed distributor names and product volumes. The process was so cumbersome that names were never changed. In both cases, the drawbacks of the old application are not being duplicated. More important, the applications are being redesigned to exploit the strengths of the micro.

*User Activity.* One of those strengths is the degree of user interaction that is possible. It is easy to develop applications with nested menus and many user prompts. This high level of interaction should be emphasized in the system design. Different types of input, data editing checks, and variables can be part of the user input or prompt activity.

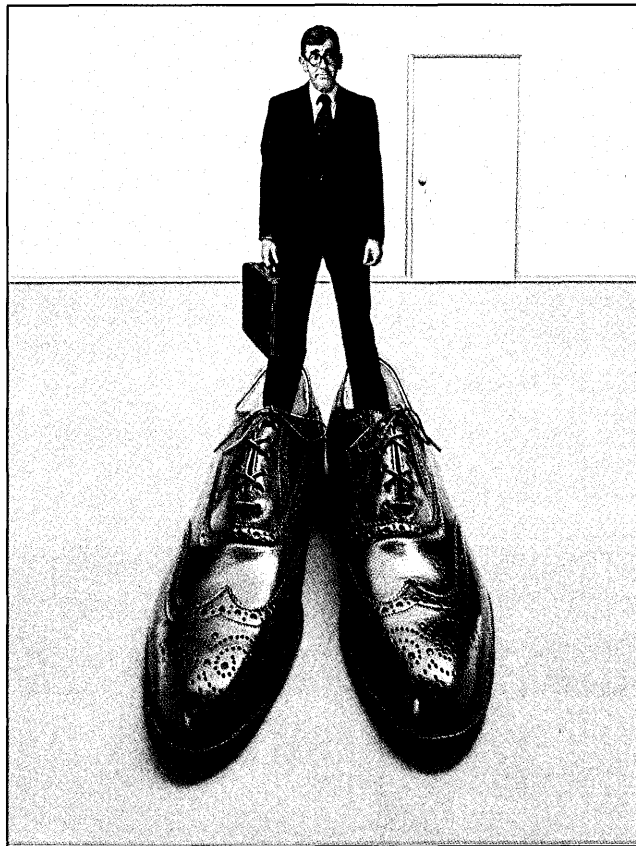
The one drawback to highly interactive systems is that they require significantly more end-user training than batch systems. Training for end users is not easy, and should be an important consideration in the planning process. Training requires careful definition of objectives, good scheduling, proper facilities, and patience. Getting users to be conversant with a system is not easy; be prepared to spend some on training.

*Local control.* The user is in charge of a micro application, and that means the system and its accompanying procedures must be foolproof. All procedures and documentation must be clear and well written. I pretend I am creating a product that will be used by any number of users unknown to me. If the procedures are poor or the documentation is unreadable, all those unknown users will become known.

Everything must be precisely defined and as simple as possible. The end user is the operator who is responsible for system connections, backups, input processing, and runs. The challenge is in designing a system that allows for operator performance. The total system (the programs, procedures, and manuals) then imposes a greater control over the local end-user control.

*New technical approaches.* The

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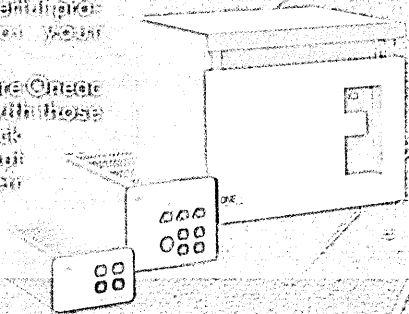
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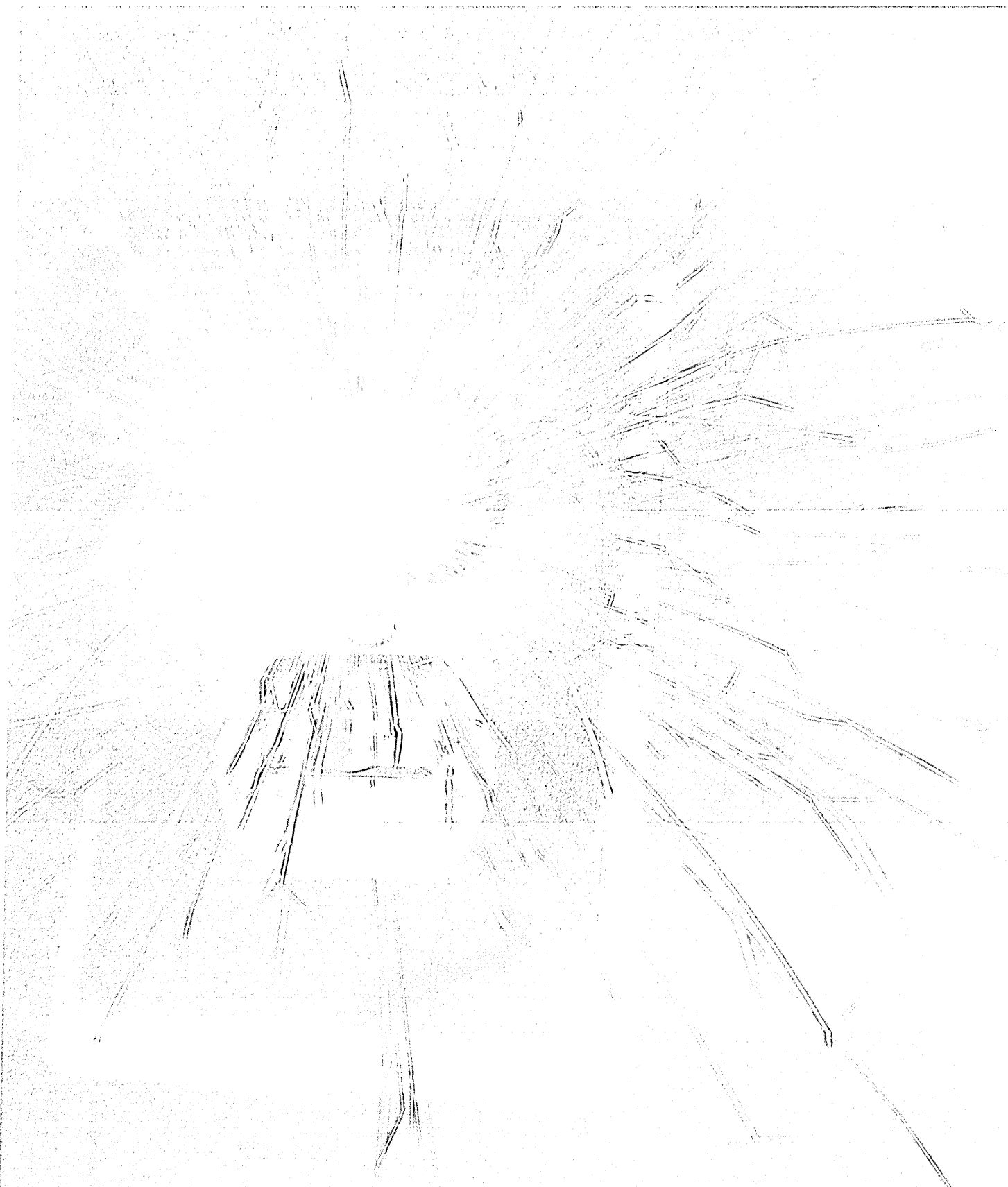
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## The strength of a micro lies not only in its nifty collection of hardware, but also in the many software products available for it.

strength of a micro lies not only in its nifty collection of hardware, but also in the many software products available for it. A combination of packaged software and unique programs (developed from programming languages) can be quite effective. Many systems have been built using the relational database packages. Additionally, we have designed systems using a combination of the database packages, a spreadsheet package, and some code written in BASIC. It can be a powerful mix.

Though small machines can use many of the same languages that are available for mainframes, BASIC remains the most common microcomputing language. Despite its size address limitations, and its lack of popularity among data processing professionals, it is still a very useful language. Recently I have seen admirable structured BASIC code; it is a language that should not be underestimated. In addition to BASIC there are Pascal and COBOL. The COBOL for the IBM P.C. has features that allow for a wonderful use of color on user screens. And Pascal is a powerful language that offers unique portability through the UCSD-P system. Any of these languages can be used to develop successful microcomputer systems.

Additionally, microcomputer software often uses different file and database techniques. Housekeeping functions are fre-

quently incorporated into parts of the software, so the user is reminded to back up files at a certain juncture, or the system automatically initiates the backup procedure. It is useful to look at some of the newer micro software products. Clever and simple approaches have been used that result in stable software, good help facilities, and nice user interfaces.

### EXAMINE COSTS AND RISKS

Before you make a decision about moving an application, you'll need to weigh the costs and risks. It may not be worthwhile to do anything. The application may be supporting a part of the business that is no longer profitable. Or it may be an application that is economical and does everything that is needed, even though it runs in an old-fashioned manner.

*Costs.* Many old applications are considered bargains. Managers believe that they were cheap to develop and are inexpensive to maintain and run. This is often not the case. It is useful to identify all the costs associated with the system—maintenance programming charges, and operational costs that include input efforts, output distribution, and error resolution time. The cost curves in today's world favor hardware and small systems, and the price of maintaining an old application may no longer be tolerable.

Costs are much different on a micro.

While the hardware can cost up to \$8,000 or \$10,000, the user department may already have the necessary machine. Software costs vary and should be estimated after a careful design study is accomplished. Along with the cost of purchased software, you have to consider the development effort required.

Development costs will be less than for a comparable system on a mainframe, largely because development is so much faster on a micro. I have no precise measurements on this other than our own experience. Our micro migration projects indicate that an application (including the requirements analysis process, a 30-page user manual, and a system summary for MIS) can be written in two to six man-months or less.

Because of the lower costs, a micro migration represents an opportunity to develop a new system—an opportunity that may not exist if the application must be rewritten for a mainframe. The organization may gain a new business system that it otherwise couldn't have afforded.

*Risks.* This is a business of risks and degrees of risk. There is risk in continuing to run an old application. A realistic assessment must be made: can the system run for a year or two or five without disaster? There are applications that are running on hardware that is unrepairable; and there are systems that are troublesome but run on currently acceptable hardware and operating systems. The two represent different degrees of risk. Quantifying risk is tricky, and a consensus may not be possible, but it is important to try.

There are also risks associated with using new technology. Microcomputers, however, have been enthusiastically welcomed by people outside the computing profession. They are not strange or unknown and because of that the danger is much lower. The greatest risk stems from the problems of developing a functional, smoothly operating application. But even that risk can be minimized by using packaged software, hiring experienced people, and setting realistic objectives. The costs can be identified, estimated, and controlled effectively. The downside is minimal, while the benefits can be very great.

Users are looking for new ways to use their micros. MIS people can be heroes and heroines by understanding this, and developing new systems for them. Old applications are ideal targets. \*

Irene Shain Nesbit is president of Nesbit Systems Inc., a software consulting company based in Princeton, N.J. She's been installing small systems at large companies for the last two years. She previously worked at NBC and the Rand Corp.



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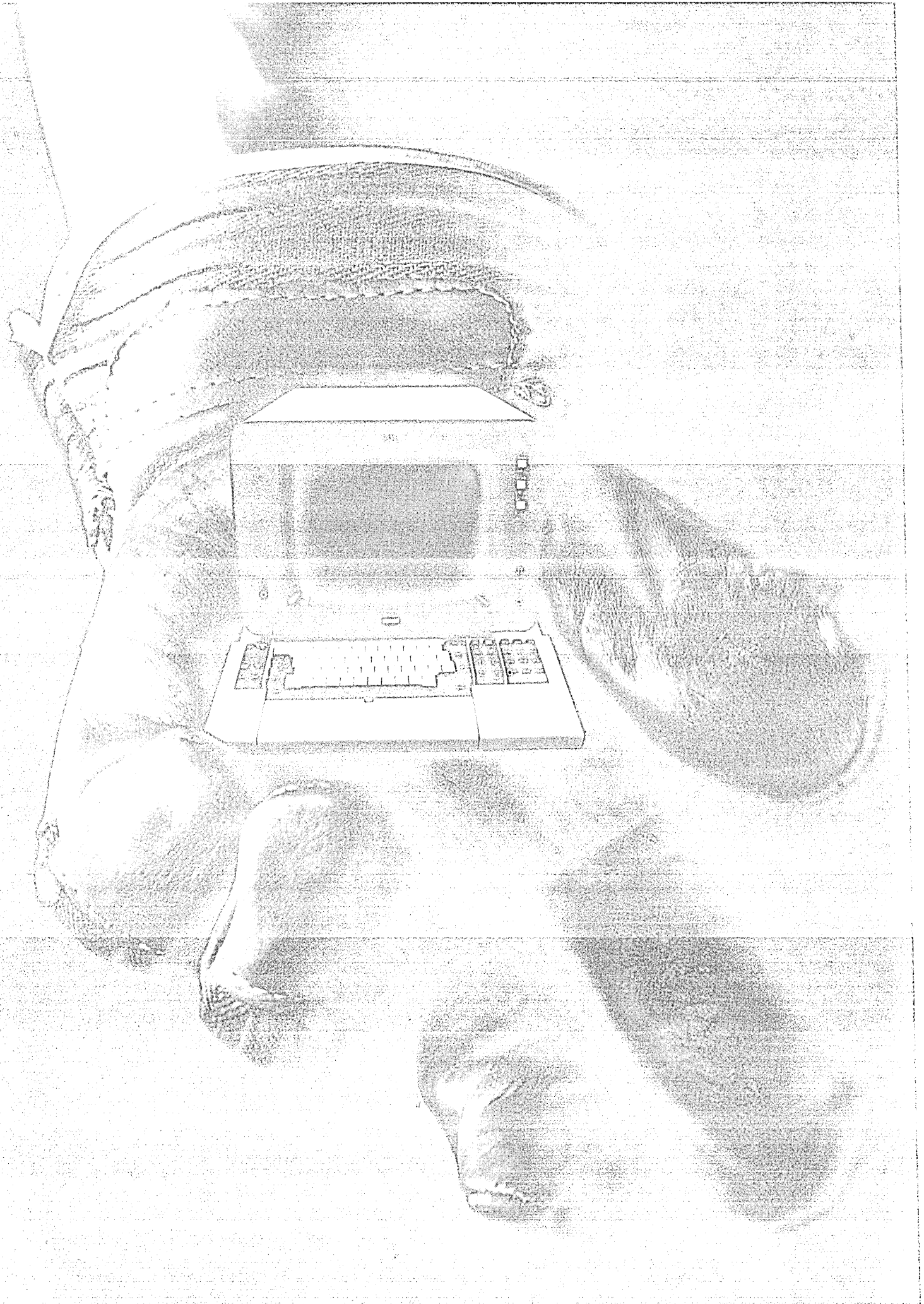
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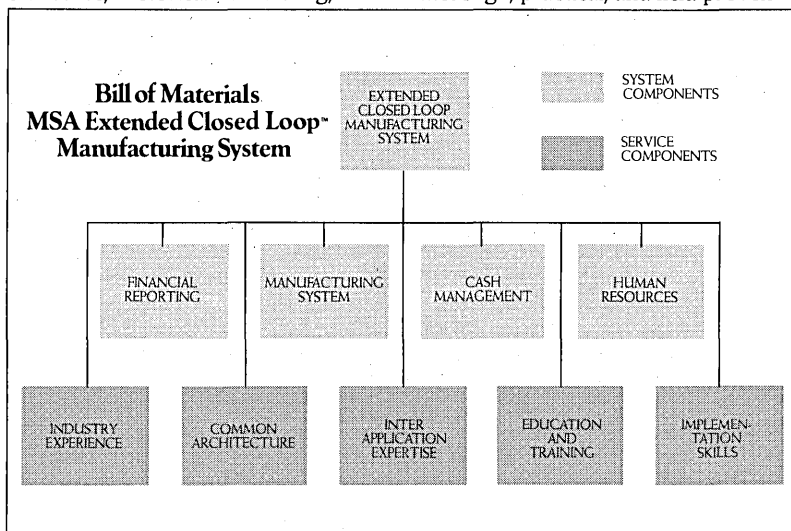
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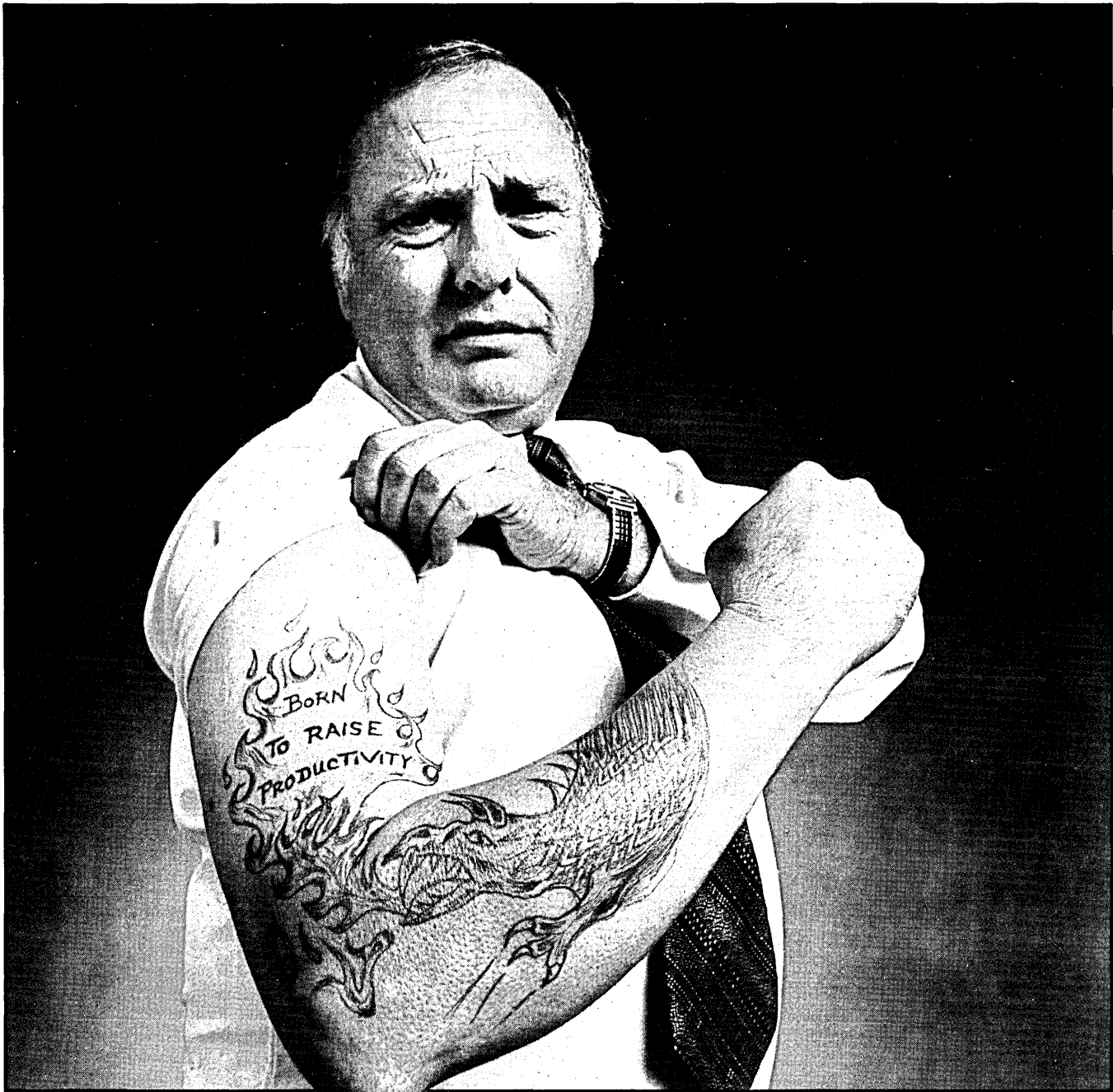
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## Advice from the trenches on how to replace an aging production system with an off-the-shelf product.

# CONVERTING TO A PACKAGE

by John G. Seddon

As application packages gain in power and popularity, more and more dp managers face the task of installing them in place of existing, highly customized production systems. They have to rethink whole applications and translate old files and procedures into new ones. The process must be well managed for the projects to succeed. How are they proceeding?

"The first thing we do," says Frank Cardamone, senior systems analyst at Rocky Mountain Energy in Colorado, "is determine how serious the problem with the old system is. If there is a need for a change, we come up with a requirements list. We'll take that down to specific detail."

How specific should this list be? "It's more than a general statement that the department needs help," says Cardamone, "but we'll try to hold it down to one or two pages." The list should be specific enough to determine the right package for the company. "If you can recognize that a package does the internal processes properly for you, moves the data correctly, it's relatively easy to deal with the externals," says Al Varey, director of corporate information services at Wickes, a Los Angeles-based chain of home decorating stores.

The analyst's role is to ensure the requirements reflect how the user will handle the company's business. This may be easy when the first computerized system is installed—everyone wants a say. But when dp is replacing the first system with a package, the situation can be different. "Many times the people who specify the system are doing things according to a policy handed down to them," says Varey. The result is that the requirements for the new system follow the old standards and procedures. The analyst must get company executives involved in

writing the requirements for the replacement system. They are the people who will set policy for the company's business in the future.

"In addition to our requirements list we'll make a list of questions for the vendors. What support do they give? What training is provided? User references? And what are the hardware and software requirements?" says Cardamone. These lists are used to evaluate the alternatives.

Once the company has selected a package, dp can start planning. What design work has to be done? What open issues have to be resolved? What conversion programs have to be written? What testing has to be done? The project leader draws a project plan and assigns the tasks.

"You have to have people who are dedicated to putting the package in," says Jim Tortorice, manager of accounting services at Allergan, an Orange County, Calif., supplier of eye care accessories. "You can't put a system in if you're trying to do your regular job at the same time."

"We make sure we have management and executive support," says Cardamone. "We make sure they realize there could be some changes they will have to approve or disapprove and that they will have to meet the deadlines for their decisions."

"User involvement is extremely important," says Brian Battuello, programmer analyst at fast-growing discount brokerage Charles Schwab in San Francisco. "If you can find a user who has a sense of ownership about the new system, who will take pride in it, be curious about it, and will help the analyst, then the installation goes well."

In the planning stage the project team should decide whether to install the package in phases. "With a package you can get more of the system up earlier than with in-house development. That can put a bigger strain on

the departments involved," warns Varey. "If you can bring up individual pieces and understand them and digest them before proceeding, do so."

### PHASES OF THE PROJECT

Varey emphasizes the learning process that starts with the first phase of a project. With custom programming, users will change their requirements and adapt their methods as the programming phases are completed and installed. Phased installation of a package may not influence the design in the same way—the package, of course, is already programmed—but each completed phase does add to the sophistication of the implementors, both on the user side and the technical side.

Lenn Kimura, a systems analyst at Allergan, is taking a phased approach for a large package installation: "You're affecting all sorts of areas and if they're not ready all at the same time you can't implement the whole package. Also, if you have some problems, it's hard to find where the problem area is. By phasing you can pinpoint your errors." Once the analyst has solved the errors in the first phase, he can look through the rest of the system to see if the problem area has been fully addressed. "When you've got everything covered you go on to the next phase. You hope each phase gets better and better," says Kimura.

How does dp decide what the phases will be? The analyst should get the users to rank their requirements. Then the installation plan can be divided into phases—by function, by warehouse, or by product line—that get the important things done first.

After planning, the next step in a programming project is design. The same is true when dp installs a package. Since there are no programs to design, the two major design issues are forms and manual procedures.

## "You can't put a system in if you're trying to do your regular job at the same time."

Who's going to get which piece of paper and how do you get it to them? "There's a trade-off," says Cardamone, "between the procedures you've bought and the procedures you currently have and the procedures you want. If the package has a better way of doing things then we do it that way."

The analyst must discuss the design of the new system with the department managers and document their decisions. Standard design tools can be used: work-flow charts, dataflow diagrams, step-by-step scenarios, etc. It can be a lot of work and it may be difficult to get people's attention. "After all," they may say, "doesn't dp know what we do? Can't you simply tell us how the new screens and reports match the old ones?"

Dp rarely knows everything that goes on in the user departments. Also, the company's business has probably changed since the old system was installed. Exceptions that, in the past, had to be handled outside the system may now be common. New standards and procedures have probably been added to the user's operating manual. Patches have typically been made to the old system. "There are always surprises about the current system," says Cardamone. He once discovered that an accounts payable system he was replacing lacked procedures to ensure that all invoices were processed. "We had to make a policy statement to stop that," he says.

The analyst usually stumbles across these surprises. They are the rare situations or missing steps. Dp can track them down by talking to the clerical people who handle the day-to-day work. Show them how the new system—package, manual procedures, and forms—will work. Then ask them what cases haven't been handled. It may be depressing for the analyst to see his well-laid plans disturbed, but he must be sure the new system will manage exceptions and plug loopholes.

"During the design process we usually find what we won't use in the package, or what we have to change," says Cardamone. Varey says he knows of few companies that have taken a package and used it exactly as it stood. How much should dp change the package? As little as possible. Dp can add reports and make cosmetic changes by writing pre- and postprocessors. Many packages also provide user exits to custom programs. But it's not wise to meddle with the package's functional design. The more changes dp makes, the harder it is for the vendor to support the product. And it's difficult to modify a complex package and know what all the side effects will be. "We modified one package so badly," says Cardamone, "that we rewrote about a third of it. We paid for it time and time again. We recently stripped it and got back to the minimal amount of changes, and it's been much easier to work with."

### STRATEGY FOR LOGIC CHANGES

What if logic changes are really needed? "The best strategy is for the vendor to change the standard package to include the feature you want—if you can get them to do it," says Varey. Unfortunately, this rarely happens. If it does, it doesn't happen overnight. An alternative is to get the vendor to make modifications and assign your shop responsibility for supporting them. "We made some changes to the system and had the vendor do some of the changes too," says Woodson Hobbs, executive vice president at Charles Schwab. "We had a problem in testing," he warns. "The vendor knows the vanilla system very well, but we have to test and support the changes."

Once changes have been made, the purchaser must control the source and object libraries. There are up to four versions of each program in the system now—the vendor's standard, the vendor's modified version, the customer's modified version, and the programmer's work in progress. What happens when the next release arrives from the vendor? Chances are that it includes new versions of standard modules, plus some changes the customer requested. It's up to the dp shop to sort them out, add back their modifications, and test and install the correct versions.

"We've written a program that goes through the existing system and tells us what programs and lines of code have been modified," says Cardamone. "Then we start comparing to the new release and adding lines back in." This is fine if a shop keeps custom coding to a minimum. "The best technique," says Varey, "would be to trap all the changes made by dp and by the vendor and have a good understanding of what exactly it is that you are responsible for supporting." Varey adds that few dp departments keep a check on the vendor's changes. This would be a huge task for a large package. "Quite honestly," he says, "I wouldn't trust the vendor to support the customized version."

Data conversion is usually done by the dp department. Users, especially batch system users, tend to expect this. The situation might be different with the first system installed, when the users want to define how the new files will be created from scratch. But because the replacement system's data can be created "automatically" from existing data, the task of data conversion often fails to receive the attention it needs.

"We reviewed what data existed in the in-house system, what data had to be in the new system, and what data had to be created. The user had to tell dp how to create the new data," says Kimura. "If we had any problems with the results of the conversion program, it was probably due to a misunder-

standing between data processing and the user."

Another data conversion issue arises when the package keeps more detailed information than the old system. Should dp go to the archive tapes and recollect the historical detail needed to compare, say, this year's activity against last year's? Few companies do—it can be very time consuming. Also, other changes made during the data conversion—a new chart of accounts or a new sales structure, for example—often invalidate any comparisons.

"Dp should automate as much of the data conversion as possible," says Cardamone, "and the user should check the data at each stage." Battuello recommends that the conversion program translate the old files into transactions that can be processed through the new system, rather than go directly file to file. "The conversion program can include automatic defaults to build new information," he says, "or can produce ledger sheets for the user to complete and have keypunched." By going through the package's transaction processing, the old data will be subject to the normal data entry edits. The package will also provide an edit listing showing errors. This can be used as an audit trail for the conversion. "If you go file to file," warns Battuello, "the new system data will be no better than the system you came from."

### USER TRAINING & TESTING

An analyst's most frustrating moments often result from poor user training. But it is difficult to get the users' full attention while they are busy keeping the old system going. "We send at least one user and one dp person to the vendor's school," says Cardamone. "From there we'll do the training in-house. We'll give the users plenty of notice and schedule a half day or more in the month before we go live."

"We took half the people at a time," says Tortorice, "and prepared a manual based on the training manual we got at the school." The vendor's manual can be condensed into an operating manual, with real-life examples and step-by-step instructions. The aim is to provide clear, confident training to educate and inspire the clerical staff, not a low-key, unprepared ramble that will cause confusion and apprehension. This means the new system must be working well enough to be demonstrated at the class.

Some vendors provide test data files and job streams. These will test the standard package but won't impress the users. "The best testing I've seen," says Varey, "is when the users defined the test criteria, ran the tests, and reconciled the reports."

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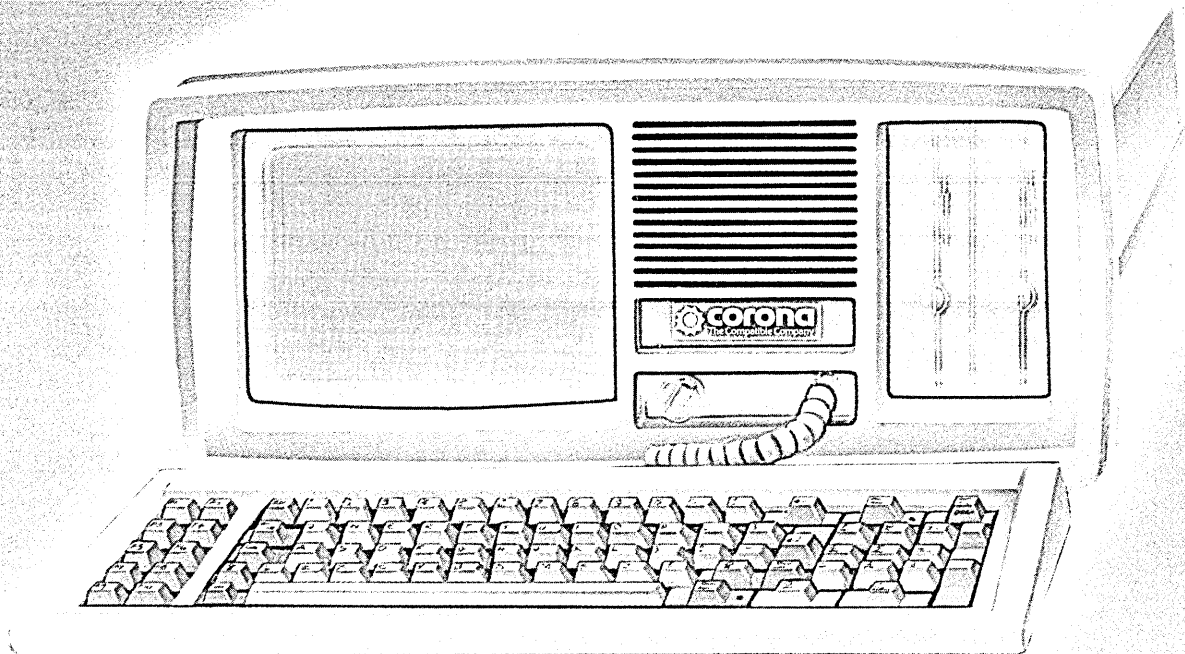
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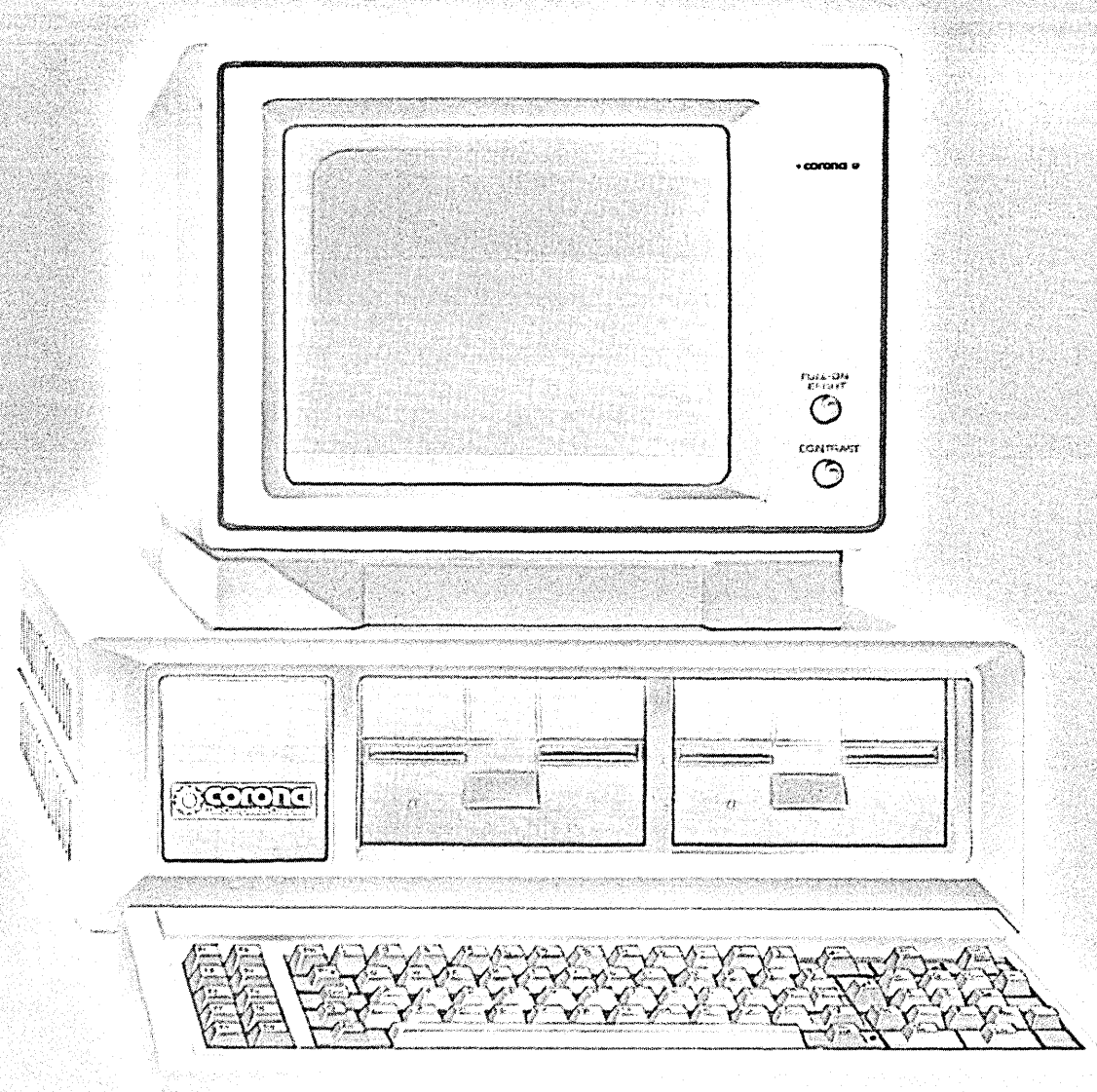
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## "The best testing I've seen is when the users defined the test criteria, ran the tests, and reconciled the reports."

in parallel with the old system. "If you set it up right," says Battuello, "it doesn't have to be a strain on the company. There are two issues. One is the ability for the processing on the new system to match your existing system. The other is to test the day-to-day procedures. If you check all the processing logic ahead of time then you can concentrate on the procedures." Battuello recalls a recent project when his shop processed 15 sets of month-end tapes from the old system. After each month-end they balanced the new system's reports against the old ones.

"When we were confident that the processing matched, we went on to test the procedures," he says. "The problem occurs when you try to do both at once—when the user is entering data and the numbers are coming out different."

After running in parallel, the decision to cutover depends largely on the user's comfort level. Dp can't force the decision, but a fall-back plan and a few words of support from the analyst can help.

"Once a system's in, from the user's side it's in," says Kimura. "But from the data processing side you still have to watch it for a few month-ends." Cardamone says that postinstallation problems are "generally file space limits or a JCL problem that was missed." File and disk space usage must be monitored after the system is installed, because files often grow faster than expected. Job stream problems should be addressed specifically during parallel running. The analyst should ensure that operations people, rather than programmers, run the system. A programmer may have run a job successfully

during testing, then made a mistake moving the programs to the production system. File definitions may have to be changed, or the operators may need password access to the files. These mistakes should be found during the parallel run.

Postinstallation problems on the user's side are often the result of poor training—the clerk doesn't know how to code a form, doesn't have clear documentation, and decides to throw it into a batch and see what happens. Later, the analyst has to make a time-consuming house call to find out what went wrong.

Another, more rewarding, postinstallation task for dp is to review the reports with the users. "They are always enthusiastic about the new package and the new reports until three or four weeks before installation," says Battuello. "Then they ask, 'How are we going to get this report out?'" The users want to see their old reports in the old format, even if a new report shows the same information. Dp can diligently provide the reports before going live, but this leads to duplication. "We get too many reports," says Tortorice. "We'll probably cut off a few of them after a while." Now is the time for the users to save paper.

The analyst should also be monitoring the system's performance after installation. Testing may have been on small test files, and a 10-minute report may have grown into an eight-hour job. Many packages include a report generator that allows users to specify the reports they want. This flexibility has a price: report generators can be inefficient. Frequently produced reports may be candidates for reprogramming. Once the package has been installed and the analyst has watched over it for a while, dp can move on to the next project. The vendor provides software support, and dp writes an occasional report program and installs new releases.

The benefits of packages over in-house development are well known. But there are some additional tasks and problems that don't occur in start-from-scratch projects. A dp shop can handle them by reaffirming its faith in project management. As Cardamone says, the rules for success are still "know what the requirements are, get management support, get a team of users and dp people, and plan well." \*

John G. Seddon is manager of systems and programming for Vidal Sassoon in Los Angeles. He previously worked for Control Data, Canada, and IBM, United Kingdom. He has managed three application conversions in the past 18 months and has gone through three hardware system conversions in his 15 years in dp.



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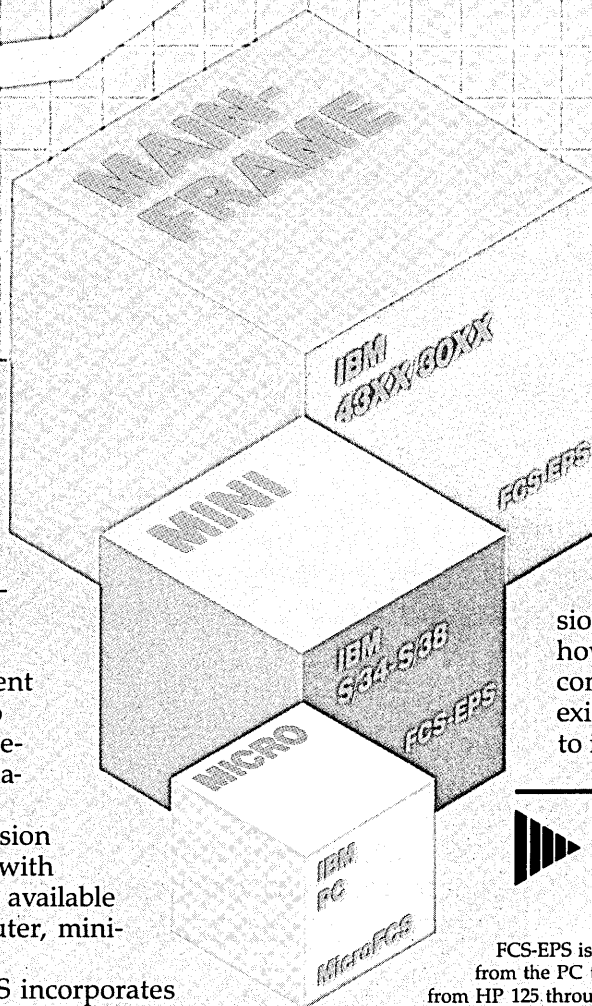
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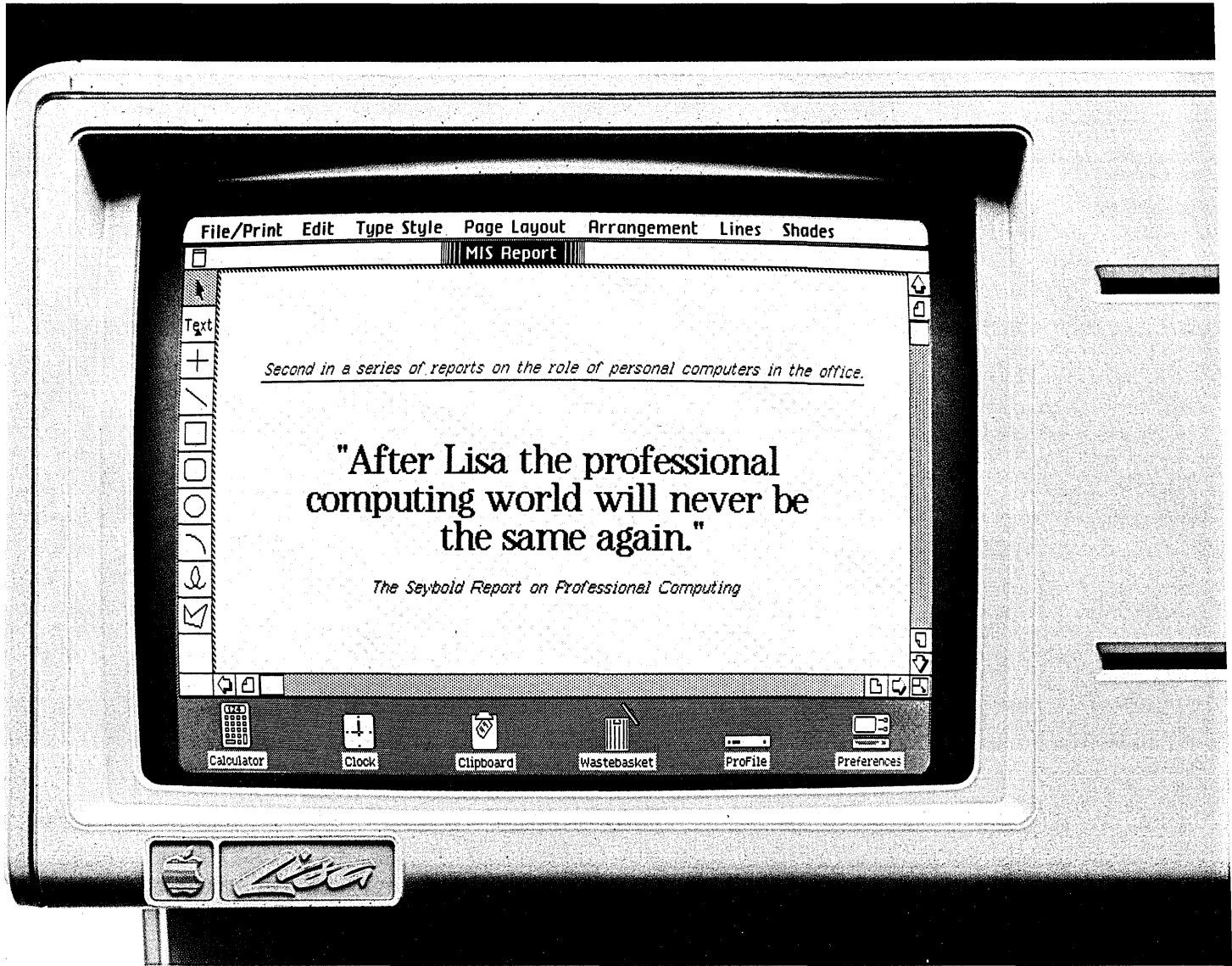
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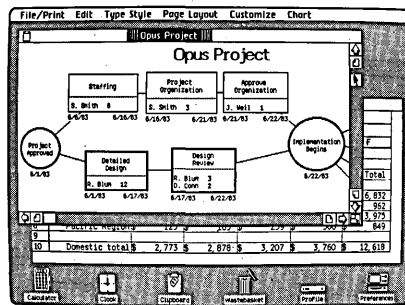
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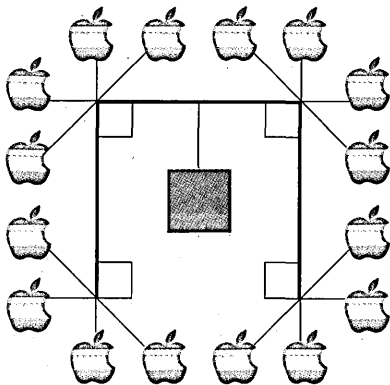
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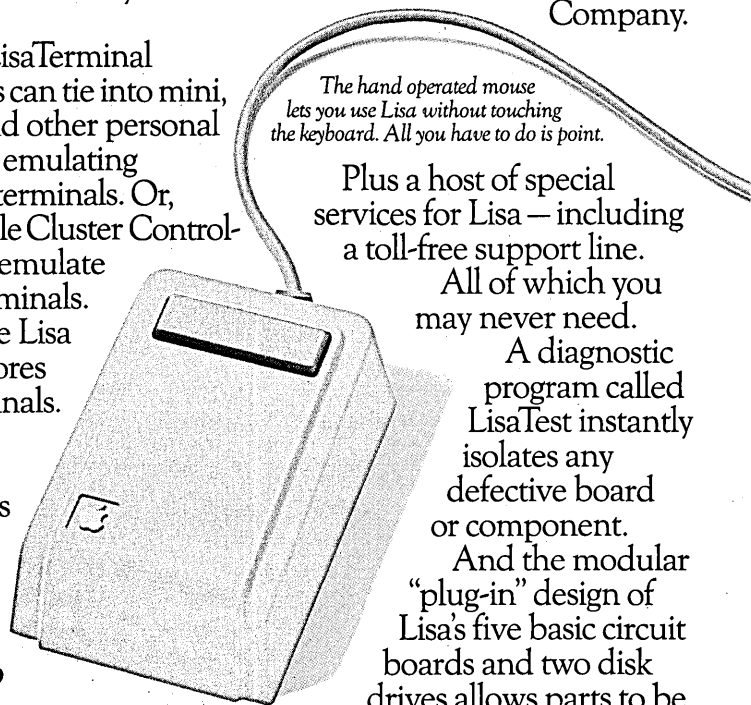
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**Information systems planning can benefit your organization, especially if you sidestep the most common traps.**

# PLANNING PITFALLS



**by W.C. Kimmerly**

To gain control over rising computer costs while ensuring that computer resource investment and allocation decisions are consistent with the organization's overall strategy, many managers are turning to a form of enterprise analysis called information systems planning (ISP).

Unfortunately, the results obtained through implementation of such plans are often disappointing. The fault appears to lie not with the planning methodologies but with the way such plans have been authorized, developed, and implemented at the local level. Even with a proven planning methodology, there are a number of pitfalls that, if not avoided, can significantly reduce the effectiveness of an ISP. These pitfalls might be encountered in one or more of the following areas.

- Senior management authorization of the ISP
- Determining the scope of the ISP
- Staffing the ISP planning team
- Establishing time constraints for the planning effort



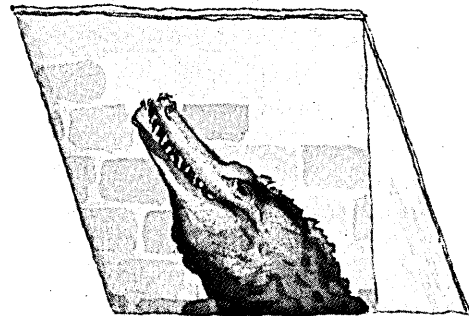
- Converting the organization's computing infrastructure to an ISP perspective
- Assigning day-to-day administrative authority for the ISP
- Unrealistic expectations for the ISP

The purpose of this article is to explain what these pitfalls are and how to avoid them. These observations are based on my experiences in planning exercises of this kind (some successful, some not) and discussions with others who have been similarly involved.

Regardless of the specific methodology chosen, information systems planning requires that the major functions or tasks of an organization be evaluated at a strategic enterprise level and that by using related information-gathering techniques (typically, structured interviews), a portfolio of information

systems development opportunities is produced. The relative priority of each opportunity is established, based upon a number of ranking techniques. Theoretically, these ranking techniques will yield a priority list which clearly shows those opportunities with the greatest benefit for the entire business unit. By allocating computer resources and related support according to the priority list, available computing resources will be used, again, theoretically, in a way that is consistent with the organization's overall strategy. The plan and the ranked portfolio of systems should, of course, be updated on a continuing basis.

Perhaps the most serious pitfall in the planning process relates to the way senior management is perceived to approach the ISP. Because of both the potential scope of the ISP and the resources necessary to develop it, senior management support may appear implicit simply in its authorization. But there is an important difference between initial support, no matter how sincere and enthusiastic, and the perceived likelihood that senior management's involvement with the plan will continue after implementation. Organization



members can usually anticipate the level of follow-up resolve with which a particular program or policy is likely to be pursued. Unless management clearly indicates that the ISP is going to be a crucial element in the organization, there is a good chance that the plan's potential usefulness will be significantly reduced.

One reason for this is the fact that organizational components are usually judged on how well they meet their own specific short-term objectives instead of the whole organization's long term objectives. This means that any resource, including computer support, that might help meet these individual objectives will not be given up easi-

ly. You can't expect line managers to see that it makes economic sense for an organization to possess only a finite level of computing resources at any particular time, and that for the long-term common good of the organization these limited resources should be deployed on the basis of overall priorities.

### **SUCCESS DEPENDS ON SCOPE**

The eventual success of an ISP may largely depend upon whether it was formulated properly with respect to scope and level of detail. The appropriate scope for an ISP depends upon a number of variables, such as an organization's size, structure, operating complexity, level of dp sophistication, distribution of dp expertise, culture, and dominant style of management. Unless an ISP takes these variables into account in the appropriate balance, it can not

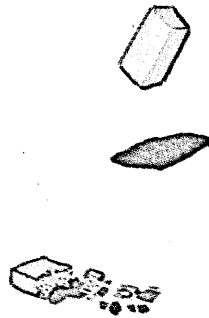
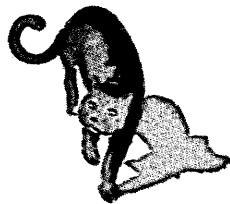
integrated plans, each tuned to a unique environment but all part of a master plan.

On the other hand, an ISP too shallow in its orientation might lead to superficial compliance, giving the appearance of control while allowing underlying activities and developments to drift along in the same unorchestrated manner as before. The objective is one of balance between the scope of the plan and the relevant characteristics of the organization. An ISP is intended to be a strategic planning and control mechanism, not a detailed operational blueprint.

For better or worse, an ISP tends to reflect the collective preferences or value judgments of the planning team's individual members. To have an effective plan, the planning team must bring together a balanced

their knowledge of and identification with specific areas of computing technology. Because of this, they become strong advocates of their particular technology. Within most organizations, there usually are various groups of technological advocates that compete with each other over the particular kind of computing technology to be exploited. Obviously, if a particular group is represented on the planning team and allowed to have a dominating influence, the plan might reflect their interests and not necessarily those of the whole organization. Their predisposition, well intentioned though it may be, would be to let technology determine strategy rather than the other way around, thereby defeating the purpose of a strategic plan.

If an ISP is to be successful, the general management perspective must dominate. The technical perspective is important because it helps the team understand what is technically feasible and what is not; it gives the plan technical credibility. But you're headed for trouble if the technical perspective is allowed to predominate because its orientation toward the technology of the moment and specific applications might well be the antithesis of strategy.



achieve its potential level of effectiveness. Unfortunately, this issue is often taken into consideration when the planning process is well under way, or even worse, after the plan has been implemented.

For example, if the scope or level of an ISP is too great for a large or complex environment, the plan may eventually founder under its own weight. Such a plan would probably evolve into a barrier, hindering progress rather than helping it. Eventually, the plan would face either outright resistance or routine circumvention and disregard, and the organization would revert to its pre-ISP state.

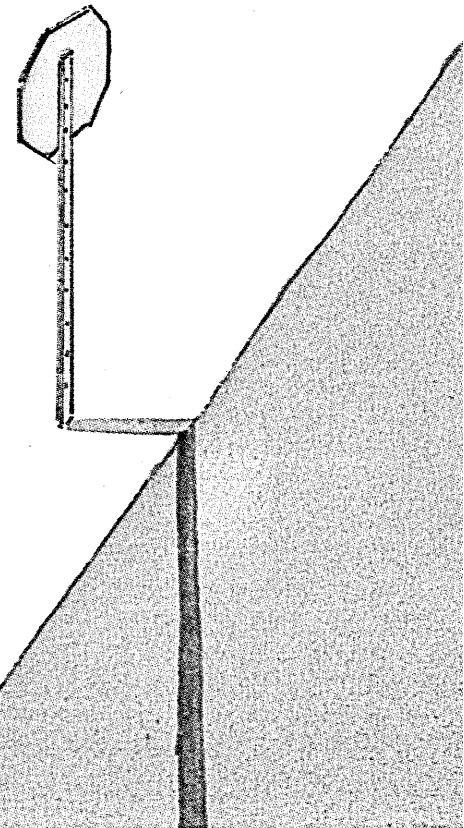
If an organization appears too large or complex for a detailed, comprehensive plan, it might be better to start with a single division plan. This could be followed by the development of similar plans for other divisions, all integrated into a master framework. This might require iterations and revisions, but the eventual result would be a series of

collection of perspectives with respect to computing technology and its role in an organization. Views on this subject vary, but in general they fall into one of two categories.

The first view, typically held by general managers and strategic planners, regards computing technology as resource, something to help an organization accomplish the basic tasks and functions for which it exists. Unless the organization happens to be in the computer business, computer technology has no intrinsic value in and of itself. Decisions relating to the kinds and amount of computing resources to invest in, and the appropriate allocation of such resources, should be subject to standard investment analysis techniques.

The second general perspective is usually held by technical professionals, particularly computer specialists. This view tends to find intrinsic value in the technology; it is something to be acquired, experimented with, developed, and exploited.

Computer specialists generally achieve their status in organizations through



# The plan administrator should report directly to senior management from an independent staff position.

Consequently, while it is vital to have solid technical input during the plan's development, this input should be carefully controlled. The best alternative is to use technical professionals in an ad hoc advisory capacity—not really a part of the planning team, but fully represented in the eventual plan. In addition to giving the plan technical credibility, this kind of liaison will help implementation because much of the work will have to be done either by, or increasingly with the assistance of, technical professionals. If these professionals do not feel they have been adequately represented in the plan's development, their support for it might be lukewarm at best.

## TIMETABLE MAY PROVE OBSTACLE

Senior management will be eager to see the ISP results and to impose time limitations on the plan's development and implementation. But the process can be quite complicated, particularly in complex organizations where the nature and number of obstacles likely to be encountered is difficult to predict. A rigid timetable will result in completion on the date specified, but often at the expense of the plan's eventual success.

Care should be taken to express any time constraints as review points, not as points at which specific planning phases must be completed. In fact, the plan will never be completed as such. It will continue to change and evolve as does the organization. Even so, there will be a temptation to have a formal presentation one day for the purpose of "wrapping up" the plan. As long as this is kept in the proper perspective and regarded simply as a transition point in the ongoing evolution of the plan, no harm will be done.

But if a wrap-up presentation is taken in any literal sense, the plan will almost certainly be ineffective.

One of the primary advantages of the ISP process is that computing resource investment and allocation decisions are based upon an overall strategic look at organizational tasks and flows of information rather than on existing structures and local data ownership considerations. But in many organizations, a dp infrastructure and philosophy have evolved which are in fact based upon a tactical or operational approach to such decisions.

Under these circumstances the development and implementation of an effective ISP require that this infrastructure adapt to the different perspective represented by the ISP. The extent to which this adaptation or decoupling from past practices parallels the development and implementation of the ISP will be significant in determining the plan's eventual success.

This decoupling process is largely one of continuing education, both for users and computer professionals. A well-thought-out training program can aid considerably in ensuring an effective plan implementation.

## DELEGATE AUTHORITY WISELY

The day-to-day administrative authority for the ISP is another area where a wrong decision can seriously jeopardize the plan's probability of success. In delegating this authority, senior management will want to ensure that the plan preserves an image of credibility and impartiality. Moreover, they will want to demonstrate their continued interest in and support of the plan. Therefore, it is not advisable to have the plan administrator located within a line division or department, particularly one

that has a widely recognized interest in computing technology, either as a supplier of computing resources or as a major user.

Under such an arrangement, the plan administrator would find it extremely difficult to maintain the independent overall perspective needed for effective implementation and control of the plan. There would be the obvious risk that in time either peer pressure or supervisory pressure (explicit or veiled) could cause the ISP to reflect the needs and philosophy of that particular component and not necessarily the needs of the organization.

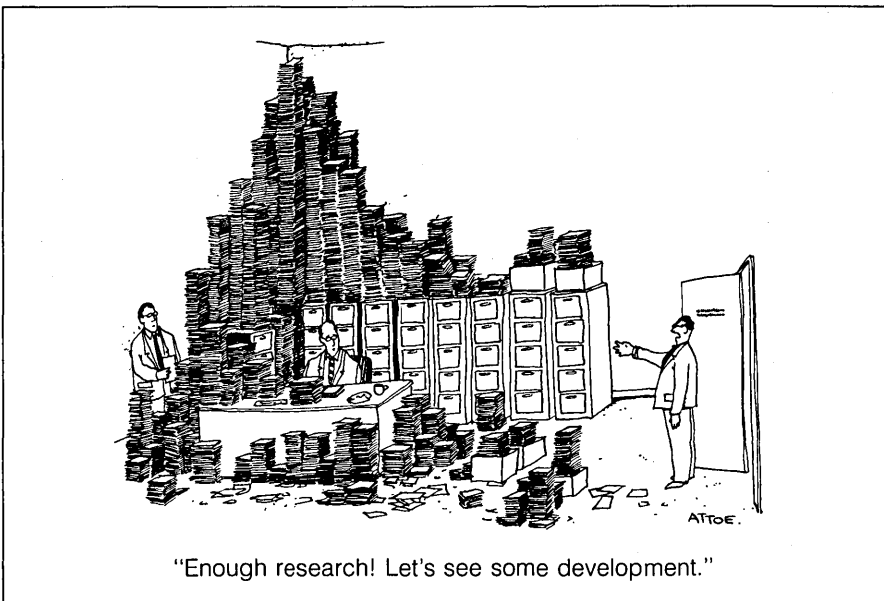
A much more effective placement would be to have the plan administrator report directly to senior management from an independent staff position. In this case, senior management could be more confident that ISP progress reports and related problem analyses submitted for their review were relatively free of bias. Also, users would be more inclined to feel they were being treated fairly in the allocation of computer resources and in the resolution of any conflicts in priorities.

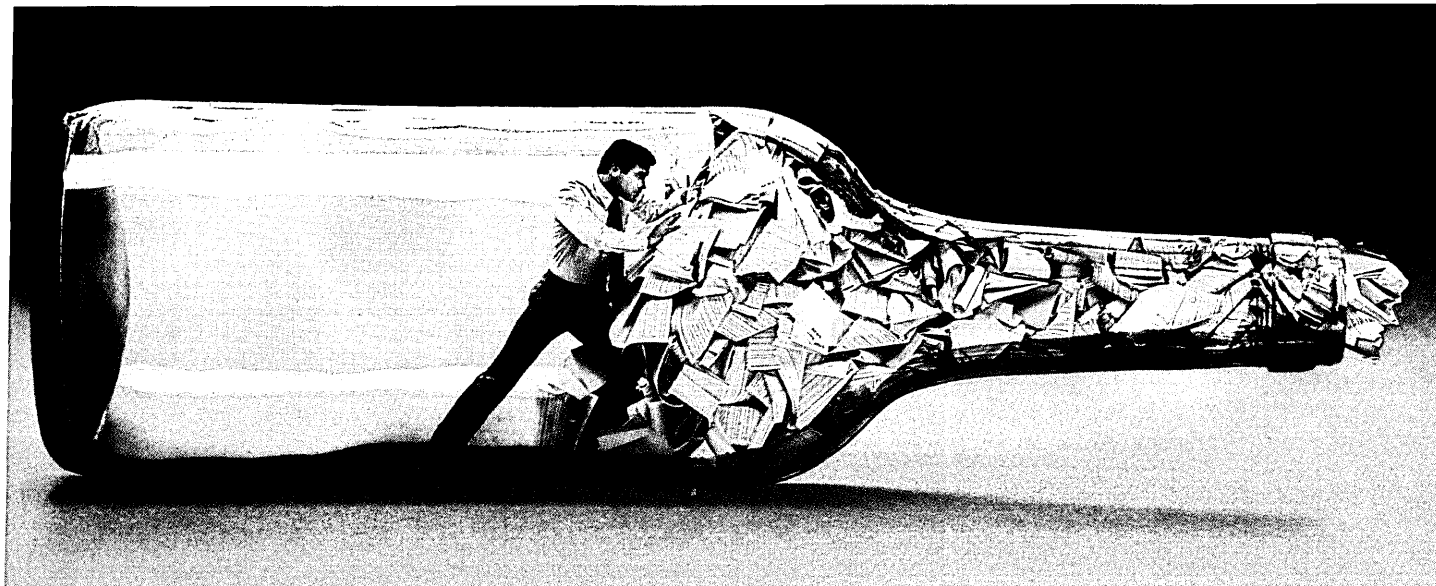
But even if the foregoing pitfalls are successfully avoided, unrealistic expectations can still make a good plan appear to be a failure. Perhaps the best that a good ISP can be expected to do is help ensure that information systems decisions are consistently in line with an organization's overall strategy. The plan cannot realistically ensure that every decision will conform precisely to plan specifics, nor should it attempt to do so. Large areas of latitude and local discretion will have to remain. But they will remain within a well-thought-out framework that will gradually evolve as the organization's strategy and priorities change. The presence of an overall sense of strategic control over computing resources is what management should look for in evaluating an ISP's effectiveness. The day-to-day problems and conflicts will continue to exist, even under the best of plans.

Computing technology is becoming such an integral part of an organization's total functioning—often determining to what extent they are successful and competitive—that it is increasingly necessary for an organization's information systems strategy to be closely integrated with its overall strategy. An information systems strategy in its operational form is an information systems plan. Such plans can be very valuable strategic management tools if they are developed, implemented, and controlled with careful attention to the potential pitfalls. #

W. C. Kimmerly is presently engaged in planning and administrative activities for Computer Sciences Div. at the Oak Ridge National Laboratory, Tenn. His background includes more than 16 years experience in systems analysis and computer planning.

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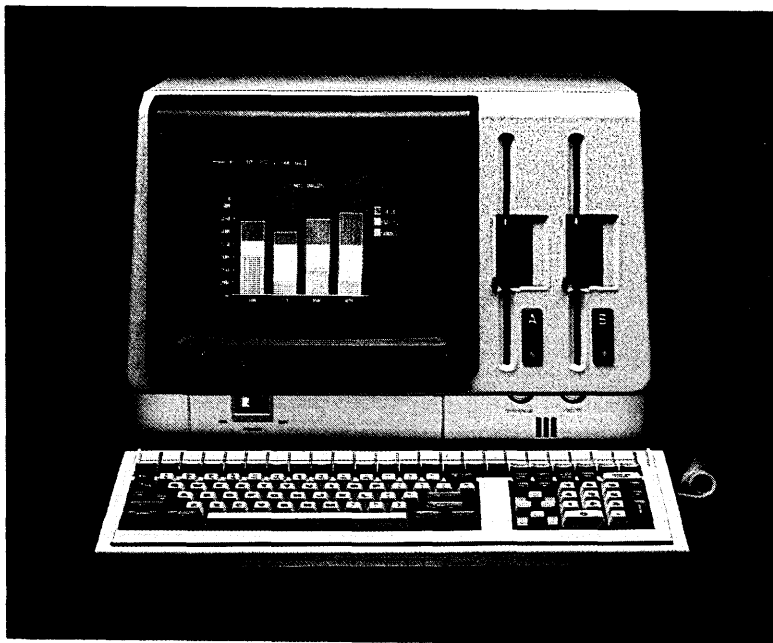
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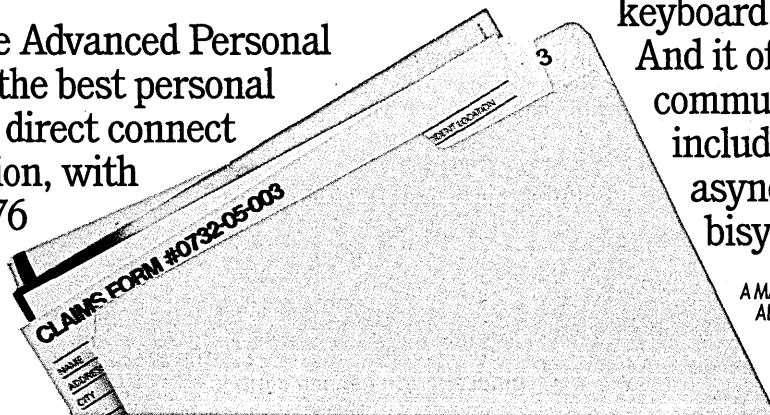
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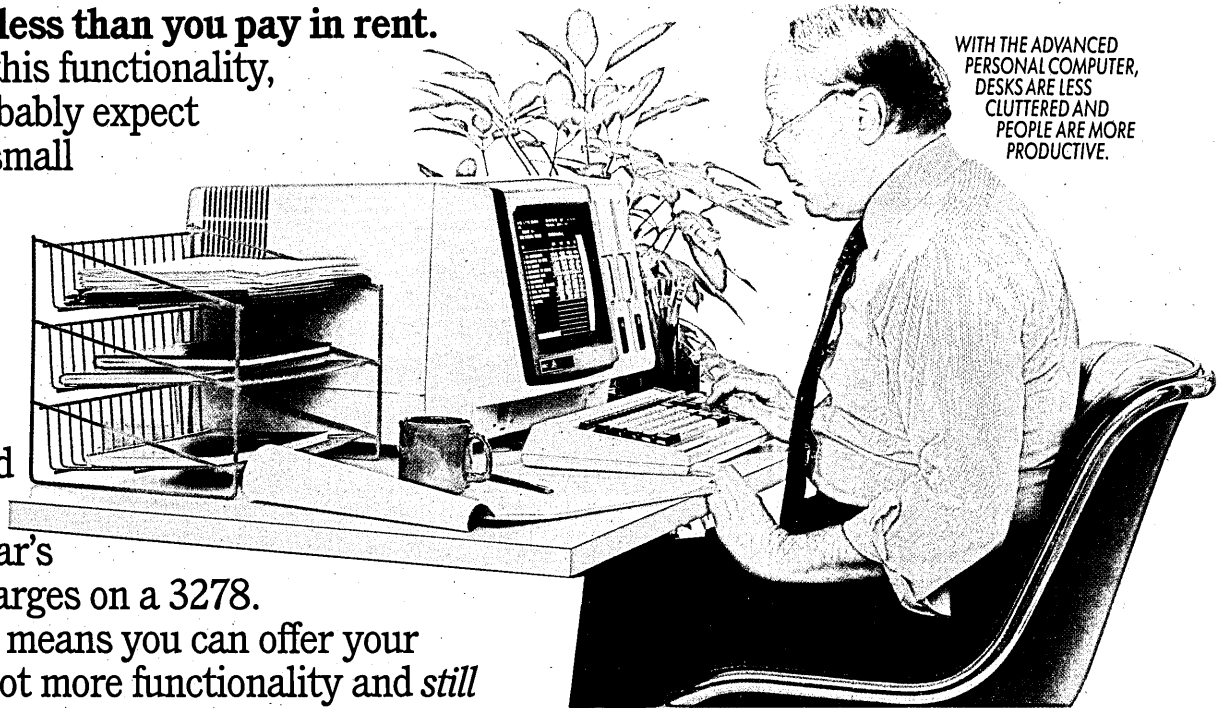
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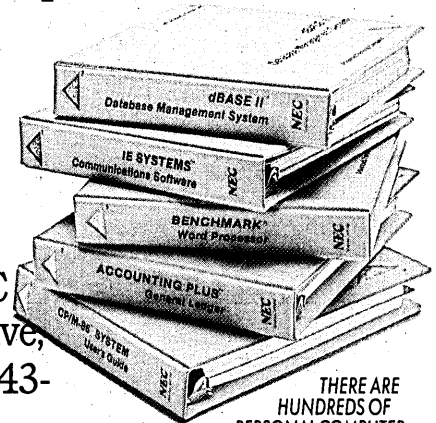
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## Some guidelines on how to manage a work-at-home project.

# A TELECOMMUTING PRIMER

by Gerardine DeSanctis

Although the popular media have given quite a bit of attention to telecommuting—the substitution of communications for travel so that all or part of a job can be performed at home—no one has much experience with it yet. Few companies have conducted experiments with home work and an even smaller number have committed themselves to the idea by establishing formal policies or programs. Where programs have been tried, they've generally been informal, involving small numbers of employees and little if any effort to formally measure results.

This makes it difficult to assess telecommuting's effects on productivity, motivation, and so forth. Still, numerous writers have speculated that it will result in reduced overhead for central work facilities, improved productivity, better morale, lower absenteeism and turnover, and more efficient use of computer resources. And there does exist a small body of experience with the practice; firms that have experimented with home work include Continental Illinois Bank, Investors Diversified Services, Control Data Corp., Interactive Systems Corp. and Mountain Bell Co.

It's possible, therefore, to examine some of the work that has been done to date and offer some initial guidelines for managers interested in implementing a work-at-home program. To that end, I interviewed eight organizations that have studied or experimented with telecommuting: a bank, a computer manufacturer, three computer service firms, two consulting firms, and one insurance company.

What kinds of jobs can be accomplished via telecommuting? Self-employed professionals, salespeople, college professors, and consultants all work in their homes; so do skilled workers who are paid on a contract or piece-rate basis. But if we focus on work currently done for an employing organization in a central office facility, the subset of jobs that can be profitably moved to a home setting narrows considerably.

A 1981 study by the Diebold Group, New York, suggests that jobs with the fol-

lowing characteristics are good candidates for relocation from the office to the home:

1. Performance of the job requires a minimal amount of equipment and space.
2. The job can be done with relatively little face-to-face contact with other people. When communication is required, it can be easily handled by telephone or "batched" during the time the employee is in the office.
3. The job requires concentration and large blocks of time when the employee works independently of others.
4. The job is project-oriented, with each project resulting in defined deliverables.
5. Projects can be completed with medium-term deadlines (approximately two weeks to four months).
6. There are defined milestones, or intermediate deadlines, that can be identified and measured.
7. The job can be performed without close supervision, and working conditions are not subject to union scrutiny.

To date, the practice of telecommuting has been applied primarily to structured work that contains a built-in method for communication between the office and a remote location. For many companies, computer programming and word processing appear to be the jobs best suited to home work. They are project oriented, can be performed independently, and allow telecommunications and computer technology to serve as the link between home and office. Although programmers may have to interact with other personnel, particularly if they do any systems analysis, they are good candidates for working at home because much of their communication can be done by telephone or conducted when they are in the office.

Telecommuting can be feasible for either part-time or full-time work; both have been tried. In either case, it is important that the work schedule be arranged so that the employee is in the office on a regular basis, anywhere from several hours every two weeks to two days every week. In this way, communication, supervision, and social contacts can be maintained.

Some employees are better candidates than others for participation in a tele-



## In some cases, a telecommuting project will enhance a company's image.

commuting program. An employee must first of all want to be involved: participation in the program should be voluntary. Preference should be given to people who have experience in their jobs and are committed to the organization.

A telecommuter should be self-motivated, self-disciplined, and work well independently. If a person has a low need for social interaction, he's more likely to adjust to the home setting.

She or he should have good planning ability, be well organized, and efficient in managing time. Good communication skills—telephone and electronic mail—are important. The employee's manager must support the telecommuting project, as should the employee's family. They must be willing to respect the worker's need for quiet and isolation.

Until management of telecommuters becomes better understood, working at home should be reserved for those who have done their jobs well and are located in areas of the company that management has designated as suitable for home work.

In general, a project will be easier with exempt employees than with nonexempt employees, who by law must be paid overtime. For exempt employees, the firm can continue to use its current method for wage computation and hour tracking. Also, the employer may be able to negotiate part-year, annual, or project-based employment contracts. Conditions for nonexempt employees, who generally get overtime pay for working more than 40 hours in a week, are somewhat different. Policies must deal with computer or telecommunications "downtime." If a word processing specialist is paid according to number of lines typed, the incentive pay rate including downtime has to meet or exceed the hourly equivalent of the current minimum wage. In short, if nonexempt employees work at home, strict record-keeping is necessary.

### NEED FOR PILOT TESTING

A company should regard its first experience with home work as a formal experiment or pilot test. Only a small number of employees should participate. The pilot is a chance to learn how to manage telecommuters in the context of that particular company and to discover some of the consequences, good and bad. Following completion of the experimental phase, the company can decide whether to establish a formal policy regarding telecommuting or conduct further study.

There should be a clear reason for experimenting with telecommuting in the first place. For example, the purpose of the project might be to improve utilization of com-

puter resources during off hours, reduce absenteeism and turnover among technical personnel, improve employee morale, reduce work backlogs, or lower company overhead costs. If immediate benefits are not important, the company might study telecommuting because it anticipates a long-term need. In any case, the project should have a specific, stated purpose. The project objectives determine its design, the manner in which it is implemented, and the measures used to determine its success or failure.

When planning either a pilot or permanent telecommuting program, the organization should be prepared for the impact of the program in several areas. For example, how does productivity of the home worker compare to that of the office worker? Productivity data in work-at-home projects have been encouraging, though most measures have been subjective if reported at all. Employees tend to anticipate that their productivity will improve. Presumably the assumption is that distractions and interruptions will be fewer at home than at work, thus raising the quality or quantity of output. The organization should determine if these productivity expectations can in fact be realized, using objective measures if possible.

Another concern is that promotion of employees will be affected if they telecommute. Will the employee be forgotten or uninformed when openings occur? Does the employee have equitable access to developmental resources? Will the employee accept a promotion if his work-at-home status is affected?

A system to ensure adequate information may be needed (e.g., job postings through electronic mail). Also, the company may want to inform telecommuting employees of career path consequences prior to placing them in the home. In the long term it may be important to monitor the degree to which telecommuting is practiced by employees within protected classes (e.g., women, minorities, older employees). Stifling of promotional chances could be evidence of "adverse impact" upon these workers if a discrimination claim were ever filed. The firm should be able to show that promotion opportunities were present, advancement positions not suited to telecommuting were well supported through job analysis, this fact was understood by participants, and participants were free to return to the office.

A final area of concern is with employee acceptance of promotion opportunities. After employees become accustomed to the benefits of working at home, they may be unwilling to return to the office when a promotion opportunity becomes available. This may affect EEO/Affirmative Action programs and personnel planning in general.

Permitting certain employees to work at home may create resentment among the others. During the pilot stage, when only a small number of people are working at home and management treats telecommuting as experimental, employee jealousy and concerns of inequity should be minimal. If participation is expanded, however, a clear and equitable policy regarding employee selection will have to be developed. This is important since the point at which telecommuting will be worthwhile and feasible for large numbers of employees is probably in the distant future.

Before embarking on a telecommuting program, a company should make some effort to assess the attitudes of clients and customers. Several companies have reported negative reactions on the part of their clientele, although a positive response is certainly conceivable. This may be a concern should the telecommuting project be discussed in the popular media.

In some cases, a telecommuting project will enhance a company's image. The firm could be seen as being progressive in its willingness to experiment with a new work concept. The impact may be most pronounced if the purpose is to make more job opportunities available to elderly or handicapped citizens. In any event, since such programs are still a novelty, the company should be prepared for media attention.

### TERMS OF HOME WORK

Several important issues should be stressed when a company plans for telecommuting, either on a permanent basis or as a pilot program. As part of the formal procedure of placing a worker in the home, a statement of the terms and conditions for employee participation in the project should be prepared. Responsibilities of the employee and the company should be outlined, along with conditions surrounding continuation or termination of the home work placement. It probably should be stressed that the company reserves the right to cancel the home work agreement at any time, given proper notice. The statement should be dated and signed by the employee and a representative of the company.

*Security of Data.* Remote access to corporate computer systems may create security problems, particularly if the firm has no prior experience with distant access. Controls should be established so that, once a home worker is connected to the central computing facilities, she can access only the system or files for which she is authorized. There are several ways to control initial entry into the system:

- Install dial-up capability. This is fairly inexpensive but somewhat risky because any-

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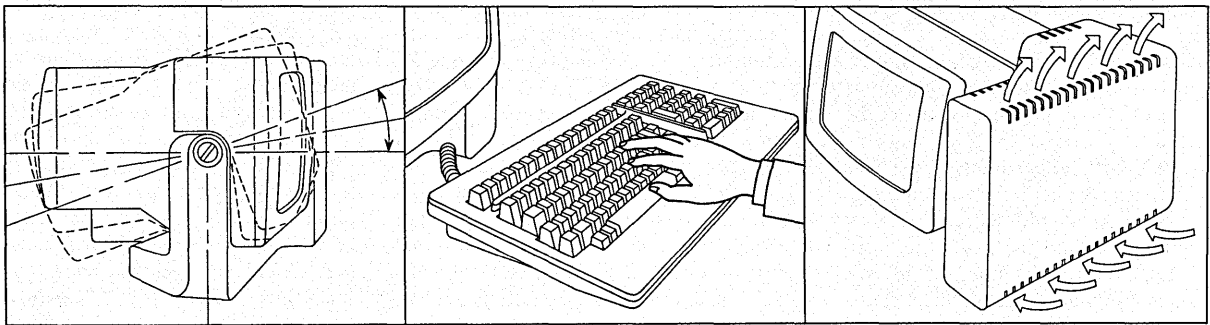
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## Training costs should be minimal unless large numbers of employees are involved.

one who knows a correct phone number and account could conceivably access the system.

- Use a call-back procedure on dial-up. If done manually, this can be cumbersome to manage, especially if many users want to connect to the system simultaneously. A better alternative is to install an automatic call-back system. Call-back systems are somewhat more secure than dial-in procedures because only an authorized list of phone numbers can be dialed by the central facility.

- Equip the home-based user with a terminal that has ID acknowledgement capability. A central computer will communicate only with an authorized device.

- Equip the home-based user with a computer that must be keyed to start and that stores personal identification information about the authorized user.

**Security of equipment.** Because it is so difficult to develop a perfectly secure system, management should entrust terminal and other equipment only to trustworthy people. All equipment placed in an employee's home or other remote site should be registered and clearly marked as company property. The company is responsible for maintaining and insuring equipment, although the employee is responsible for reasonable care and protection of the goods and for reporting repair needs as they occur.

**Zoning of residence.** If the employee's home is treated as a secondary or alternate work location, no special permits, licenses, or approvals should be necessary. Should the employee decide to alter or add to his home, it is his responsibility to abide by any municipal property restrictions. The same rules apply to a worker whose housing is rented. If the work location is considered secondary, no problems should result. Deed or other rental agreement restrictions should be consulted if structural changes are made in the home.

**Work site conditions and inspection.** If an employee is to work at home on a regu-

lar basis, adequate space and a proper home environment are a necessity. If special furniture and equipment are to be installed, the employee may decide to convert a basement area into an office or to remodel some other part of the home so that it is suitable for work. In any case, the decision of where to locate the workstation is the employee's, and he or she is also responsible for absorbing any costs related to remodeling. The work place should be neat, quiet, and preferably used for no other purpose besides work. The company should make it clear to the employee that it reserves the right to improve and periodically inspect the work place. In conducting an inspection, the company is interested in assuring that its equipment is in a safe place and receiving proper care. In no case should it be assumed or implied that the employer is renting office space from the employee.

**Compensation of participants.** The opportunity to establish a lower wage rate for telecommuting employees has not been realized in practice. Control Data, Continental Illinois, and Investors Diversified Services all report that they have not reduced labor costs through telecommuting. Reducing salaries of current employees would prove difficult. The employee may experience a decline in clothing and travel costs, but home electricity, heating, and water costs may rise, and there may also be remodeling expenses. Telecommuters tend to desire wage equity with their labor market.

**Termination of transfer conditions.** The company needs to establish conditions and guidelines for equipment retrieval upon the termination or transfer of an employee. Because a telecommuter's immediate supervisor may switch jobs or leave the company, it is advisable that the employee have the approval and support of the next level of management.

**Tax issues for employees.** Contrary to popular belief, working at home does not necessarily constitute a rationale for an "of-

fice at home" tax deduction. It is up to the employee to decide what are fair and reasonable tax deductions, if any. The company may want to avoid advocating or counseling in tax issues for the employee.

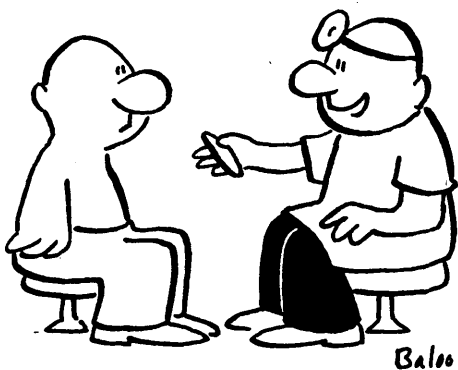
**Training considerations.** The type and extent of training for home workers depends, of course, on the job and individuals selected for the program. The least desirable training situation in terms of cost and risk of failure would be the case of a nonprofessional with little or no experience in the job and no prior work record in the firm. Committed, professional, experienced employees are the best candidates for telecommuting. Training dealing with the job or the company is thus unnecessary.

Before a firm places people at home, however, they'll need some orientation regarding the purpose and objectives of the home work program. They should become familiar with the procedures, policies and expectations associated with home work, and they should receive advice on how to manage their time and activities. Also in order are suggestions on how to coordinate communications with other personnel and how to "block" work so that parts can be done in the office and parts can be done at home. Finally, they should be briefed on potential problems, such as interruptions or distractions while working, the family's reaction to the new situation, attitudes of neighbors, etc.

The employee's immediate manager should receive special instructions regarding the purpose and rules of the program, and in general should become familiar with all information given to the employee. Estimates regarding the cost of training are difficult to make until the exact nature and scope of the project are defined. In general, training costs should be minimal unless or until large numbers of employees are involved (say 15 or more) or inexperienced or new employees are permitted to work at home.

There are still many unresolved issues surrounding remote work and its impact on the organization, the employee, and the employee's manager and family. The ideas discussed here must be viewed as preliminary since additional knowledge will become available as telecommuting becomes more widely practiced. As more organizations experiment with home work and study its consequences, general management guidelines should evolve. \*

Gerry DeSanctis is assistant professor of Management Information Systems of the University of Minnesota. She received her BDA from Texas Tech University. She's interested in the behavioral aspects of information systems design, implementation, and use.



"You're my 10,000th patient, Mr. Gridley—you may keep the tongue depressor."

Bales

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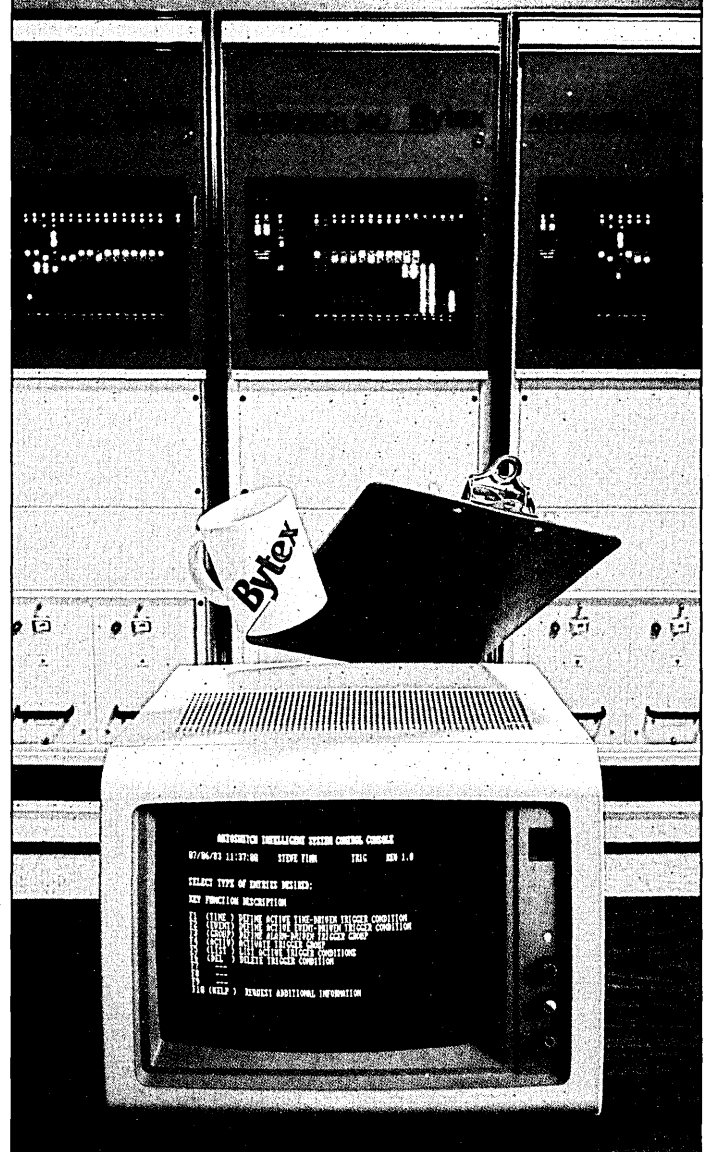


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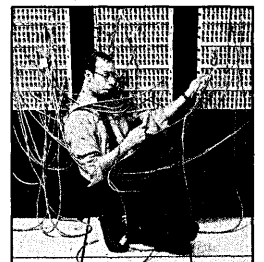
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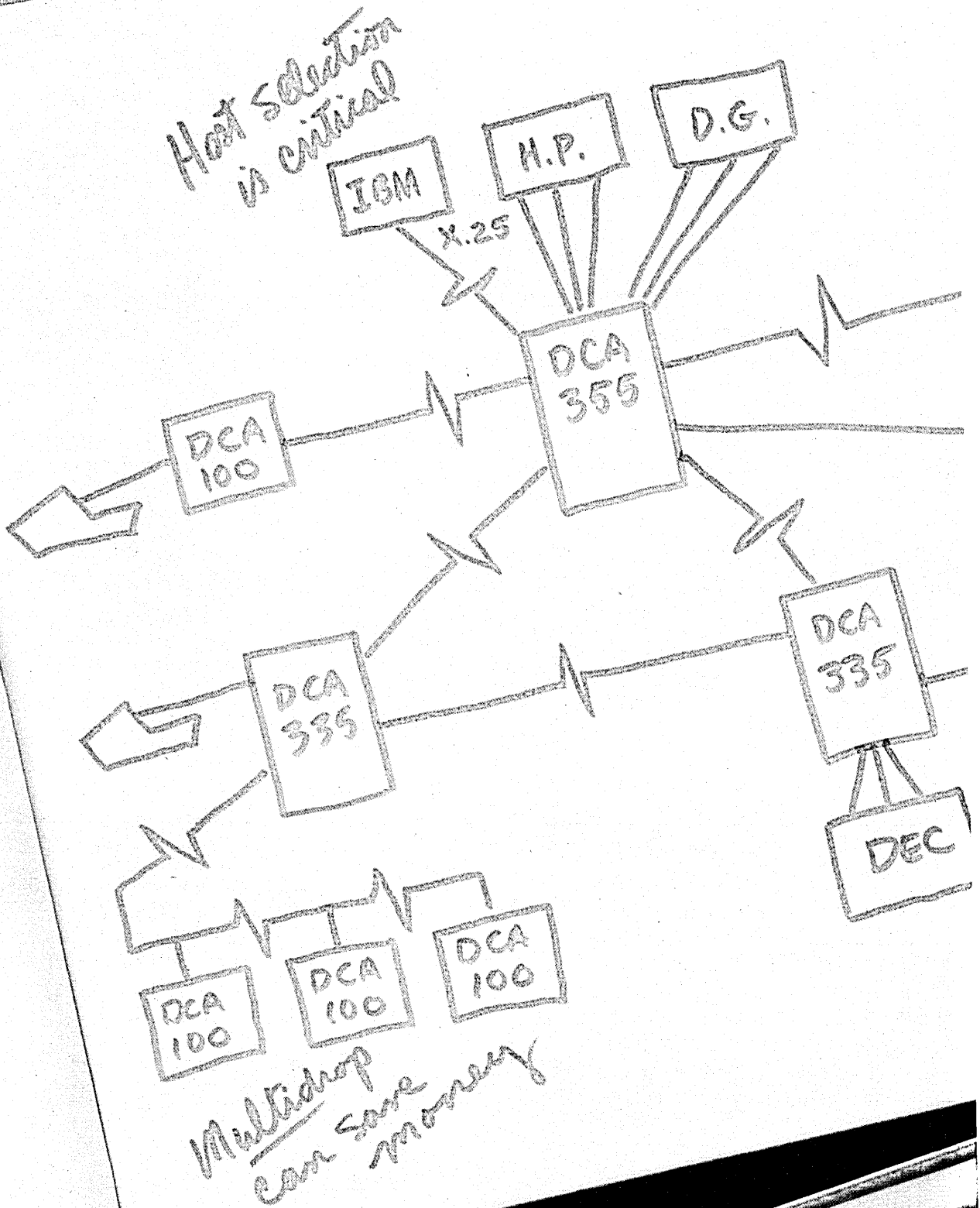


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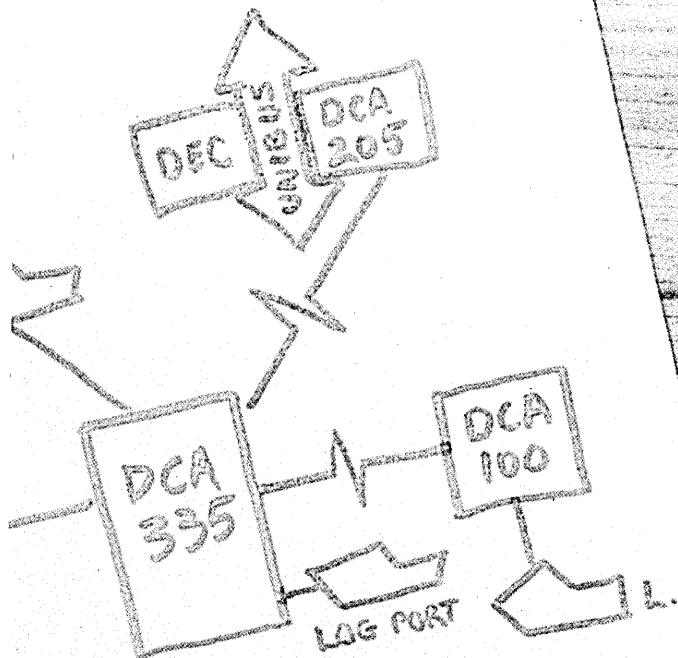
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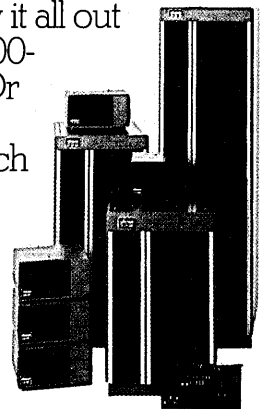
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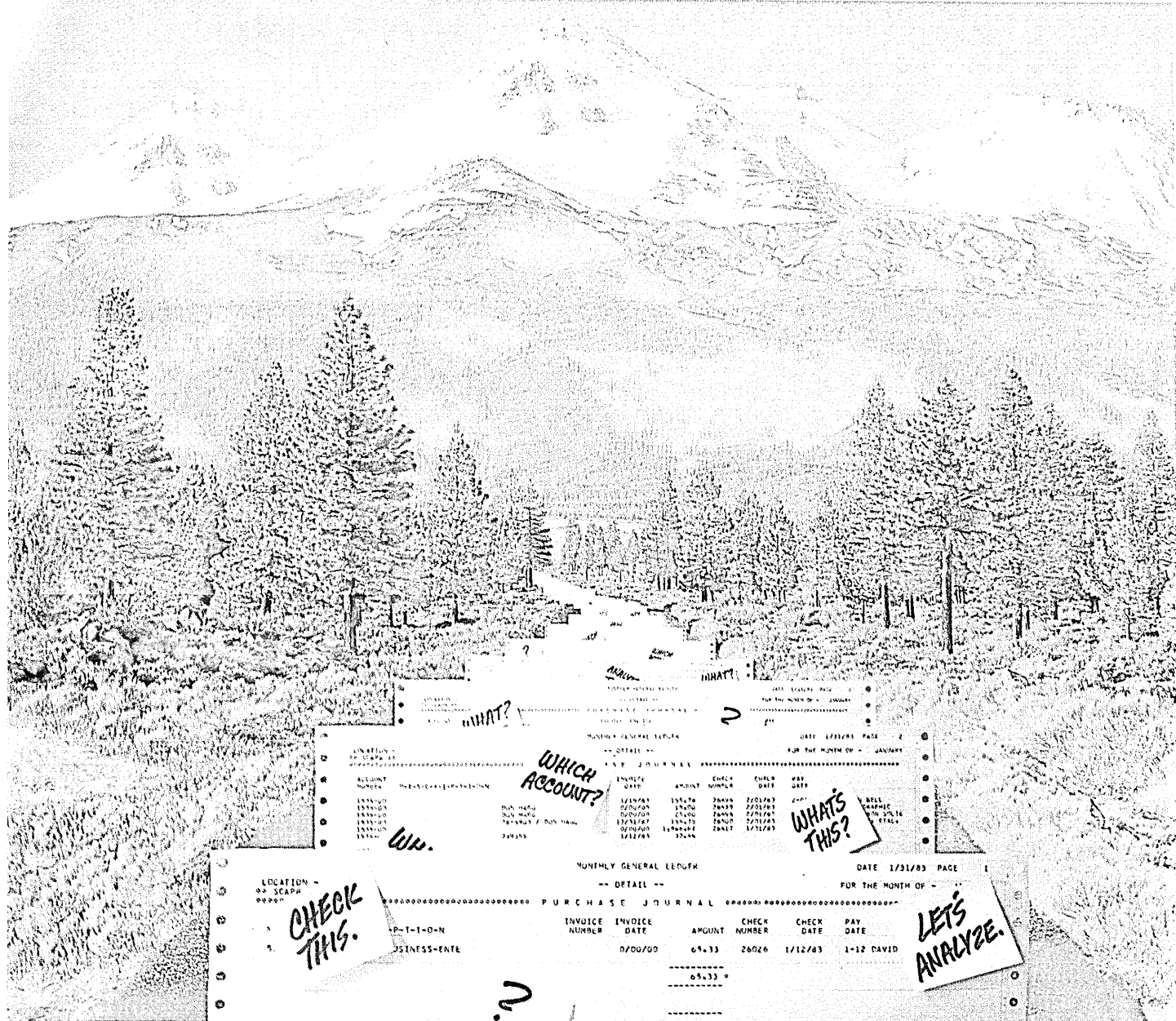
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As users proliferate, the chances for information pollution increase; IRM planning can help keep things neat.

# LAW OF THE DATA JUNGLE

by Daniel S. Appleton

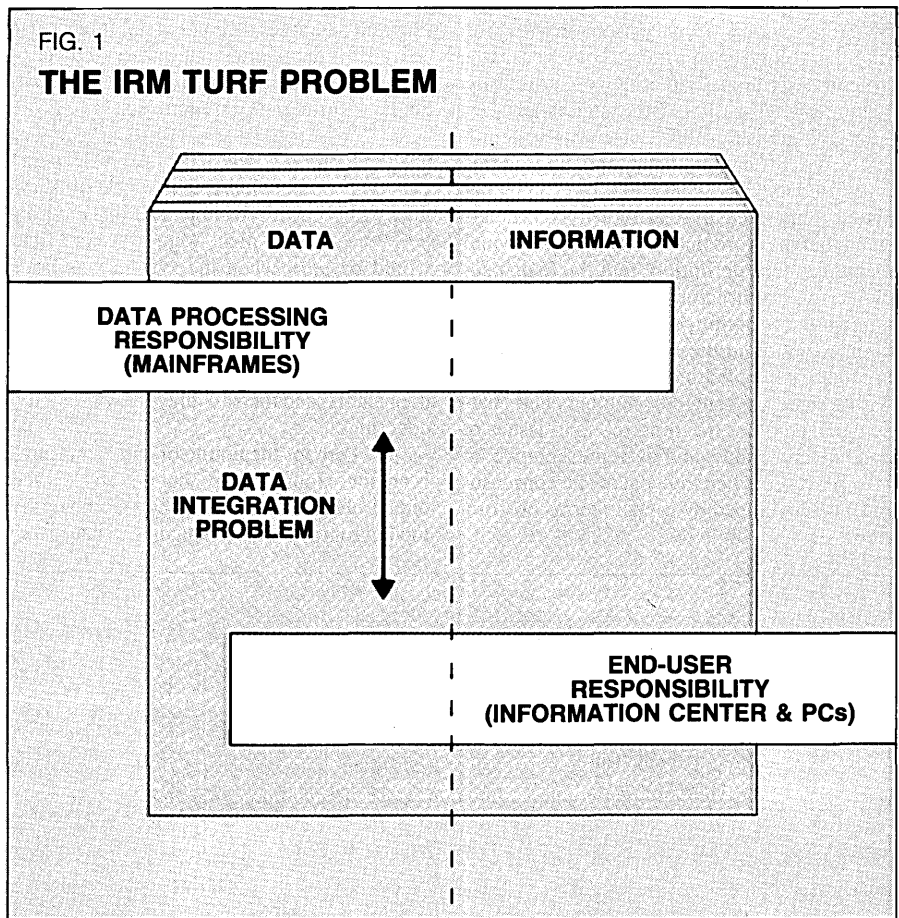
Over the past 30 years, the world has spent an estimated \$400 billion building databases and end-user applications. Today, some 500,000 programmers are writing 15 to 25 lines of code a day to maintain, enhance, or replace this investment. During the next five years this work force will be augmented by up to 14 million business professionals, each with his own personal workstation, building databases and applications to service local needs. These "nouveau programmers" will use fourth generation languages that will increase their productivity by a factor of 10, enabling them to generate the equivalent of 150 to 250 lines of code per day. All of this activity, if left unmanaged, will result in information pollution.

At the heart of this commotion is the struggle over data. Data are the quintessential information resource. They are also the most enigmatic information resource. Businesses that intend to manage their information environments must get a firm grip on what they intend to accomplish by data management. It is the only way to keep sanity in their information world.

That sanity will not emerge until businesses really understand data. To do this, they will have to acknowledge three fundamental laws of the data jungle: 1. There are clear differences and relationships among the ideas of data, information, and knowledge. 2. Data follow a distinct life cycle, different from the systems life cycle, that must be clearly understood and managed. 3. Databases and end-user software must be developed using data-driven methods for planning and implementing; this means embracing the ANSI/X3/SPARC three-schema architecture as the data management strategy.

Information is "mined" from data, and knowledge is "retained information." This means that in order to get information, you must do something to data. It also means that there are at least two classes of information: information that is retained and information that is not.

FIG. 1  
THE IRM TURF PROBLEM



The objective of information resource management (IRM) is not to manage knowledge, nor is it really to manage information—though that is what the phrase implies. IRM's objective is to manage, store, give access to, and provide the ability to manipulate and communicate the raw material of information and knowledge: data.

The inability to understand this IRM objective is at the heart of what I call the IRM turf problem (see Fig. 1). Given that there are two sides—data processing and end users—the problem is, what does each control? For

reasons that I will explain later, data processing has traditionally controlled data, but has also crossed the data-information line to assert control over information.

Lately, with the introduction of end-user computing through information centers and personal computers, users have countered, claiming "information freedom" as license to encroach on dp's data turf. Until the turf problem is resolved, via dp and user cooperation, information pollution will continue. The first focus of cooperation must be data integration.

# If we can get a handle on managing data, the outcome could be increased business productivity, better decision making, and overall economic growth.

Data integration is not accomplished by "dictionization," i.e., collecting all of the data elements from various files and databases, loading them into a data dictionary, and spending countless hours arguing about what they are called. The issue is not what names we use, but what we are naming, and whether or not it is real.

Data reality is a structural issue, not a semantic one. Things only make sense when they are understood in the context of other things.

The first problem of data management is to establish a consensus structure for data. The second problem is to figure out what to name the elements of that structure. Data integration's primary problem is to provide the ability to add to the consensus data structure, without violating or arbitrarily changing any of the existing agreements.

Establishing this consensus structure is always difficult until the agreeing parties fully understand what they are agreeing about. This is easily clarified if you understand that the word data has two equally valid meanings. One definition, familiar to dp people, refers to structural issues such as part number, description, quantity, and drawing number. Without these "meta data," meaning the structure behind the data, we'd be left with a senseless tangle of numbers and characters. The other meaning refers to issues of content and value and is representative of how most users perceive data. The consensus must be developed by users in terms of structure.

A data structure compromise can only be attained by synthesizing many different information requirements, each with its own particular data structure, into one standard data structure. This standard must have its own neutral form, and will be valid only if each of the source data structures can be recreated from the neutral form. The best consensus structures are those that have the lowest probability of change, given a new, valid information requirement.

The neutral form of the consensus data structure is, in fact, a model of the organization's data. It must be extensible, accessible, consistent, and transformable into the physical structures necessary for building files and databases on computers. It must also be transformable into an arbitrary number of user-oriented data structures to service particular information requirements.

## THE DATA LIFE CYCLE

The data life cycle parallels the life cycle of its environment. If that environment were a system, data would be born when the system was born, and would die when the system ended. Our experience shows, however, that data don't die when the host system dies. In a sense, data shed their system, like lobsters shed their shells, and then assume a new protective covering.

Perhaps the notion of data "molting" is an obnoxious analogy, but it is an excellent one. Lobsters molt when their bodies grow too big for their shells; data molt because they

too are growing.

The growth concept of data can be explained by introducing an idea recently termed data ownership. For the sake of discussion, let's agree that there are only three degrees of data ownership, even though a normal company may have many more. I will categorize these as private, shared, and common data. Private data are used by one individual. If he dies, his data die with him. Shared data are used by several people. Common data are used by many people. As data become more pervasive, stronger quality controls are necessary.

In the beginning, all data are private. The best of that data get shared. The best of the best become common. It's survival of the fittest: if private data are no good, they will disappear. It's too expensive to maintain irrelevant data.

The demand for common data comes from business growth and change. This can be traced directly to the business life cycle. Thus, the data life cycle, i.e., the maturation of common data, exactly parallels the business life cycle. Common data must be treated as a business asset, and business must establish its own sense of data ownership and auction. Managing this evolution is the most important factor in preventing information pollution.

The movement of data from private to shared to common status must be accompanied by technologies and organizational responsibilities appropriate to the business's needs. These technologies relate directly to nine specific areas: data independence, resiliency, reliability, integrity, accessibility, security, sharability, performance, and administration. Common data must be managed using technology that rates high in all nine areas.

By contrast, private data environments can score low anywhere. The problem comes when managing the transition of data from degree to degree and therefore technology level to technology level. These technology levels must be defined consistent with data ownership rules, and the migration path must be clearly understood. The actual migration is managed by using methodologies and tools to create databases and end-user software.

## THREE-SCHEMA APPROACH

IRM planning (top down) and software implementation (bottom up) methodologies, if they are truly data driven, must consistently employ the ANSI/X3/SPARC three-schema architecture. This architecture is the single most important advance in data management thinking in the last decade.

The ANSI approach to data manage-



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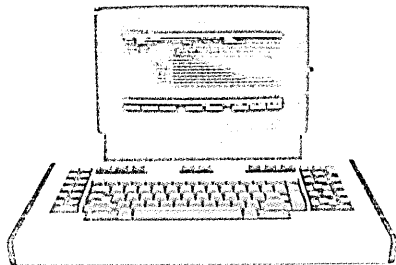
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Calls to main office  
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Center attendant. The  
attendant knows who  
you're the best  
be reached - or  
to leave as a message  
You can return calls  
three ways from call





ment (Fig. 2) defines three different but integrated views or schemata of information: 1. external views—what users see, 2. internal views—what computers see, and 3. a conceptual view—which is a normalized version of the internal and external views. Many external and internal schemata are integrated by one conceptual schema.

Unlike the traditional two-schema approach, which maps external schemata directly onto internal schemata, the ANSI concept, through introduction of the conceptual schema, makes external and internal schemata independent of one another. The conceptual schema drives the IRM planning and implementation from the data rather than the application or process perspective. Thus, these methodologies are called data driven.

True data-driven IRM planning and software implementation methodologies, such as BSP and PDM-80, are joined together by a common conceptual schema (Fig. 3). The planning procedure builds on the conceptual schema—sometimes called the data architecture—from the top down. The implementation procedures build on the conceptual schema—sometimes called the normalized data model—from the bottom up. They both employ the same information modeling tool (such as IDEF<sup>1</sup> or INFO model-ER) for describing the conceptual schema.

Choosing an appropriate information modeling tool for defining the conceptual schema is very important. The tool must have a semantic form and graphic form, it must include precise rules and procedures for building and extending a conceptual schema, and it must be based on sound mathematical theory, such as the relational or entity/relationship model. The last rule is extremely important, for without a good mathematical basis, you cannot construct a conceptual schema that is consistent (free of logical anomalies) while it is extensible. Without a sound mathematical foundation, the conceptual schema cannot be consistently projected or transformed into many different internal and external schemata.

A primary role for the conceptual schema is to provide a set of data conventions or business rules for managing the data life cycle. It is employed by a data-driven software implementation methodology to maintain alignment between data in various life-cycle stages (private, shared, common) and the various levels of data management technology at each stage.

The data jungle is growing rapidly. IBM predicts that by 1987, 20 million "business professionals" will be using 8 million to 14 million intelligent workstations worldwide. Everyone will be creating, destroying, swapping, and sharing computerized data. The outcome could well be information pol-

FIG. 2

### THREE-SCHEMA ARCHITECTURE

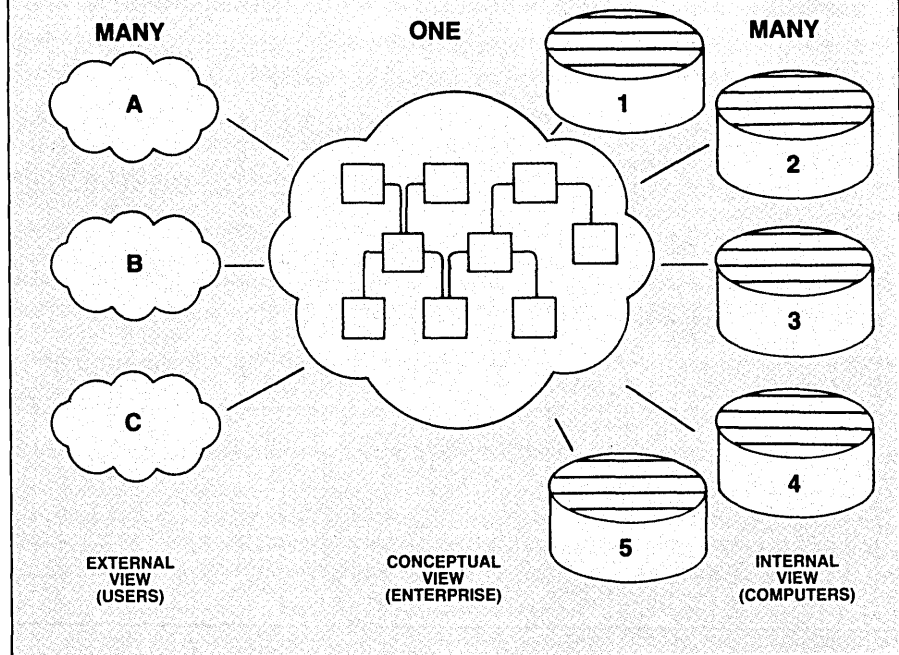
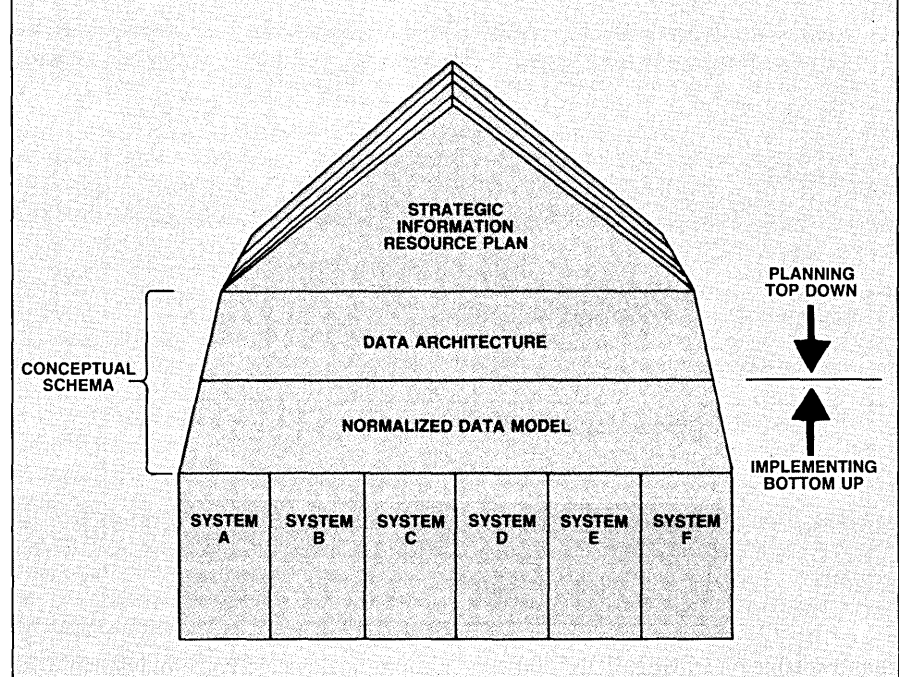


FIG. 3

### ROLE OF THE CONCEPTUAL SCHEMA



lution. Or, if we can get a handle on managing data, the outcome could be increased business productivity, better decision making, and overall economic growth. But, data management will not evolve under our current perceptions of what IRM is all about. We don't have the perspectives necessary for proper planning and implementation of information resources. Perhaps this article has helped set the stage for focusing on the fundamental laws of the data jungle. If so, we will

see significant changes in how businesses approach planning for IRM and, more important, how they manage the implementation of database and end-user software. \*

Dan Appleton is president of D. Appleton Co. Inc. (DACOM), Manhattan Beach, Calif. He is an internationally recognized expert on data management and database design, his area of expertise since 1973.

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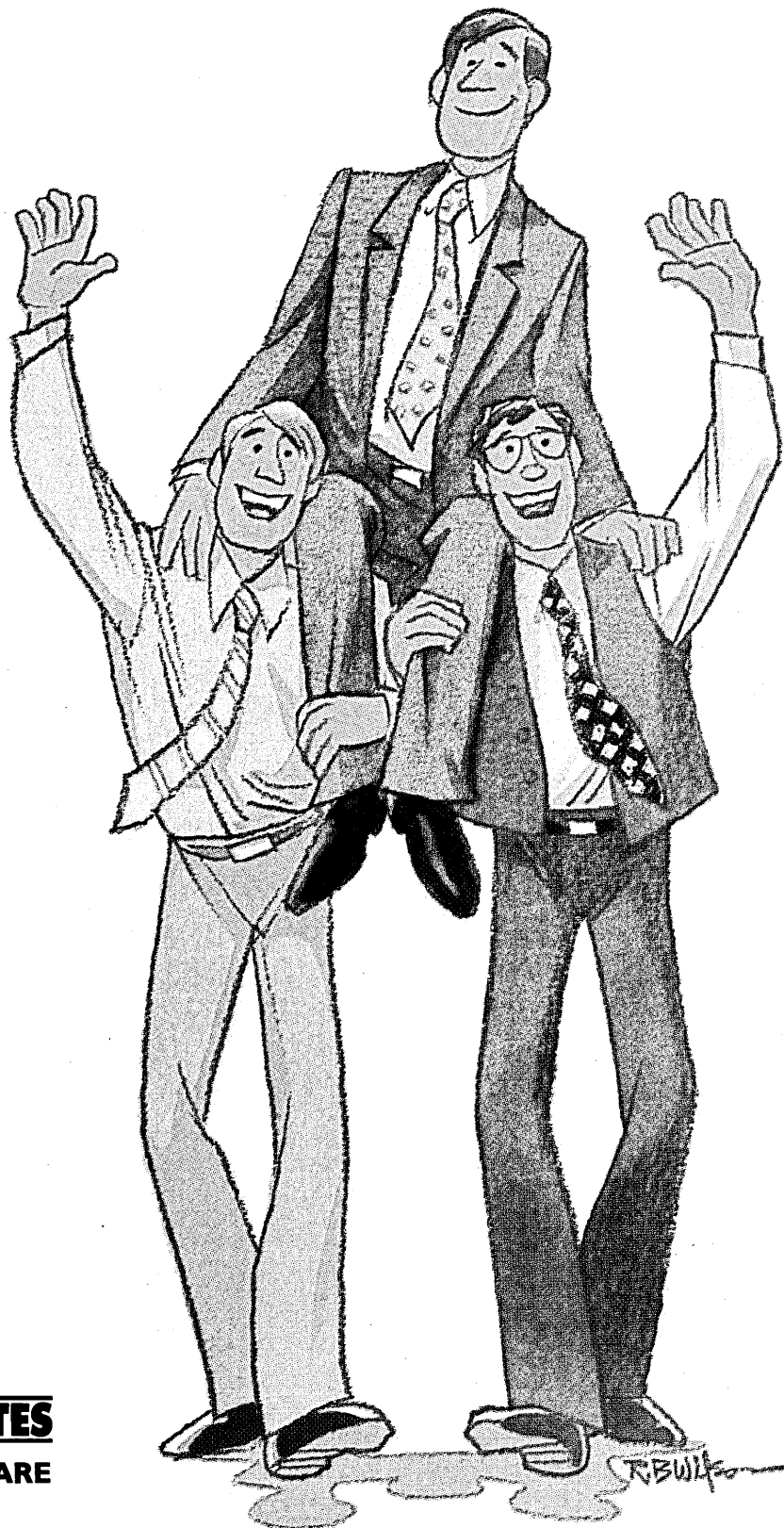
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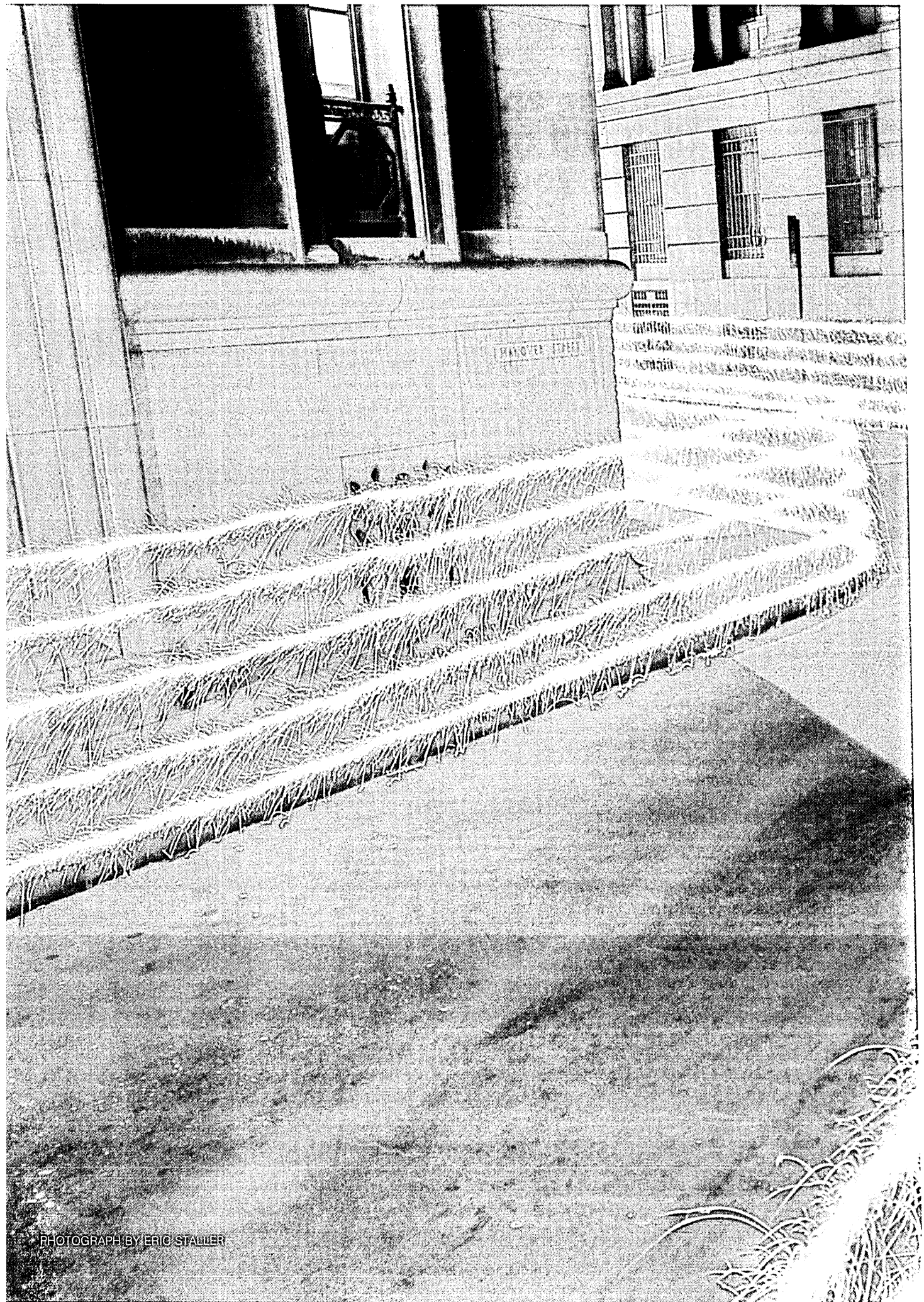
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Teleports present one of the hottest telecommunications topics in recent years.

# SPARKING URBAN GROWTH

by Terry G. Mahn

Electronic spinal cords are being stitched together to revitalize the health—and the wealth—of major metropolitan areas around the country. These backbones to urban growth and prosperity are called teleports.

Just this June, New York City mayor Edward I. Koch and Peter C. Goldmark Jr., executive director of the Port Authority of New York and New Jersey, broke ground for what was hailed as "the world's first" satellite communications center and office park. The \$25 million project is a joint venture between New York City, the Port Authority, Merrill Lynch & Co., and Western Union Corp.

The new facility, situated on 200 acres on New York's Staten Island, will use dish antennas with access from the single location to the 24 existing or planned domestic communications satellites and several international satellites. Instantaneous worldwide communications will be provided via base-powered cables for the region's business and industry.

And the name of the facility? The Port Authority has named the Staten Island complex—the complete with appearance via a video conference satellite hookup of each of the chairman of the Port Authority, Merrill Lynch, and Western Union—has renewed the talk of teleports

# Municipal teleports will soon be to urban environments what shipping, rail, and airport facilities have been in the past.

across the country.

Despite recent fascination with the concept, the term teleport has lacked a precise definition. No, a teleport is not a helicopter landing pad—as reportedly was discovered, with great dismay, by one opportunistic concern eager to enter what it had heard was a booming business. Neither is a teleport strictly an antenna farm, as installations on the scale of the Staten Island project are often called. Instead, a teleport is a centrally located facility for the termination of communications systems and services within a single city for facilities management and/or special networking services. And teleports come in two flavors—municipal and commercial.

In the near future, municipal teleports will be to urban environments what shipping, rail, and airport facilities have been in the past—commercial gateways to greater economic opportunity. Cities and regions that have thrived due to good transportation arteries will soon require good information arteries if they are to maintain their dominance as commercial centers. Although still a relatively unexplored concept, municipal teleport technologies have already attracted over \$1 billion of investment capital. Recent studies hold that teleport management services—excluding voice and videoconferencing—could become a \$15 billion industry by 1988.

Typically, a municipal teleport will be owned by a local operating group, state or regional government, or a combination thereof. Its function will be to attract businesses to locate their computer and communications operations, facilities, and personnel in a particular city or region by featuring large quantities of telecommunications facilities and satellite services.

Unlike their municipal counterparts, commercial teleports are much smaller and offer the telecommunications user a form of one-stop shopping for most of his networking needs. Facilities management, local bypass, and special services provide remote users with a central hub to enhance their data communications operations. The commercial teleport offers users a space for their equipment in a high-security, computer-controlled environment, and on-site, trained, professional technicians for remedial maintenance and monitoring of the user's network (see Fig. 1). In addition, these trained professionals act as liaisons between the local telephone companies, the control center, and its users.

The commercial teleport's network services may include both messaging and voice capabilities. Message services can include various types of information distribution, including letter forwarding, telex, TWX, mailgram conversion, word processing termination, and protocol conversion, as well as other modes of document delivery that do not

FIG. 1

## COMMERCIAL TELEPORT FEATURES

- Computer controlled environment
- Adequate space requirements
- Security
- Reliability (power redundancy)
- Technical supervision
- Network control & monitoring
- Circuit backup & supply
- Equipment maintenance
- Continuous carrier interaction
- Messaging and voice service capabilities

FIG. 2

## TELEPORT NETWORKING SERVICES

### A. MESSAGING

- Letter forwarding and other forms of document delivery
- Telex
- TWX
- Mailgram conversion
- Word processing conversion
- Protocol conversion
- Least-cost routing

### B. VOICE

- Voice storage and retrieval options
- Long-distance resale
- Call accounting

require a formal signature. Typical voice services involve long distance discounts (resale) together with call accounting, least cost routing, and voice storage and retrieval options (see Fig. 2).

## TELEPORT MARKET OVERVIEW

The teleport concept is relatively new in the United States, although various commercial teleport services have been offered by computer time-sharing companies that had limited extra space to lease. In addition, the International Record Carriers (IRCs), such as ITT World Communications and RCA Global Communications, offer capabilities similar to those of commercial teleports in the sense that they provide space to their larger users and then tie these customers' communications into their own existing functions. The primary concern of the IRCS, however, has always been to profit from the leasing of international circuits. Historically, therefore, the IRCS have

FIG. 3

## POTENTIAL TELEPORT USERS

- Government: federal, state, & local agencies
- Insurance companies
- Financial institutions
- Law firms
- Transportation industry
- Retailers
- Oil companies
- Telex refilers

FIG. 4

## TELEPORT SUPPLIERS

- Intercity carriers
- BOCs
- Cable television companies
- Satellite vendors
- Office equipment suppliers
- Database service suppliers
- Technical service suppliers
- Real estate firms

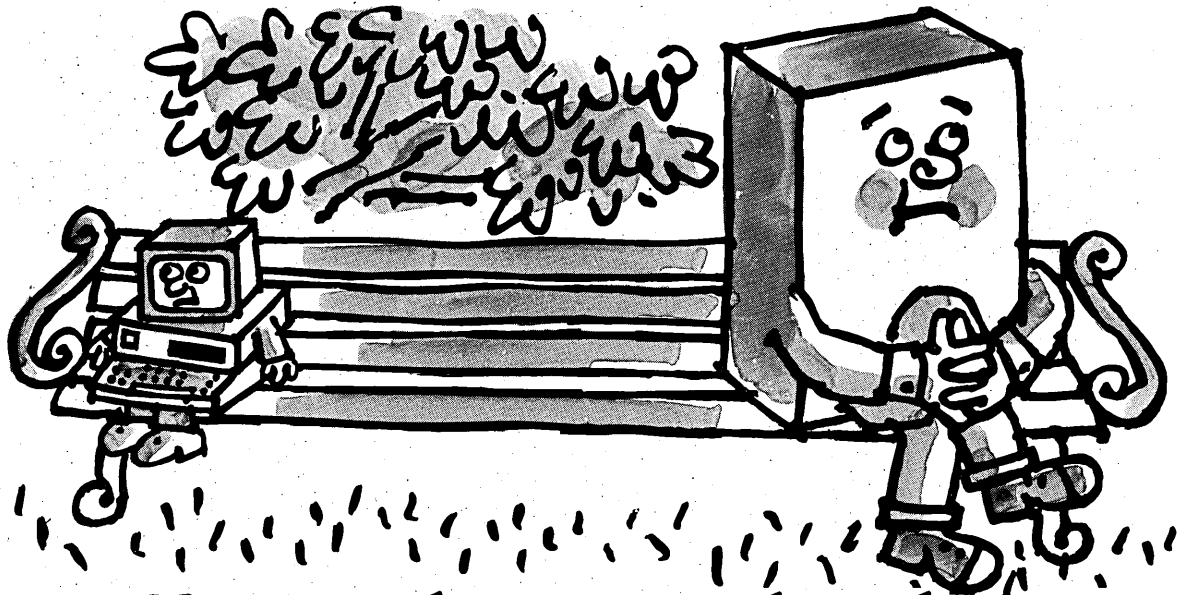
not been concerned with on-site maintenance and other customer requirements, and consequently, the general level of service to users.

Internationally, the oldest commercial teleport is located in Hong Kong and has been operated by Cable & Wireless Ltd. for over 20 years to provide users in the Far East with equipment cubicles in a high-security environment. Recently, Telecom Inc. of New York has opened commercial teleports for facilities management in Switzerland, West Germany, the United Kingdom, and Singapore, and is currently reviewing the potential for commercial teleport operations in Australia. Telecom is also poised to enter the messaging market through its teleport hubs.

Commercial teleports appeal to a broad range of users (see Fig. 3). Companies that use distributed data processing on a national or international basis are teleport candidates due to their need to hub these services through remote computer or communications systems.

In addition, general business users including banks and insurance companies may use teleports to disseminate information to remote or branch offices. Other groups that could benefit from teleport capabilities are transportation companies, oil companies, law firms, voice/data service companies, remote paging transmission companies, telex refiling companies, and copying service organizations. Finally, government agencies

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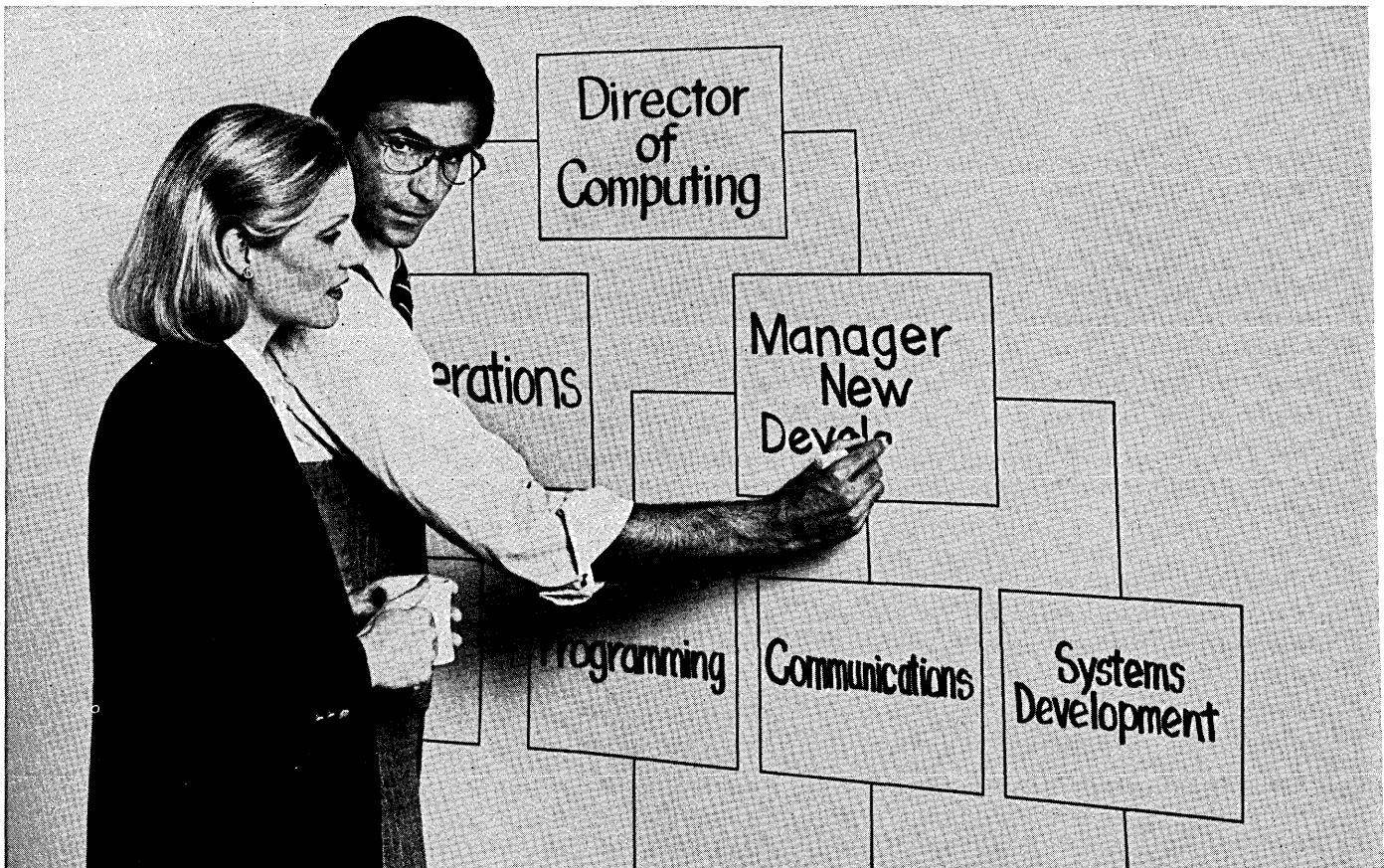
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# The oldest commercial teleport is located in Hong Kong and has been operated by Cable & Wireless Ltd. for over 20 years.

and offices offer a tremendous market for commercial and municipal teleports. These entities would be able to distribute legal drafts, reports, proposals, memoranda, purchase orders, invoices, and any other documents not requiring formal signature.

Because telecommunications and information processing vendors will be selling to users of teleport services, the teleport market concept should appeal to a wide range of these businesses as well (see Fig. 4). For example, teleports will provide inter-exchange telephone carriers with increased opportunities for intercity, specialized, and resale common carriage, as well as joint venture options both locally and nationally. In addition, teleports will offer the restructured Bell Operating Companies the opportunity to expand their business activities and increase local access revenues.

Cable television operators and satellite vendors also should stand to benefit from the emerging teleport technologies. Local cable companies can provide bypass services to the teleport, including broadband local computer networking for businesses; national cable operators will be able to provide regional interconnect services, and teleports could play a key role in cable refranchising. For satellite vendors, teleports will provide opportunities for multiple user up-link earth stations, teleport networking, and shared teleport teleconferencing capabilities.

With the development of teleports, office equipment and service suppliers can enhance their marketing of shared-user PBXs, local area networking equipment, electronic mailbox systems, and multiple client word processing and data processing configurations. The small but growing industry database service suppliers will be able to market databases and data processing capabilities to the teleport for use by their customers. Technical services suppliers will be able to offer teleports turnkey technical support, customer software, satellite earth station operations and maintenance, and preparation of proposals for teleport presentations.

## THE COMMERCIAL CONCEPT

The problems currently confronting a data network user involve placing business equipment such as multiplexors, computer switches, and modems in central locations. Previously, a user could lease space in an open, remote location (from Western Union, for example) and simply hope that the system didn't fail. The cost of employing full-time technicians on-site, however, is seldom justified, since most failures originate in the circuits.

Until the emergence of the commercial teleport concept, users rarely have been able to have access to a carefully monitored

computer-type environment. Moreover, there has been little or no available power backup, and the low quality of security in these locations invites message transmission interference and irreparable or costly computer damage.

In addition, the absence of on-site technical staff compels the main control center to identify and take corrective measures for its remote location. This process is inefficient and often compounds existing problems.

Commercial teleports are designed to solve these problems. Specifically, teleports can operate single, high-security facilities that offer strict environmental control for users' computer operations, and can offer users either general rack space (if the equipment does not require extra security) or special security enclosures in the form of walled space with sensory devices to monitor customer equipment.

Typically, the teleport's communications personnel will be responsible for interacting with the control center and with the local telephone companies for more expeditious resolution of problems involving circuits, switches, network control, and other teleport functions. In some cases, these technicians can be trained by the user for board replacement, although teleports normally would not be in the business of replacing components.

Because teleports will be in constant communication with local exchange telephone companies, users will always have access to local telephone facilities. Furthermore, teleports will establish and maintain close working relationships with AT&T resale and specialized common carriers. Finally, teleports may establish agreements with foreign PTTs to enable the user to distribute information on an international basis.

The commercial teleport is gaining in popularity in the U.S. The first domestic commercial teleport was offered by I-NET Corp., a subsidiary of Cable & Wireless of North America Inc. Through Cable & Wireless's FCC-licensed data communications resale carrier, Pacnet Communications, the company has been offering facilities management services on a space-available basis in 11 cities.

The IRCs have also offered teleport functions in major gateway areas (Los Angeles, San Francisco, Miami, and New York) where the user requires international circuits. In addition, Western Union offers teleport functions on a space-available basis if the user agrees to use only Western Union's circuits. Raytheon also offers facilities management on a limited basis through its maintenance company, which is computer rather than communications oriented.

Internationally, Cable & Wireless Ltd. and certain foreign PTTs have offered space to companies wishing to centrally locate their computer and communications equipment with either limited or no technical advice and assistance. Telecom Inc., for example, provides commercial facilities management and limited messaging services in several foreign countries.

A startup operation in Dallas has plans to move into the teleport business by piggybacking on an existing network of telephone answering service operations. Teleport Computer Corp. is a wholly owned subsidiary of WUITAS, a privately held spin-off of the answering service division of Western Union International that resulted when MCI bought WUI.

TCC plans to open hubbing centers this year in Dallas, Houston, Denver, and New York to provide outward-bound electronic mail systems and management services for its electronic mail customers. TCC's target is to expand to 40 hubbing cities in the U.S. and two international gateways by September of next year, all through an expansion of WUITAS answering service centers already situated in those cities. TCC's electronic mail services will be linked with a dedicated network driven by a centrally located tandem computer "switch." In addition to electronic mail, TCC expects to offer on-line database retrieval services such as Dow Jones stock quotes, weather, news, etc.

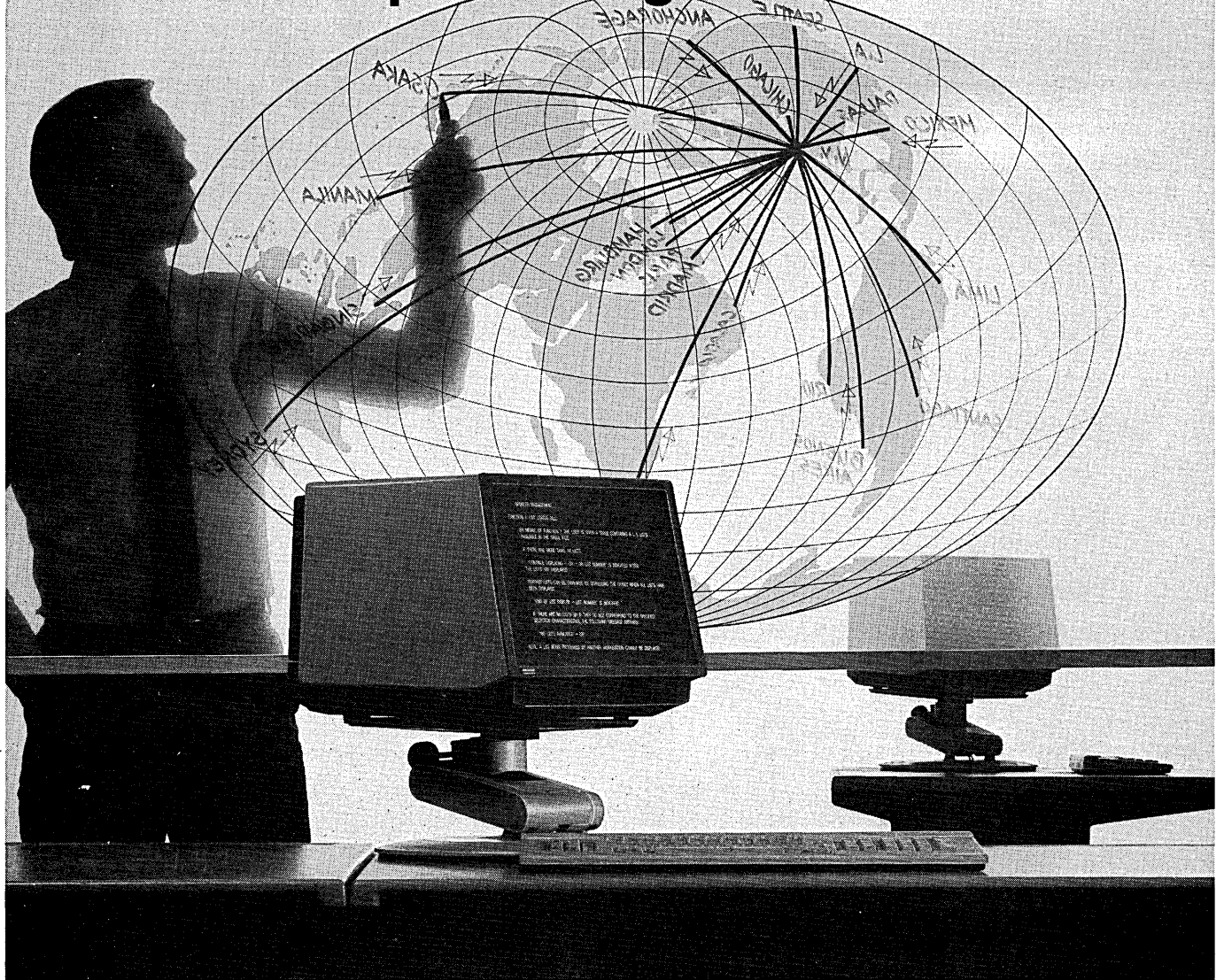
Within four years' time, TCC hopes to develop its hubbing offices into major teleport facilities providing a full range of facilities management services to its customers. A unique aspect of the TCC electronic mail service concept is the provision of low-cost receive-only printers that customers can carry virtually throughout the world to receive messages routed through the TCC network.

## MUNICIPAL TELEPORT PRINCIPLE

Numerous companies and institutions are considering developing teleports in many regions around the U.S. in response to the increasing emphasis being given to telecommunications and information processing by corporate executives and office park developers.

In the Staten Island project, for example, the Teleport will be built on a portion of the city-owned corporate park in the Bloomfield section of Staten Island. Phase I, to take five to eight years to complete, calls for the Port Authority to clear the site and provide the necessary infrastructure for the land to be developed. The plan also includes approximately 1 million square feet of office space to be built by private developers and the Port Authority, designed to house firms employing an estimated 3,400 workers.

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# To the extent teleport operators buy and resell network facilities to their customers, they could be classified by the FCC as common carriers.

Merrill Lynch and its partner, Western Union, will be responsible for financing and construction of a protective 50-foot-high berm and a Telecenter building on the site, together with the installation of related earth stations and telecommunications equipment. The communications facilities of Teleport, including earth stations and fiber optic cable between Staten Island and the World Trade Center, are now scheduled for regular operation by next April.

Merrill Lynch and Western Union will install approximately 17 earth stations on the shielded portion of the site. Special laser-powered fiber optic cables will provide a direct link between the Teleport site in Staten Island and the New Jersey, Manhattan, Brooklyn, and Queens central business districts. The telecommunications facilities linking the Teleport with Manhattan will terminate in the World Trade Center. And since

the World Trade Center is already connected to both the telephone network and the Manhattan Cable Co.'s network, the Teleport should appeal to users over a wide geographic area.

In Columbus, Ohio, four companies and institutions—Ohio State University, CompuServe Inc., Chemical Abstracts Service Division of the American Chemical Society, and M&R Cos., an operation of the Ruschilli Construction Co.—have entered into a joint venture to build a teleport for business users who desire a cost-effective way to deliver and receive data and video communications and audio signals. The organizations plan to conduct further research on the telecommunications needs of Ohio businesses; they will also begin technical planning for the teleport and will develop educational programs to assist potential business users in understanding how teleports can fulfill their in-

formation needs. Formally organized in October 1982, the Columbus Teleport Corp. expects to begin operations during the first quarter of next year.

In the Oakland/Alameda, Calif. area, across the bay from San Francisco, Harbor Bay Isle (HBI) Associates proposes to build the most advanced real estate/telecommunications teleport in the U.S. HBI plans to construct 6 million square feet of office space and 3,200 to 3,400 residential units on 1,000 acres at the edge of San Francisco Bay near the Oakland airport in Alameda.

Every residential unit and office will have a minicomputer or word processing terminal; each building in the office park will be equipped with complete coaxial cable facilities. The teleport will be wired with the Times-Fiber mini-hub fiber-optic cable network as well as a separate institutional cable for digitized voice and data communications for commercial use. In addition, a private microwave system will provide satellite uplink services in three different locations.

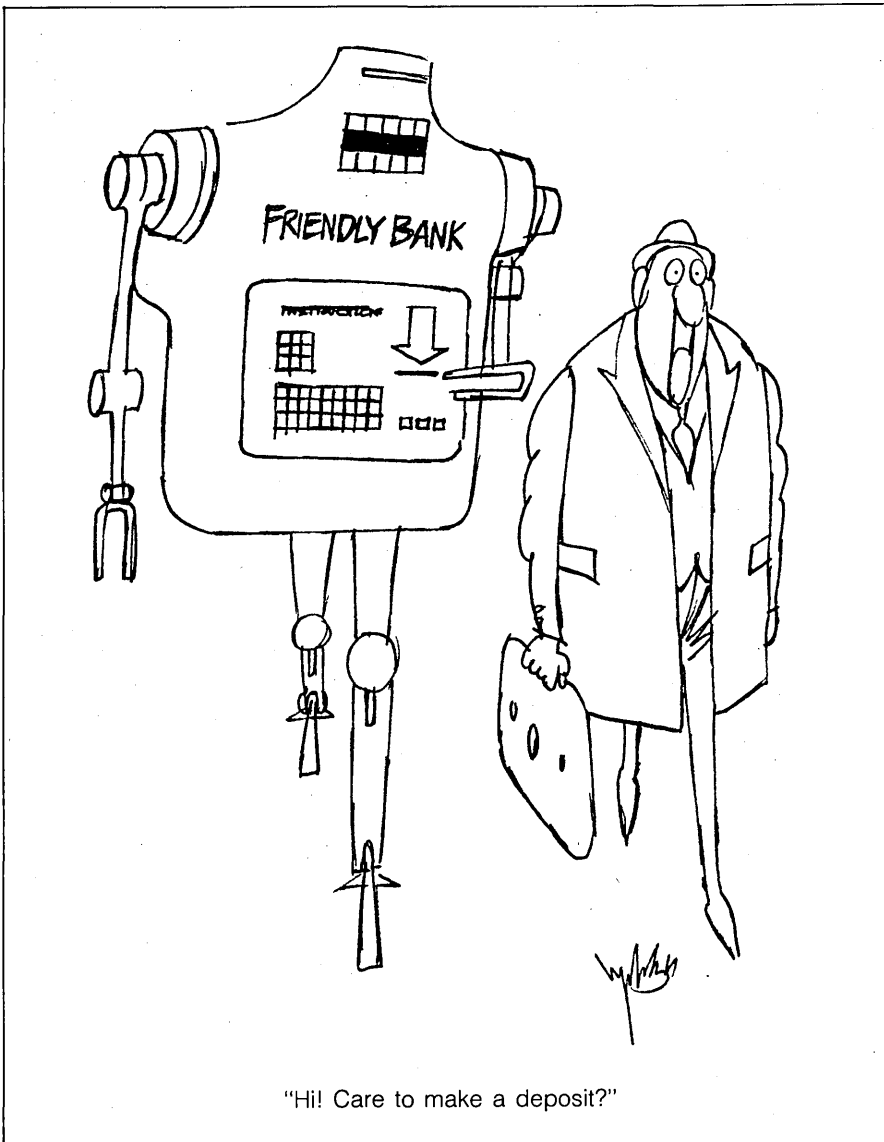
Every residential unit will have a local area network (LAN) that will provide security monitoring, automatic window controls, heating and temperature controls, and other technical service. Personal computers in each residence and office will be linked to a main computer facility that will consist of controllers, processors, and a central branch exchange to handle database retrieval. This central facility will be the control point for all system LANs.

HBI estimates that the total cost of the Alameda development, including the costs of fiber optics and hardware, will be \$2 billion. Office tenants will pay from \$1.10 to \$1.50 per square foot; residences will cost between \$98,000 and \$750,000. To date, 600 homes, a school, tennis and golf facilities, and all streets have been completed. Digital Equipment Corp. is among the first companies to purchase space in the 350-acre business area.

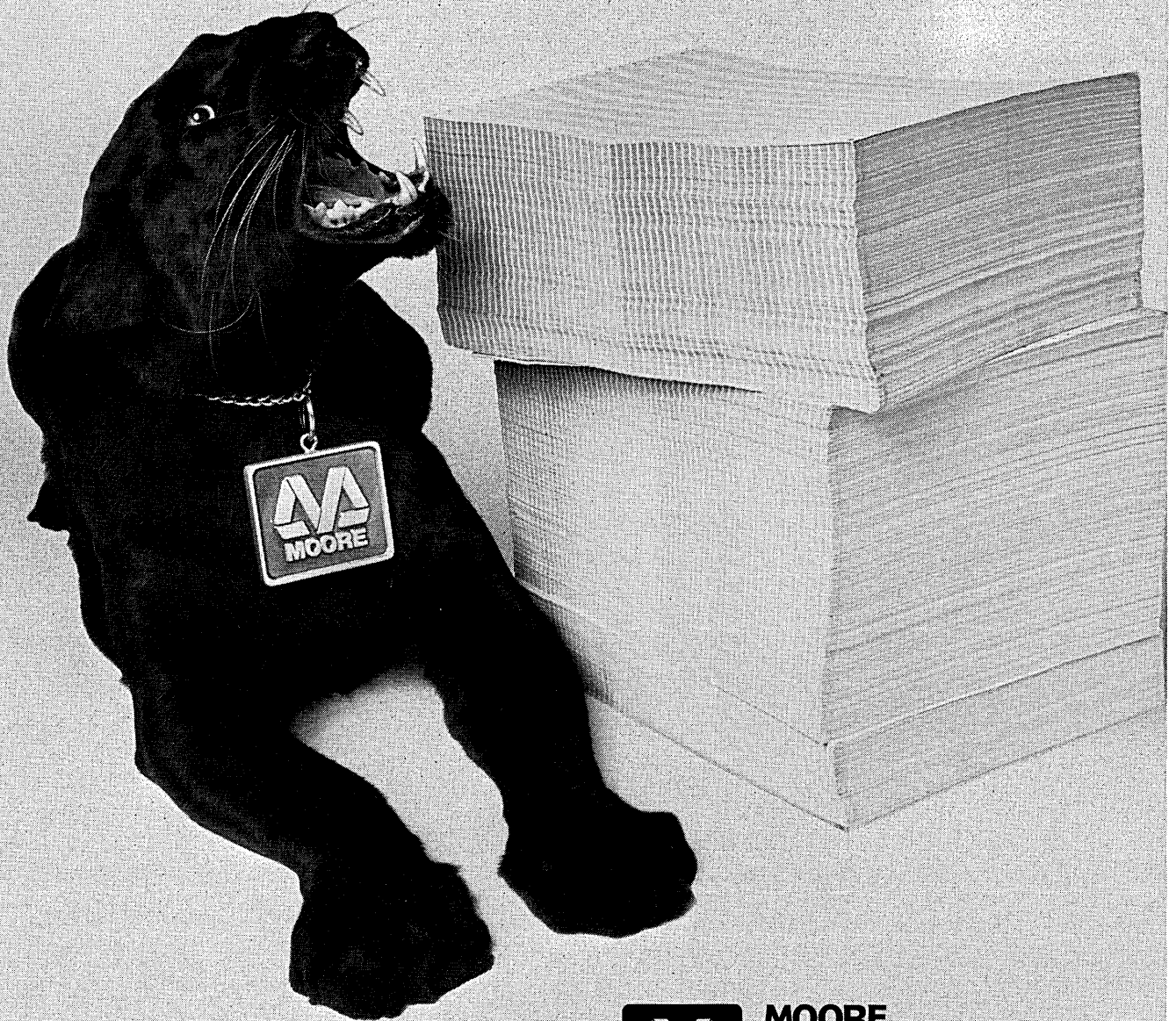
The latest entry into the teleport field is Taylor & Mathias, an Atlanta developer responsible for constructing the Perimeter Center. T&M is currently examining the possibility of building a real estate-oriented teleport in Atlanta, but the project is only in the earliest stages. Like HBI, T&M sees teleports as a profitable opportunity to enhance existing or new real estate projects by offering communications network facilities and services.

Although satellite downlinks would be the cornerstones of T&M's teleport project, the company is considering employing uplinks to allow national end-to-end delivery. Communications requests from T&M's present tenants in several of its developments range from simple microwave transmission for local loop to delivery to the need for tying into national circuits.

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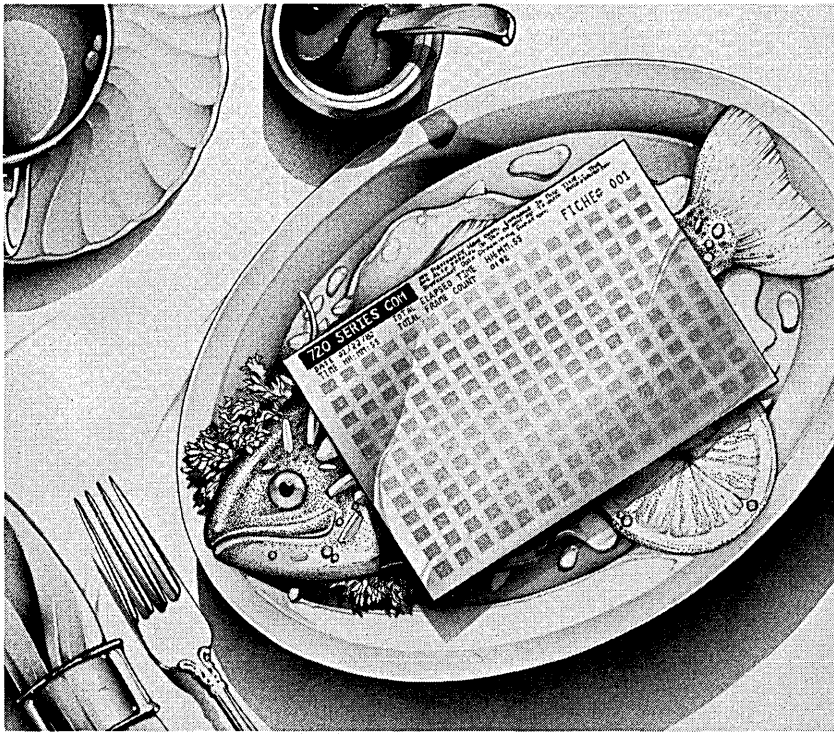
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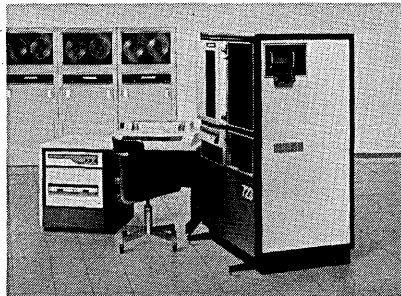
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### POTENTIAL LEGAL ISSUES

Because the underlying technology and economics of commercial teleports vary from system to system, it is difficult to forecast all the legal and regulatory issues that may arise from teleport systems development. Nevertheless, some of these issues are becoming identifiable through examination of recent developments in telecommunications technology.

To the extent teleport operators buy and resell network facilities to their customers, they could be classified by the Federal Communications Commission (FCC) as common carriers under Title II of the 1934 Communications Act. A typical example would be a teleport that buys transmission services from an organization like Satellite Business Systems and resells them to its customers. Under existing federal law, such a teleport operator would be classified as a resale satellite carrier and would be subject to FCC common carrier regulations involving tariff filing and licensing requirements.

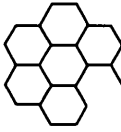
Virtually every public utility commission (PUC) in the U.S. has jurisdiction over intrastate telephone operations. If the services provided by a teleport are isolated to intrastate usage, i.e., local telephone service, the teleport operator might be subject to local rate regulation.

Although there is no evidence that state PUCs have examined this issue to date, the question of state regulation of teleports may surface as teleports become operational; by analogy, an increasing number of states have imposed regulations on cable television system operators as that industry has grown and developed.

In addition, most cities can require a franchise (a license or consent) for a teleport operator to use public streets or rights-of-way. Most cities can be expected to treat teleports in the same manner as they have treated cable television; specifically, cities have used their franchising powers to impose a vast array of requirements (such as franchise fees) upon cable systems. In light of the worsening financial condition of most urban areas, it is possible that many governments will regard teleports as new mechanisms for generating local revenues.

Teleports present one of the most attractive telecommunications business opportunities of recent years. Developers, investors, and users, both on- and off-site, stand to benefit from the myriad communications services offered by teleports. And while the term teleport is a long way from being a household word, teleports are quickly becoming the darlings of real estate and telecommunications system developers across the country. \*

Terry G. Mahn, a communications attorney, is a principal in the Washington, D.C., law firm of Mahn, Franklin & Goldenberg. A regular contributor to this magazine, Mr. Mahn is also a member of DATAMATION's Advisory Board.



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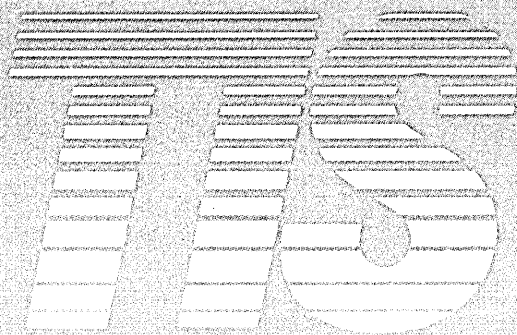
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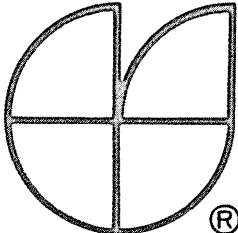
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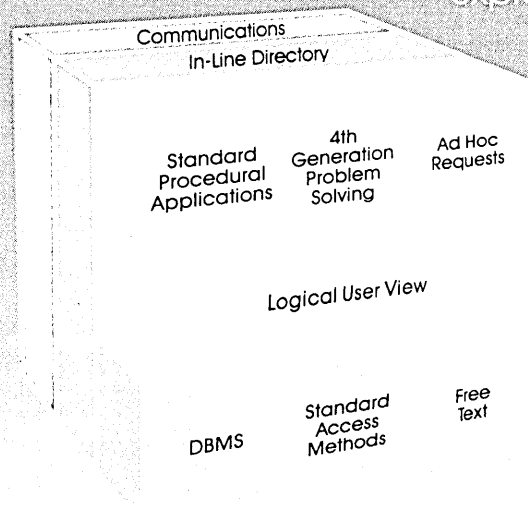
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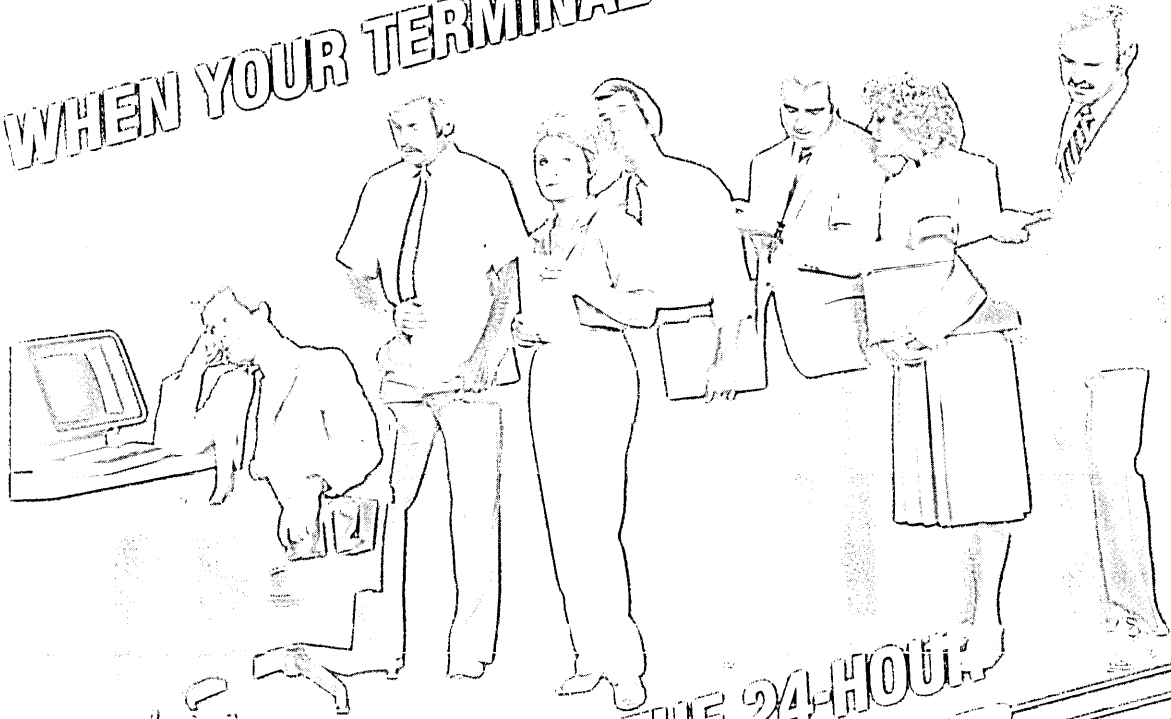
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CIRCLE 117 ON READER CARD

## How innovative management combined with office automation to boost productivity at the Federal Reserve Bank of Atlanta.

# CHANGING THE CORPORATE CULTURE

by **Donald L. Koch**  
and **Delores W. Steinhauser**

American society is moving out of the age of industrialization and into the age of information. In the industrial age, standardization, centralization, synchronization, uniformity, and mass production permeated our society. But today, new technologies, new forms of energy, new modes of thinking have spawned a civilization of diverse attitudes, knowledge, and beliefs—a society that is breaking through the constraints of the industrial environment.

For the most part, however, corporations still operate in an environment based on the concepts of industrial society. Few corporations have found successful techniques for migrating to the more fluid forms of management required in a rapidly changing environment. Yet enlightened executives acknowledge the changes occurring in society and recognize the need to join the information age to retain their competitive advantage.

This article explains how corporate management can change an organization's culture using computer information systems. It includes a step-by-step discussion of our experience at the Federal Reserve Bank of Atlanta research department in increasing the productivity of office workers. While computer technology can play a large role in eliminating routine, mindless tasks, we found that it is only part of a greater management effort to leverage the human mind.

To prepare the corporation for these more fluid forms of management, executives must first identify the organization's current culture. In many cases, management techniques that have proved successful in the manufacturing environment are being adopted in office settings. This style places a heavy emphasis on procedures, standardization, automating mechanical processes, and scheduling. Management rewards workers who are obedient, punctual, and willing to perform rote tasks. In an industrial culture, office automation tends to imitate factory automation by mechanizing existing functions. This mechanistic environment, however, inhibits the information worker, who must

be a creative and active thinker. Great strides in office productivity will occur only when the organization is unleashed from the restrictions of the industrial environment.

Productivity in the industrial age was measured in terms of quantity. The objective was to satisfy a growing population's appetite for more and more consumer goods. But the mechanization process reached diminishing returns when standardization and mass production became resistant to change. The standard example is the U.S. automobile industry, once the showcase of American productivity and successful management techniques. The industry became so big, inflexible, and resistant to change that it threatened to destroy itself.

Productivity in the information age involves creative thinking, flexibility, and the ability to change and adapt quickly. Information workers must rely less on vertical, sequential, logical, left-brained thinking. The new environment requires that people break away from old patterns of thought. If productivity is to be stimulated by creative thought, the working environment must provide the proper atmosphere, resources, incentives, and rewards to promote this new kind of productivity.

The foundation for managing knowledge workers rests on a clearly defined management style. Traditional techniques successful in controlling manufacturing processes fail to motivate knowledge workers. The approach that works best is collegiality. Decisions should involve open debate among all players, because decisions arrived at through open dialog are more likely to be based on sound judgment.

At the foundation of the decision-making process lies a kind of dynamic tension—a positive and constructive friction between employee and employer to ensure that the best possible decisions are made. Freedom of expression is encouraged as long as that freedom is handled with concern for professional objectivity and respect.

Unlike traditional hierarchical management, the collegial approach often works from the bottom up. The most important link in the decision-making chain is the person

who is most effective and who makes decisions that stand the test of time in contributing to products, regardless of his position on the organization chart. In such an open environment, petty considerations and ill-considered propositions can be rejected quickly. Open debate, bottom-up decision-making, internal consistency, and appreciation for all employees' strengths are the benchmarks of an effective management process.

### **JOBS THAT CHALLENGE POTENTIAL**

The attributes of effective management can be hard to find in a large organization where adherence to standard procedures is often more highly rewarded than high-quality, high-quantity production. In the corporate world, firms often motivate employees by encouraging them to acquire shares of stock in their companies. In another sense, employees maximize their human equity by performing well. They buy shares of time in their own lives through their work. They can enhance the quality of their life by making a real contribution, or they can perform in a mediocre way, which devalues the institution and their own human equity. The best knowledge workers will seek out environments that challenge their potential and allow them to maximize their equity through growth, experimentation, and hard work.

To create this environment, a management system must offer both accountability and autonomy. Employees must be able to make autonomous decisions and implement them freely without regard to what their superiors think, as long as the controls of accountability and responsibility are in place. Along with enjoying the freedom to act, the decision-maker accepts responsibility if his decisions fail to produce tangible results. Innovation and creativity are rewarded and employees make their decisions based on what is best for the organization rather than what might satisfy the boss.

In such a system, success and failure are easily recognized. Annually, each employee establishes a performance contract that is reviewed several times a year. Success comes when one is able to fulfill the contract.

## As measured by printed material, productivity increased 920% from late 1980 to early 1983.

High achievers prosper, but some individuals who fail to perform recognize they would do better elsewhere.

This was the new style of management introduced early in 1981 to the research department of the Federal Reserve Bank of Atlanta—the research arm of the central bank that serves a six-state southeastern district. Today the research department is segmented into eight teams, generally consisting of three economists, three research analysts, two clerical support workers and two student interns. Research content focuses on four major themes:

**National economic policy.** The central mission of the Federal Reserve is monetary policy. Each Reserve Bank president shares a seat on the Federal Open Market Committee, the Federal Reserve body that oversees monetary policy, and requires independent staff work from his or her research department.

**The Southeast.** The Southeast district is a high-growth region, undergoing high rates of immigration and requiring importation of capital. Regional information about the Southeast is in high demand and short supply. Analysis of such a region can be important to national policymakers as well as to institutions in the region.

**Financial services deregulation.** The pace of financial innovation and deregulation makes this a research area with great potential, particularly when it is oriented toward the future rather than the past. Competition in the southeastern market for financial services offers important opportunities for research on the entire deregulating financial system.

**Payments research.** The Atlanta Fed processes a high proportion of the checks handled by the Federal Reserve System. Atlanta pioneered in electronic funds transfer, and the bank has one of the most efficient operations areas in the system. Therefore, research focuses on the future of the payments system and the Fed's role in it.

Our research teams are decentralized and exercise unusual freedom to develop products within agreed overall goals. This is far from a laissez-faire proposition, however. Research manuscripts, for instance, must be relevant, literate, and oriented toward the future. Team leaders work under performance agreements, which they draft themselves and negotiate with department management.

The department is extraordinarily results oriented. As measured by printed material delivered to our market, productivity increased 920% from late 1980 to early 1983. The flagship product, the *Economic Review*, was increased from a bimonthly to a monthly publication in 1981 and doubled in number of pages per issue. Circulation of that magazine, which carries economic and financial arti-

cles, increased from 17,800 in 1980 to 30,500 in 1983. A new semimonthly newsletter, entitled *Insight*, currently reaches 6,000 subscribers.

The department has sponsored three major conferences in two years, attracting an average of 300 top-level executives. Proceedings from each conference were edited and published in book form. Additionally, department economists prepare a 100-page briefing booklet every six weeks to support the bank's president at meetings of the Federal Open Market Committee. A regional economic database containing over 2,000 statistical series and updated monthly by the department will soon be offered to the public via an electronic information system.

The new level of output came from the same basic group of people who worked in research prior to the management change. There has been a net increase in staff of one full-time person since January 1981. Of the eight team leaders, five worked at the Atlanta Fed under the old style of management. Only three of 14 professionals chose to leave when the management philosophy changed.

### LEADERS USE INGENUITY

Our eight team leaders are encouraged to use their ingenuity, technology, and networks of outside contacts to develop products, working with visiting scholars, college interns, part-time specialists, and the department's facilities for microcomputer databases, information retrieval, and publications production. The effective use of computer technology is only part of the reason for the increased productivity. Without the appropriate culture, as we have described, the technology could hardly have generated these gains.

Knowledge-work can be defined as any job that requires gathering information; analyzing, reshaping, integrating, transforming information into decisions and recommendations; and generating information output in printed or spoken form. This description fits a multitude of jobs in our society: lawyers, doctors, managers, accountants, ministers, secretaries, engineers, investors, computer programmers, salespeople, corporate executives, financial analysts, strategic planners, regulators, bankers, economists, scientists, marketing specialists, purchasing agents, and educators. The tools these people commonly use to accomplish their jobs are generally limited to pencil, paper, telephone, and calculator. Yet the technology available today can free knowledge workers from routine, mindless tasks and allow them to do more. The way this was accomplished at the Federal Reserve Bank of Atlanta research department is applicable to any knowledge-work environment.

Research management focused on automating department functions that would provide the most leverage in meeting the overall department objective: elevating the organization to a center of excellence for economic understanding in the Southeast. Automation helped to meet that objective by providing the means to increase quantity of output (more printed pages); shorten the lead time required to produce output or respond to requests; and improve the quality, relevance, and timeliness of output. Early on, management recognized several principles that guided the decision process in choosing equipment to meet these needs.

Technology must be applications driven. We know it is essential to keep up with new technologies and monitor the direction of the industry, but we attempt to introduce only proven technologies and well-tested equipment.

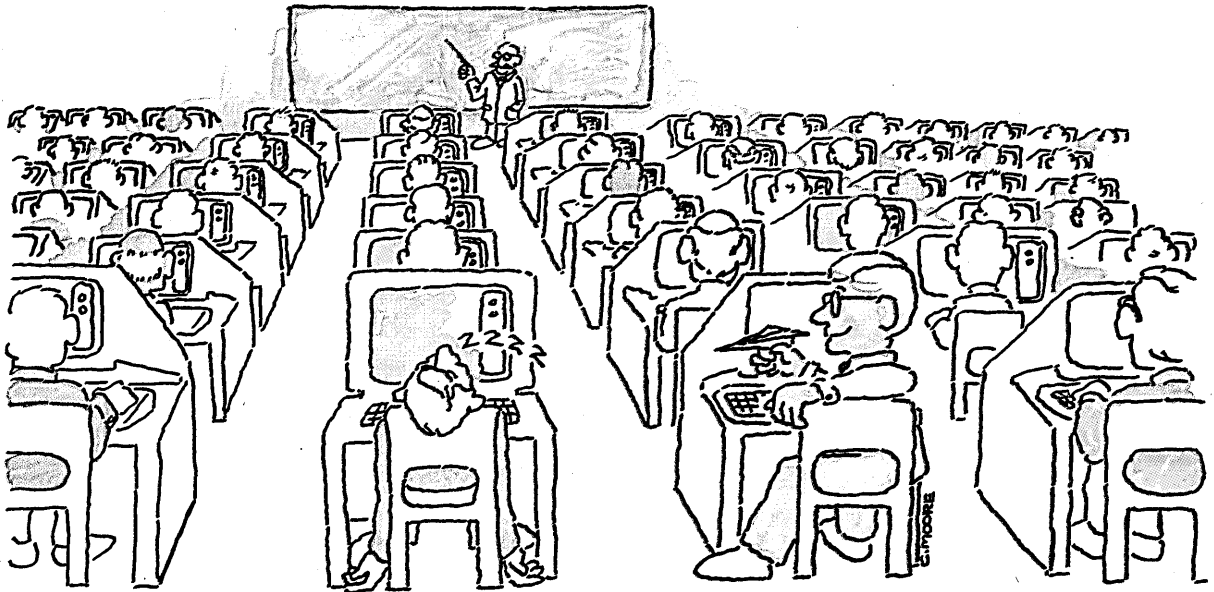
For example, bubble memory at one point was lauded as the wave of the future for storage media. We tried two portable terminals that had bubble memory, but made no major investment. The technology never delivered the results it promised. Weight proved to be a problem and the commands to exercise the memory were cumbersome. Today, CMOS technology is beginning to be used in consumer products as a storage device. Although the products are very new, the technology is at least 10 years old. We are likely to be a major purchaser of new portable computers using CMOS chips because the technology's usefulness has been proven.

Vendor competition is better than vendor standardization. By introducing several vendors into the organization, each one must bid against others. This tends to keep the vendor honest and to maximize discounts. Additionally, when an organization becomes totally entrenched with one vendor's products, it becomes extremely difficult to change to other products.

The vendor should be scrutinized meticulously for financial viability, innovative spirit, commitment to the product line, and manufacturing quality. This scrutiny is essential whether an organization is buying one or one thousand units. We personally visit the headquarters of each company selected as a vendor and talk extensively with management as if we were planning to invest in the firm's stock. Essentially, we are making a substantial investment in each of the firms we do business with, and we want to be sure that our investment is being well managed.

The decision to purchase a certain type of equipment must stand the test of time. We want to be able to look back in three years and say, "That was a good decision." For us to be able to say that, the company must still be active in the industry, the product must

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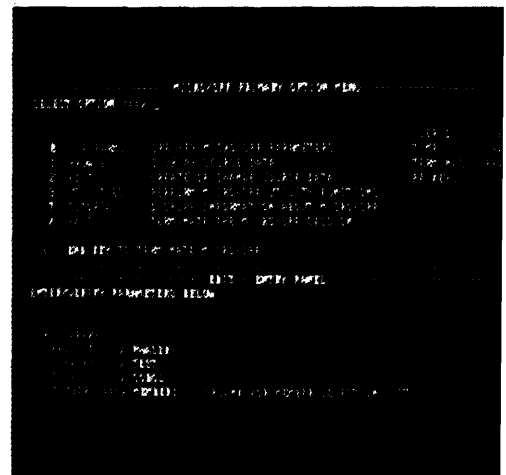
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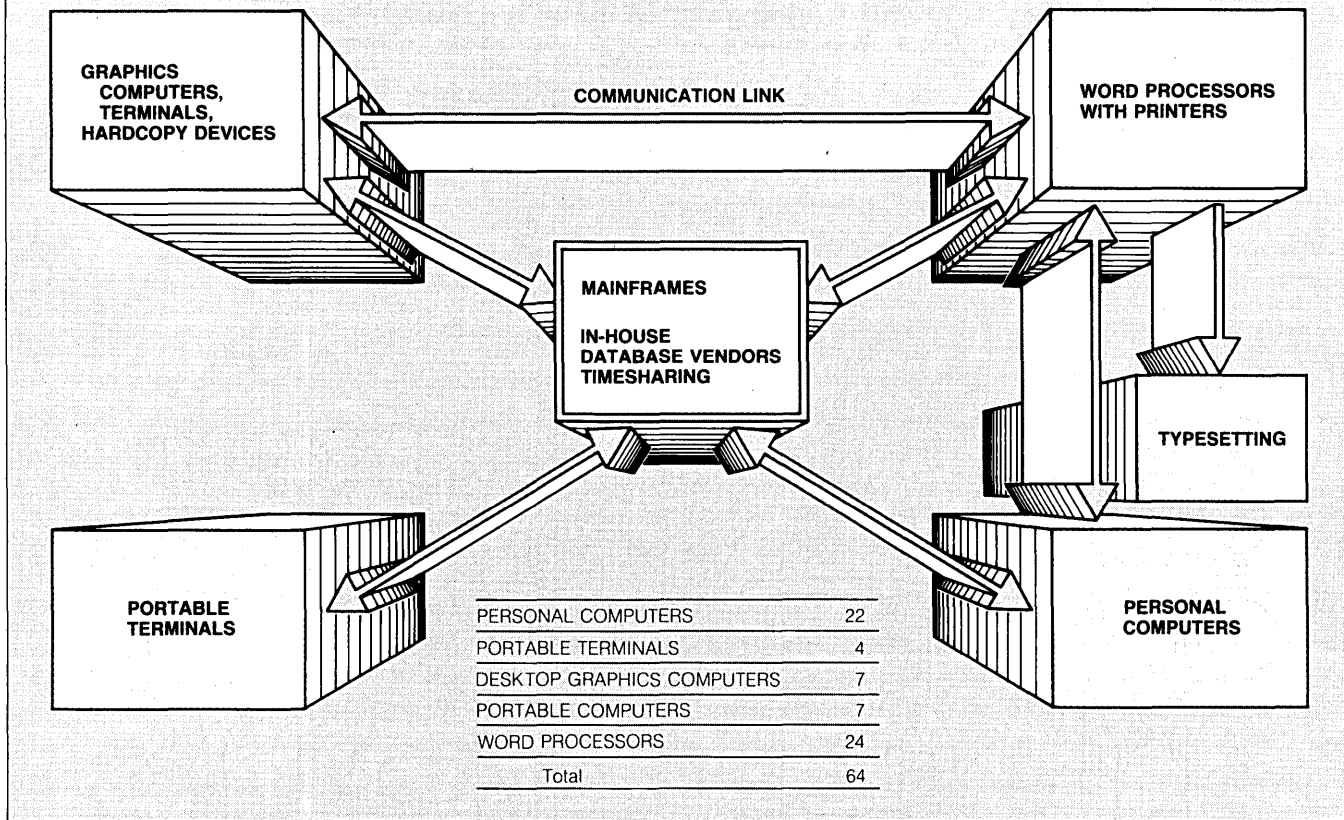
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Fig. 1

## RESEARCH DEPARTMENT EQUIPMENT



have been accepted within our organization, must have met our growing needs, and must still be usable.

Equipment should be designed to meet a specific need, yet should be flexible enough to expand with growing needs. A piece of equipment cannot be all things to all people. A commercial word processor should be used almost exclusively for preparing final drafts of reports. But the author can input first drafts directly on less expensive equipment. If the word processing equipment includes communications capability, the early drafts can be transmitted to it from any machine in any location for final preparation.

All computer equipment should allow work done on one system to be transmitted to another. This capability allows text to be keyed once and only once. Documents can be passed from personal computer to word processor to phototypesetter. We have found simple asynchronous RS232 communications at speeds of 300 or 1,200 characters per second quite adequate in this capacity.

With these six principles in mind, the research department began a systematic acquisition program in early 1981. Four major types of equipment were chosen to facilitate our work: dedicated word processing equipment, desktop graphics computers, personal computers, and portable computers (see Fig. 1). We have accumulated enough equipment to provide a computer for each of our 56 full-time staff members. (The department also

employs 16 student interns.)

The Research Department's output is virtually always in the form of printed material—black ink on white paper. Therefore, we had to improve the means of generating our publications.

Before the automation effort began in 1981, the entire department was funneling work to a word processing pool consisting of two workstations, two operators, a supervisor, and a proofreader. Almost all typing was done by the word processing pool. This arrangement was a source of frustration for many economists and research analysts who found themselves waiting for days to have their work processed.

### EACH TEAM GETS WP SUPPORT

Our first move was to dismantle the typing pool and distribute secretarial and word processing support directly to each team. In this way, a team responsible for a given level of output could control all its resources. The excuse that a project was delayed because it was held up in the typing pool was no longer valid. A secretary was matched to each team by asking the secretaries which team they wanted to work on. In every case, secretaries were given their first or second choice. The department leased enough word processing equipment (seven stations with CRTs) to give each secretary her own station plus extra one-line display keyboards to tie into the system. Economists'

and analysts' offices and cubicles were wired to the word processors, providing a receptacle to support a one-line display keyboard. In this way, five extra keyboards acquired at lower cost than the workstations were shared among professionals within their own work spaces. Professionals began inputting their own reports and memos to speed up the production process. This was the first step to eliminating the "legal pad draft."

The results of this one effort were impressive. Secretaries spent less time typing and retyping from handwritten manuscripts, but their jobs weren't threatened. Their time shifted to other responsibilities on the teams, which gave them a greater sense of participation in the department. As word processor operators in the past, the secretaries had been required only to key in material; in their new positions they now had to proofread and correct for grammar. The secretaries were given more diverse responsibilities, such as planning meetings, setting up files, updating databases, and controlling requisitions. As more and more professionals became interested in doing their own word processing, the secretaries proved invaluable as teachers. Roles were reversed as the professional began to depend on the secretary to teach him or her a new skill. Professionals who had resisted the idea of typing soon found it much easier to keyboard ideas than write them out.

The professionals' increased use of the keyboard allowed a tremendous increase



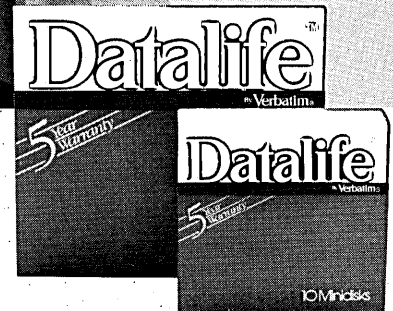
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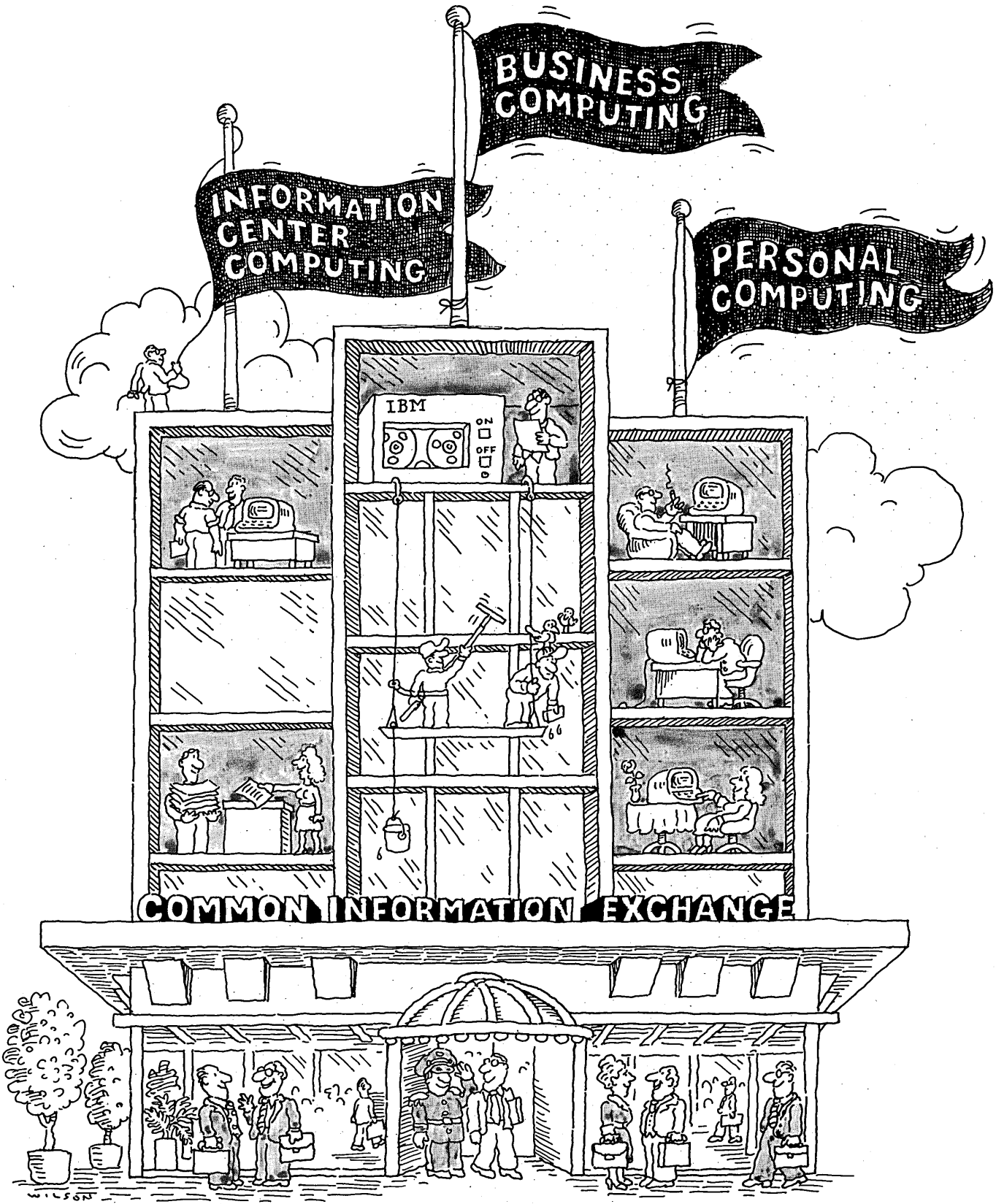
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## **We visit the headquarters of each selected vendor and talk extensively with management as if we were planning to buy stock in the firm.**

in speed and output without increasing staff. Generally, a professional keys ideas into the word processor in rough form. Then he or she works with the secretary to edit the document into final form. The real time savings comes from reducing duplication of effort when the ideas initially go down in machine-readable format. As more and more professionals demanded full capability, we added word processing stations. Since the initial 12 word processing workstations were introduced in early 1981, the number has doubled.

Within months of introducing the word processors, we found that the increased output facilitated by the word processors was creating a bottleneck in the final production stage. Most of our final output is typeset for publication, and we were still sending manuscripts out to a commercial typesetter to rekey. This costly and time-consuming process was inhibiting our stepped-up printing schedule. For \$22,000, we purchased a phototypesetter to be operated in-house by our own employees. It paid for itself in four months. The process for printing documents now is for the author and secretary to create a manuscript on the word processor. Then the diskette is passed to a staff editor whose revisions are keyed into the document. When all final editing is complete, the document is transmitted to the phototypesetter via an asynchronous RS232 communications line. Typesetting formats are applied once the document has been transferred to the typesetting machine.

This is one example of the importance of flexibility in equipment. We knew we needed communications capability in our word processors, but we did not know that we would be buying a typesetter. The flexibility of our equipment allowed us to bring in the typesetter, connect it to the word processor, and begin operations quickly. It is also important to note that the word processor and the typesetter are supplied by two different vendors. A company that specializes in office automation tools supplies our word processors, and a vendor whose specialty is optics makes the phototypesetting equipment. Each vendor is good at what it does. It is unlikely that the same vendor could offer both the best of word processing technology and the best of phototypesetting technology.

In each installation of new equipment, we tended to underestimate the demand. We anticipated that the typesetter would be used only 20 hours a week. Now, however, we have a full-time operator and a part-time operator who works after normal hours. Another employee also knows how to operate the typesetter and can fill in during peak demand. The machine is used about 12 hours every weekday and frequently on weekends. This word processor/phototype-

setter combination streamlined the production process tremendously and continues to support the production of printed material.

### **DESKTOP GRAPHICS COMPUTERS**

The research department monitors and analyzes a large group of economic statistics such as unemployment, gross national product, housing starts, and interest rates. A particular data series may be used as frequently as daily or weekly or it may be needed only occasionally for special studies or to fill special requests.

This need for various time series is not unique to economic data. Internal data monitoring for management purposes has the same character. Yet computer storage of corporate data traditionally has been structured for accounting purposes. The accounting databases focus only on one point in time and are very detailed. But anyone who analyzes trends for decision or research purposes needs databases that represent aggregates over time.

Recognizing this need, we acquired four desktop graphics terminals, later expanded to seven, with hard-disk storage. We developed databases to fill our needs by transferring existing data from mainframe computers and keying in data received in printed form. We wrote several simple programs that allowed for updating the data, displaying the data in list or graphic form, and doing simple analysis. A three-member team is constantly building, updating, and documenting the databases. The entire department has access to the data through simple, menu-driven programs. The graphics computers are mounted on mobile carts that anyone can move into an office or cubicle. Having economic data immediately accessible in graphic form has enhanced the quality of analysis and shortened the time required to do lengthy studies or respond to special requests.

Of course, the databases and software cannot accomplish everything we need. An economist or analyst must directly input certain data series not regularly maintained, to perform graphic analysis. Also, users sometimes want to conduct more sophisticated analyses than our software can handle. In those cases, he or she can transfer the data from our graphic terminals to a mainframe computer and use econometric modeling packages for the analysis. Then the user can download the results for graphic display. The capabilities that are missing represent only about 20% of our work. The 80% that has been automated effectively using local computer intelligence has greatly increased our ability to provide timely analysis.

While graphic analysis can be performed on a regular personal computer, we found our demand for graphics so great that it

warranted a machine designed specifically for that function by a company specializing in graphics. We chose a flexible system that is programmable and has asynchronous RS232 communications. Peripherals tie into the equipment easily. As the databases grew rapidly, we invested in a 32-megabyte hard disk for central data storage. To ensure the data integrity, we centralized the job of maintaining these internal databases in the department.

One year after we began our automation effort we found that, while a few people were becoming expert with the computers, others shied away from them. The graphics computers still required custom programming and had to be used for specific predefined functions. We saw the need for a personal productivity tool that professionals could use creatively to increase their effectiveness. We acquired three personal computers with standard text editing, spreadsheet, communications, and database management programs. The demand for these machines quickly proved far greater than the supply. Professionals found them to be a tool they could use not only to write reports and display data graphically, but also to do large calculations, build simple econometric models, and organize data. The spreadsheet capability alone gave them the flexibility to do more and better analysis.

We encouraged employees to take the machines home over weekends to gain familiarity with them. Most learned by reading a manual and experimenting. Others waited until a colleague who had gained some knowledge could show them how to get started. We borrowed some game packages from the local computer vendor for our people to use in off hours. Playing games reduced the fear factor and increased the intimacy between human and machine.

A few months later we purchased five more personal computers, then another four more-sophisticated units. Employees complained that there still weren't enough to go around. Our latest round of purchases added 10 more personal computers, boosting the inventory to 22. With those units we were able to assign machines to individuals rather than requiring users to share. This arrangement works much better because now the machine truly is a personal productivity tool.

The personal computers are used much more for word processing than we expected. Professionals and analysts take them home to write a report free from office interruptions, then transmit the document by modem to the word processor for final formatting and editing. With the personal computer, to-do lists are kept on computer rather than on note pads. Database management programs are becoming more and more useful for tracking projects, organizing information that is

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As appeared in **BUSINESS WEEK**, July 11, 1983

As appeared in **SYSTEMS & SOFTWARE**, August 1983

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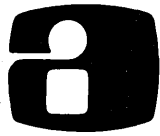
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# The old environment valued standardization, procedures, and machines; the new organization thrives on creativity, individuality, and flexibility.

collected for a project, and analyzing survey or questionnaire results. The personal computers are being tied into a local network to enhance data sharing and to develop an electronic communications scheme.

Initially, some problems occurred with servicing the personal computers, since most vendors require users to bring the system to the outlet for repair. We initiated an on-site service contract with our vendor that works well. We hadn't wanted to purchase a separate software package for every machine, but found that the problems involved in sharing software outweigh the dollar outlay. Researchers have standard packages available at all times. We have a central checkout station for rarely used packages.

## A FEW PORTABLE TERMINALS

At first we invested in portable terminals for employees who were involved exclusively in timesharing work. We kept that investment small—four portable terminals. We also wanted to develop a system so those who travel could communicate with the office. We developed a system in which the traveler signed on to a timesharing vendor and typed a message into a file stored on the vendor's disk. The traveler's secretary could sign on to the same account and retrieve the file. The secretary would prepare messages on a word processor and then, once or twice a day, sign on to the timesharing vendor and transfer the messages to a file for the traveler to read.

The original system worked fine, but

the 15-pound terminal proved too bulky to carry on short trips. Now we have a three-pound portable computer that allows the traveler to prepare messages off-line and then upload them to the host computer. Also the traveler can retrieve the secretary's messages, edit a letter off-line, and then send it back. The training required to do this is minimal. We now use more sophisticated electronic mail offered by the timesharing vendor. It allows for greater privacy in sending files and verifying that messages have been read, and makes the system easier for several people to use in concert. In this way a person can always be in touch with the office and can respond to messages and correspondence that come in while he or she is away. Many tasks can be completed remotely that might have been delayed for days without this system.

User acceptance is often considered a potential problem in introducing new technology. We found, without exception, that once a person experiences the benefits of the machine, he is hooked.

If the equipment can pass one special test, then it has met with approval. When we first introduced word processing, a veteran secretary adamantly opposed using the system. We sent her to a training class anyway. For months she ranted whenever something went wrong with the machine—but she did learn to use it. The true test came when she transferred to another department within a year after being introduced to word processing. She said she would take the other job only if she could take her word processing

equipment with her. We knew then that once anyone learns a new skill, he or she can never go back to less efficient operations.

Transforming an organization so it can operate effectively in the information age requires that people shed industrial age values and adopt new approaches and incentives. Whereas the old environment valued standardization, procedures, and machines, the new organization thrives on creativity, individuality, and flexibility. Industrial roadblocks should be recognized and moved to provide the proper environment for the information age worker.

The major contrasts between the old and the new office environments are:

- People—not machines—are central to productivity.
- Power today is in the hands of those who possess information and can turn it into knowledge; the old hierarchical system is less important in our new era.
- Emphasis is on results, not rigid adherence to standards.
- Technology is seen as liberating man's mind to improve productivity—not as enslaving him to his own inventions.

The computer—introduced during the height of the industrial age—was regarded like any other piece of machinery; it mass-produced numbers instead of widgets. The equipment's expense made large, centralized mainframes the most efficient approach. Today, computer components are so inexpensive that it is becoming much more efficient to distribute the computing power to users. To accomplish that task, we must change people's perspective on using computers. To raise productivity to a higher plateau, we must find ways to develop the mind, promote creative thinking, and facilitate the rapid exchange of information and ideas. \*

Donald L. Koch is senior vice president and director of research at the Federal Reserve Bank of Atlanta. In that capacity, he is the bank's senior official responsible for economic research, public information, and bank relations. Prior to joining the Federal Reserve Bank in January 1981, he was an executive officer and chief economist of Barnett Banks of Florida.

Delores W. Steinhauser is an economist in the research department at the Federal Reserve Bank of Atlanta. She is responsible for automating economic research through database development, office equipment acquisition, and staff education in uses of computer technology. She was previously an economic analyst at Barnett Banks of Florida.

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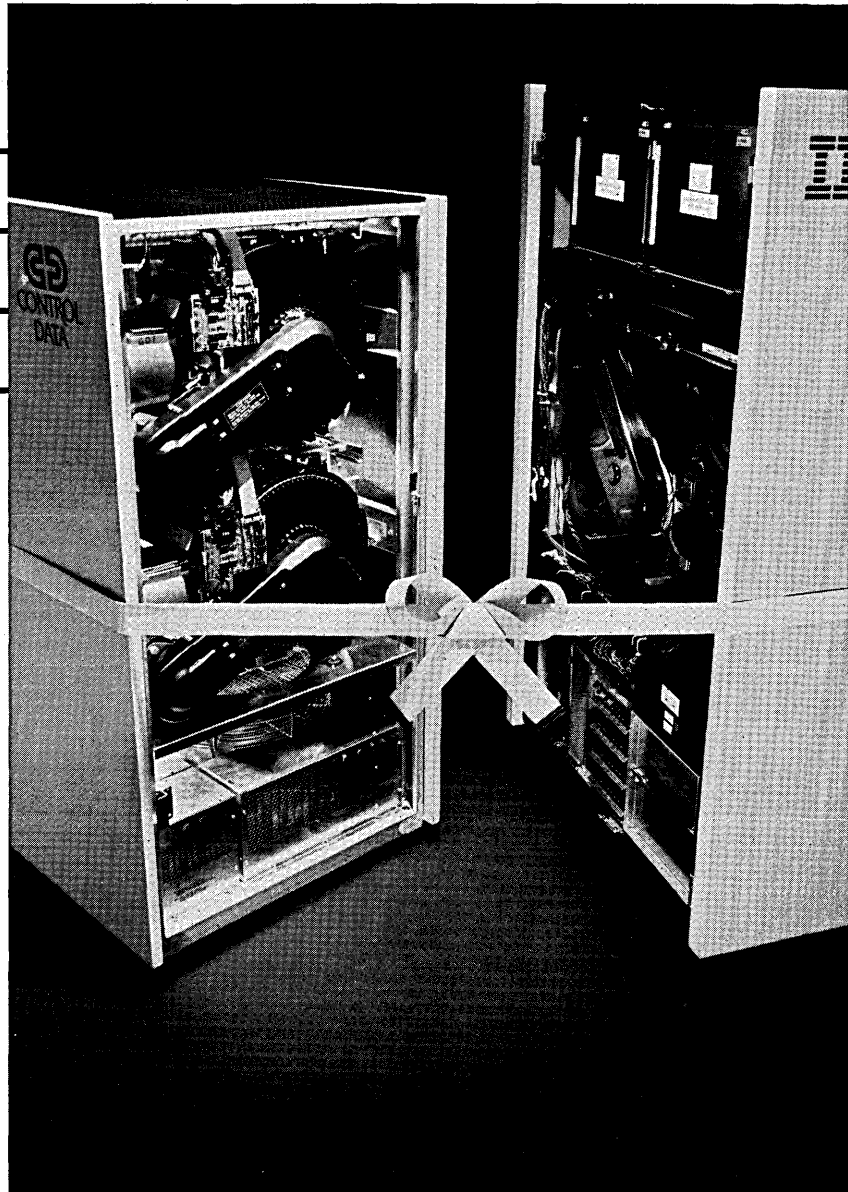
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CIRCLE 123 ON READER CARD

A report on the IEEE's efforts to make programming an engineering discipline.

# SOFTWARE STANDARDS TAKE SHAPE

by A. Frank Ackerman and Fletcher J. Buckley

Software professionals have a tendency to greet the subject of standards with a yawn. To most of us, a standard is a restriction foisted upon us either by the government, as a contractual requirement, or by the special interest committees that define programming languages, information interface standards, and so on. But the most active software engineering standards effort under way today is engaging the energy and enthusiasm of many hundreds of software professionals all over the world. The Institute for Electrical and Electronic Engineers has now published four standards, completed one more, and currently has 12 additional standards under development.

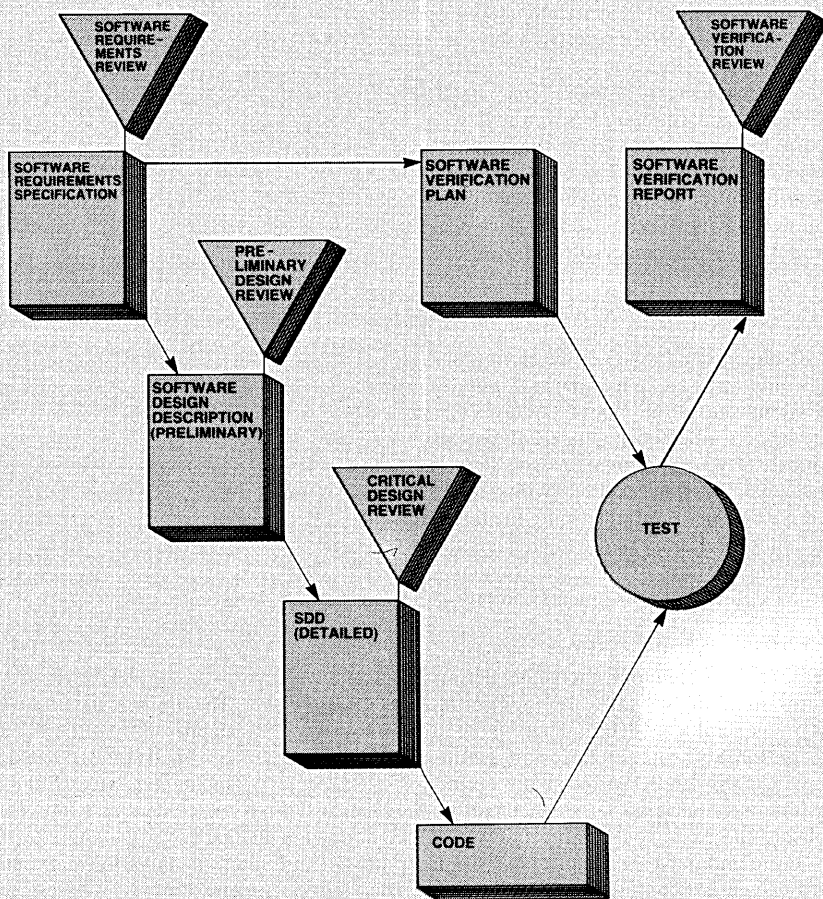
These standards (the term is used here to include recommended practices as well as standards per se) represent an important step in the growth of software engineering as a profession. They are establishing the basic practices and procedures that will guide this fledgling profession in the years to come.

Computer programs control critical-care medical units and the fabrication of drugs, the timing of our automobiles and the flight paths of aircraft, the flow of our wealth and the launch and guidance of our ultimate weapons. Our society has come to depend on the reliability of software. For the past two decades, the responsibility for the design, production, and ultimate reliability of software-based services has been in the hands of people trained in disciplines other than software. In the next two decades, much of this responsibility will be assumed by professional software engineers who will increasingly

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FIG. 1

## DOCUMENTATION AND REVIEW PROCEDURES FOR QUALITY ASSURANCE



perform the tasks of specifying, designing, implementing, testing, managing, and delivering software and software-based services according to recognizable and accepted standards of professional practice.

This is what the energy and excitement behind the IEEE Software Engineering Standards effort is all about. The standards that have been completed, and those under development, are the first firm steps toward establishing norms of professional software engineering practice.

What is more, the process of initiating, defining, reviewing, and voting on these standards is an open one, and anyone in the industry who wishes to participate is welcome to contribute.

The first software engineering standard to be produced and approved was the "IEEE Standard for Software Quality Assurance Plans" (ANSI/IEEE Std 730-1981). Among other things, this standard specifies the minimum documentation that should be produced and the minimum reviews that should be held during the development of critical software—programs which, in failing, would endanger people or cause large financial or social losses. The four development documents required by this standard are a software requirements specification (SRS), a software design description (SDD), a software verification plan (SVP), and a software verification report (SVR).

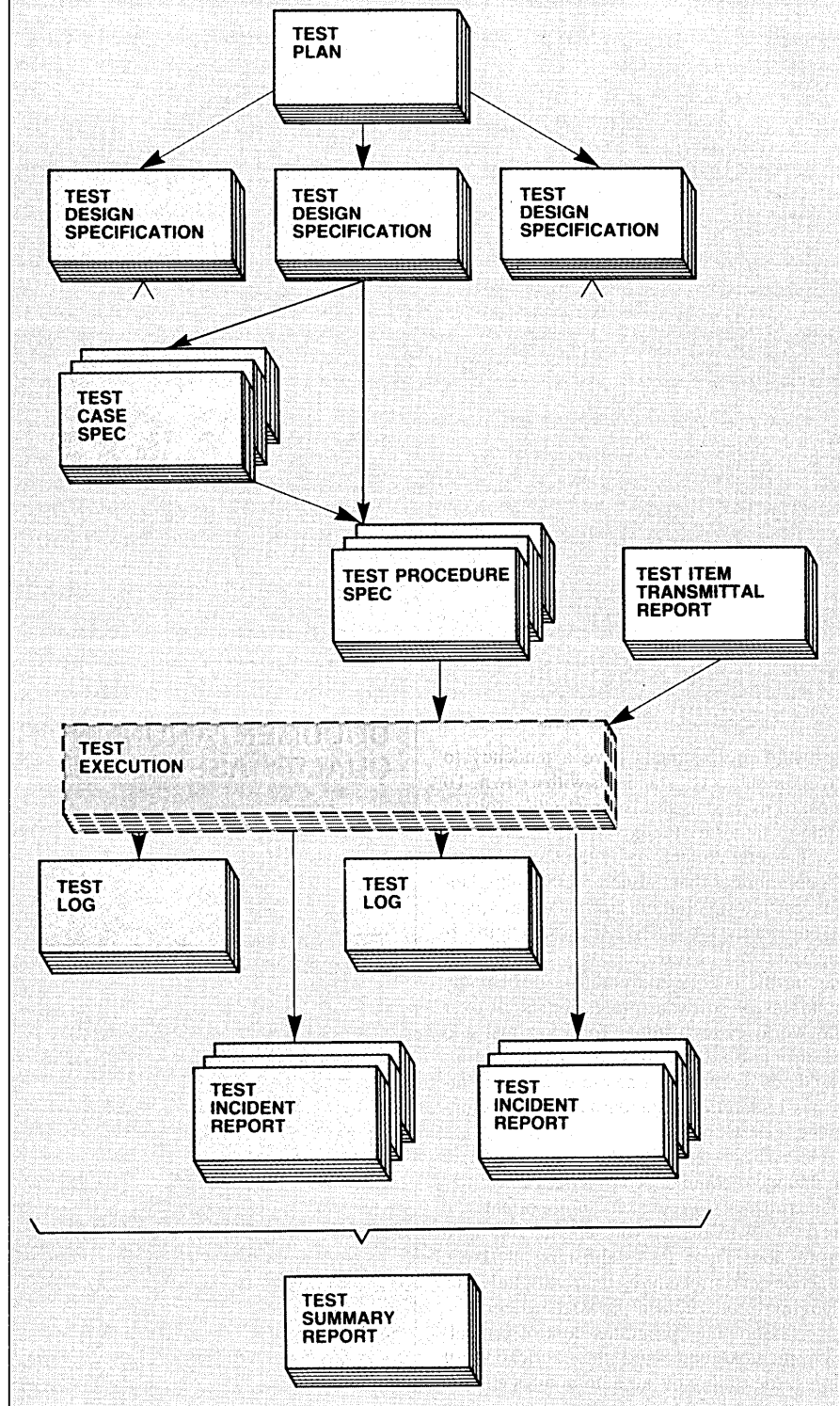
The standard requires seven reviews, four of which are addressed to the required documents (see Fig. 1). These four reviews are a software requirements review (SRR), a preliminary design review (PDR), a critical design review (CDR), and a software verification review (SVR).

Although the quality assurance standard provides only the basic definitions for these documents and reviews (the entire standard is only three and a half pages), it nonetheless delineates a minimum set of tasks that should be performed during the development of critical software to provide reasonable assurance that the final product will operate correctly. By only briefly defining the documents and procedures, this standard sets the stage for the creation of additional standards to further define these documents and procedures.

The second standard to be approved addresses the problem of establishing definitions for most of the software engineering terms in general use. The "IEEE Standard Glossary for Software Engineering Terminology" (IEEE Std 729-1983) contains definitions for more than 500 terms. It therefore establishes the basic vocabulary of software engineering and makes a major contribution toward decreasing confusion and facilitating precise communication.

FIG. 2

## STANDARD TEST DOCUMENTATION PROCEDURES



### DEFINING TESTING DOCUMENTS

The third standard to be approved is the "IEEE Standard for Test Documentation" (IEEE Std 829-1983). It defines the content and format for eight documents that cover the entire testing process from initial planning to final report. The eight documents are:

1. Test Plan

2. Test Design Specification
3. Test Case Specification
4. Test Procedure Specification
5. Test Item Transmittal Report
6. Test Log
7. Test Incident Report
8. Test Summary Report

The relationships of these documents to each other and to the overall testing proc-





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# The message is coming through loud and clear: the software engineering standards effort is widely appreciated.

ess is shown in Fig. 4.

The "IEEE Standard for Software Configuration Management Plans" (IEEE Std 828-1983), the fourth standard to be approved, is similar in format to the quality assurance standard. It gives requirements for configuration identification, control, status accounting and reporting, and configuration audits and reviews.

It was formally approved by the IEEE Standards Board on June 24, 1983.

The fifth standard to be completed is the draft "Guide for Software Requirements Specifications." It is being issued as a guide because the current consensus is that there is not yet any best way to write a software requirements specification.

In addition to the above standards, there are currently active efforts on seven other standards, with four more to be initiated this fall. Some of these efforts are just starting, others are nearing completion. Some provide guidance for implementing standards that have been completed, such as guides for software quality assurance and software configuration management; others are breaking into new areas such as design documentation and software unit testing.

The main motivation behind the creation of these standards is to provide recommendations reflecting the current state of the art in the application of engineering principles to software design. It is assumed that these will continue to evolve, and the standards are meant to serve as starting points for further development. For those who are new to the practice of software engineering, the standards should prove an invaluable source of carefully considered advice. For those who are on the leading edge of the practice, the standards serve as a baseline against which advances can be evaluated.

The first paper to cite the application of an IEEE Software Engineering Standard was published in the *Proceedings of the IEEE Computer Software and Applications Conference* in 1982. This paper, by J. J. Greene, et al, describes how the quality assurance standard was used in a large-scale telecommunication project. A paper by J. A. Kish in the *Proceedings of the Second IEEE Computer Software and Applications Conference* in 1983 describes how the test documentation standard was used to define test documentation requirements for numerically controlled machine tools.

But published references are only the tip of the iceberg; most applications of standards are routine, and the professional doing the work usually does not have the time or support necessary to produce a paper. The real test of these standards is in their practical application in ordinary situations in company after company. We only hear about these rou-

FIG. 3

## CURRENT SOFTWARE ENGINEERING STANDARD PROJECTS

Standard for Software Quality Assurance Plans (Revision) (P730-1)  
Guide for Software Requirements Specifications (P830)  
Standards for Software Reliability Measurement (P982)  
Guide for Software Quality Assurance (P983)  
Guide for the Use of Ada as a Program Design Language (P990)  
Software Engineering Standards Taxonomy (P1002)  
Standard for Computer Program Unit Testing (P1008)  
Guide for Software Design Documentation  
Standard for Software Verification Plans  
Standard for Software Reviews and Audits  
Guide for Software Configuration Management  
Standard Classification for Software Errors, Faults, and Failures  
Guide to Software Engineering Techniques  
Standard for Software Productivity Metrics

tine applications by reading the internal memoranda of our own organizations, by word of mouth, and by exchanges at presentations and seminars. The message that is coming through loud and clear is that the software engineering standards effort is widely appreciated, and the standards are being widely employed.

The sine qua non of an IEEE standard is that it represents a consensus of professional practice. To achieve this result, every effort is made to ensure that the process of creating a standard is an open one. The initiation of a standards effort initially requires only a generally perceived need, a volunteer to lead the effort, and the approval of the IEEE Standards Board.

### GROUP DOES LEGWORK

The legwork of collecting information, writing and rewriting drafts, and patiently building a consensus is performed by a working group. The meetings of a working group are open to anyone who wishes to attend, and are rotated geographically. Working drafts and minutes of the meetings are available to anyone. Participation in the work of the group can also be accomplished by submitting written comments. While the participation of most of the members of a working group is supported in part by their employers, they represent only themselves in the deliberations of the group. The reward is likewise personal: a sense of service and the opportunity to learn from and share experiences with others.

After a draft document is produced by a working group, it undergoes a thorough balloting process, managed by the chairperson of the Software Engineering Standards Subcommittee who organizes and runs the balloting group. With some special exceptions, the members of a balloting group must

be members of the IEEE or its Computer Society. Creating a standard draft and getting it approved takes three to four years.

Given the amount of activity now under way, the software standards effort will have produced 10 standards by 1985, with seven more scheduled for completion by the end of 1986 (see Fig. 3). The expectation is that these standards will ultimately define the norm of the professional practice of software engineering. The open process of discussion and debate that is needed to create and revise them should ensure that they will not be in conflict with standards in related areas produced by other groups.

The IEEE standards should be widely employed because they represent a professional consensus on what should be done to produce the kind of software our society now depends on. \*

Dr. A. Frank Ackerman is a member of the technical staff in the system development technology group at Bell Laboratories, Piscataway, N.J. He is co-chairperson of the IEEE Working Group for a Guide for Software Quality Assurance.

Fletcher J. Buckley is with the Missile and Surface Radar Unit of RCA at Moorestown, N.J., and is chairperson of the Software Engineering Standards Subcommittee of the IEEE Computer Society. Readers who wish to take part in the standards effort can contact him at RCA, MS 101-230, Moorestown, NJ 08057.

Copies of IEEE Software Standards can be bought from IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854, (201) 981-0060.

# PEOPLE

## XEROX, TANG, AND DARPA

Lynn Conway knows about frontiers. The 43-year-old computer scientist spent the last 10 years at the Xerox Palo Alto Research Center in California, working on very large scale integrated (VLSI) chip design and artificial intelligence applications. Her pioneering work with Mead Carver of CalTech on VLSI design assured her a national reputation (DATAMATION, July '83).

Conway now has new territory to probe. This August, she assumed the title of computer research manager for the Defense Department's Defense Advanced Research Projects Agency (DARPA). As head of DARPA's Supercomputing and Survivability project, Conway will direct a national effort to develop computer systems that are both superfast and capable of reasoning like a human and understanding natural languages.

In an exclusive interview before she left California for Arlington, Va., Conway observed that her work with DARPA will build on the skills she developed at Xerox. As at Xerox, she plans to use computer and social networks to build an active community of researchers capable of making rapid progress. The territory has broadened, but the techniques of exploration remain much the same. Through the use of what she terms "strong tools," such as computer networks, Conway wants to "leverage" intellectual and technological advances—much as she did at Xerox.

"DARPA is to the Department of Defense as the Palo Alto Research Center is to Xerox," Conway said. "The charter of DARPA is to explore the farthest frontiers . . . to have a sense of what is possible." That exploration is now touched with urgency, since the Japanese have embarked on their much-publicized fifth generation



LYNN CONWAY: "Wherever people are they can participate. We'll cook up some network activity."

advanced computer project.

Conway shows her excitement about the frontier. "I like to be part of the community of people who go for it," she said. It is a phrase she uses several times in the conversation, sometimes pounding fist into palm for emphasis. She measures her phrases carefully and listens intently, but then is likely to say "That's really cool!" when something impresses her.

"There's a kind of spirit that approaches passion" that arises when researchers are forging ahead in new territory, Conway explains. As DARPA computer research manager she will not spend much time in the lab, although she expects to contribute her technical two cents now and then. Rather, she will be a pollinator, spreading money, advice, and encouragement among the various industry and university researchers working on grants that

she will administer.

DARPA has requested \$50 million for its supercomputer project in 1983-'84, and an additional \$95 million for 1984-'85.

"I'm going to try real hard to make some interesting things happen with that money," Conway said with a noticeable gleam in her eye. According to the DARPA summary description of the supercomputer project, the technologies developed will serve such military purposes as aircraft carrier command and control, photo interpretation, and strategic target planning. For 1984, according to the summary description, several goals will be set, including activating a pilot gallium arsenide fabrication line and developing techniques for integrating various VLSI systems.

"It greatly oversimplifies to say that we're out to produce a machine," Conway points out, however. "Any one machine is only one point in the design space." Conway believes that, in the tradition of Tang and Space Blankets, the research conducted for the government on the defense computer will yield diverse and unexpected commercial developments.

"You'll see a whole array of technologies and knowledge" spin off from the DARPA work, Conway predicts. "If the work is sufficiently successful, it will have all sorts of applications . . . [within 10 years] I imagine that you are going to see a wave of startup companies" as a result of the DARPA-funded research.

Others aren't so sure. Dr. Sidney Fernbach, who chairs an IEEE committee on "superscientific computers," testified before the Congressional Science and Technology Committee in June that "It is highly unlikely that the DARPA program will significantly contribute to advances in scientific supercomputers." Fernbach took particular exception to the artificial intelligence emphasis of the DARPA project. It may be appropriate for defense purposes, he said, "but for the civilian market, we must develop techniques and systems to do our numeric data processing at the ever-increasing pace needed."

But Conway has set her mind on

## PEOPLE

stimulating a "collaborative/competitive" R&D environment, an environment, she feels, that will contribute both to the DARPA project and to other commercial purposes. She speaks enthusiastically of attracting a "critical mass" of researchers in "different compartments of knowledge," such as software, chip design, and natural language capabilities.

Conway's phrase for the upcoming research effort is "an open evolution of knowledge." When researchers are connected, they can observe each other's work, evaluate and imitate the best of it, and thus bring models quickly into general use. The work will be competitive, as different groups of researchers endeavor to get their prototypes accepted as standard, but it will be collaborative as well.

"There are some incredible technical opportunities that can be taken if we go for it," Conway said. With researchers exposed to each other's work, "if they see something that works, they'll use it."

Although some scientists, such as Stanford University professor Edward Feigenbaum, author of *The Fifth Generation*, have called for the establishment of a national research center to work on advanced supercomputers, Conway thinks otherwise. Just as she has not set her eyes on a particu-

lar machine as the sole goal of the DARPA project, she does not envision the Supercomputer and Survivability research being undertaken at one specific location.

"We don't have to form some institute," Conway says. "Wherever people are they can participate." Conway will try to be the thread that ties research groups together. "We'll need to have some workshops and some establishing of interfaces among these groups," she notes, and this can be accomplished through such traditional means as lectures and conferences.

"And then," Conway adds with a touch of anticipation, "we'll cook up some network activity." Computer networks, such as the ARPANet set up by DARPA over 10 years ago, are the sort of "strong tool" that Conway believes makes rapid progress possible.

While Conway is known in the computer community for her work in simplifying VLSI chip design, the tool she used to develop the chip design philosophy may be as important in the long run as the design philosophy itself. The tool is the computer network; Conway did not invent it but she certainly exploited it.

In the 1970s, Conway was attempting to design a new type of facsimile transmitter to transmit photographs from one lo-

cation to another.

"I came up with a very elegant architectural solution," Conway recalls. Unfortunately, the solution would also have been prohibitively expensive because of the number of silicon chips involved.

That set Conway thinking about VLSI chips. She and Carver Mead from the California Institute of Technology began collaborating on simpler ways to design VLSI chips. Much of the collaboration took place while the two were separated by 400 miles but connected over the ARPANet. In 1979, Conway used the ARPANet to teach a course in VLSI design at the Massachusetts Institute of Technology. Students used the ARPANet to transmit their design projects to Xerox PARC, which arranged for the chips to be built. Because of the computer network, students were able to see a finished product much quicker than they would have otherwise, and Mead and Conway were able to get rapid feedback about their design philosophy. The Mead-Conway chip design method, which essentially makes it easier for computer designers and others to build custom chips, is currently taught in about 100 universities.

"There was a very rapid evolution of knowledge," Conway said. "The people were using technical advances to leverage their own work." This kind of intellectual leveraging through tool use has always fascinated Conway. She recalls working at IBM in the early 1960s, when the first copy machines entered the work place. "I was one of the early copy freaks," using the new tool to distribute information so that further advances could be made, she said.

Conway is holding onto her house in Palo Alto even while she is living in the East, and she fully expects someday to return to California to live. She says she is "a fan of the laid back, Palo Alto life style." She enjoys bicycling, sailing, and hiking in parks that dot the hills around the Bay Area. Her work with DARPA may mean a little more hectic life, but she seems to relish that as well. "I wish there were more years in life," she said.

For now, her life revolves around the new territory of advanced supercomputers. Her attitude was summed up well in a lecture given at Caltech, and later published by Xerox. The development of computers and computer networks, Conway wrote, "are reminiscent of the pervasive effects of the telegraph and the railroads as they spread out everywhere during the 19th century, providing an infrastructure people could use to go on adventures, to go exploring, and to send back news of what they had found.

"I think of personal computers and computer communication networks as a similar sort of infrastructure . . . as we explore the modern frontier—the frontier of what we can create."

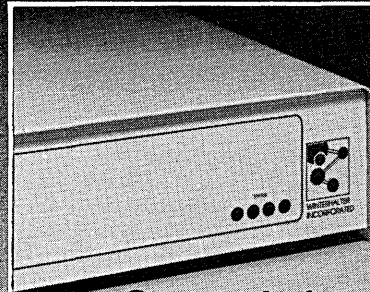
—Michael Doyle



"I don't have the test I scheduled for today. My dog ate it."

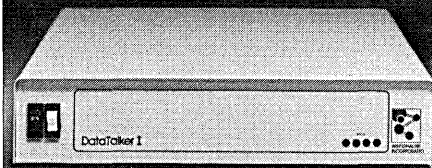
CARTOON BY SIDNEY HARRIS

# Finally, micro-to-mainframe communication that's:



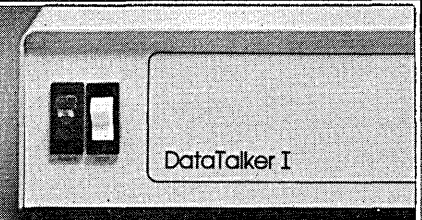
## Complete

With 3270 and 2780/3780 using the full Bisync protocol.



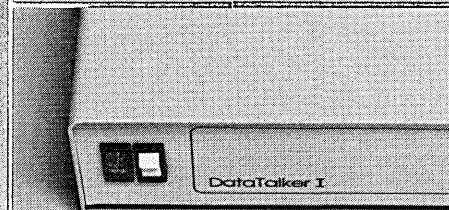
## Programmable

Interface custom applications to the host.



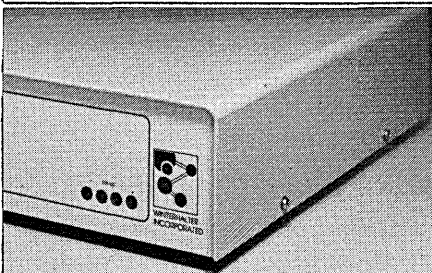
## Configurable

Modify the protocol to your specific needs.



## Upgradable

Works with most microcomputers.



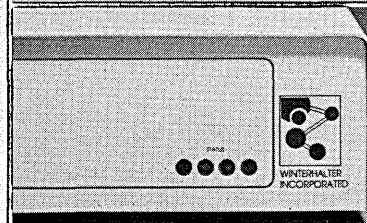
## Hardworking

Relieves all micro overhead and overload.



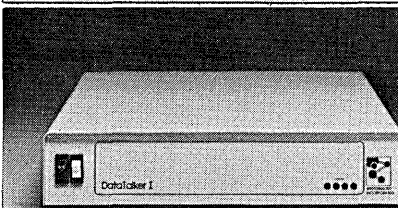
## Experienced

Emulation software proven over 6 years of customer use.



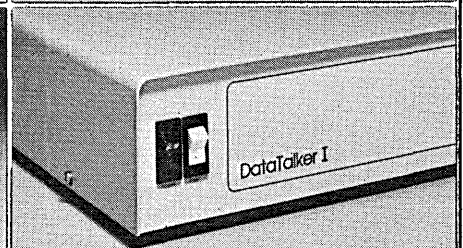
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## Durable

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## Affordable

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Our DataTalker™ intelligent front-end processor allows your micro to emulate most IBM terminal systems. Yet it retails for about half of what you'd pay for conventional protocol conversion, software or hardware.

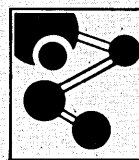
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CIRCLE 126 ON READER CARD

# HARDWARE

## OFF-LINE

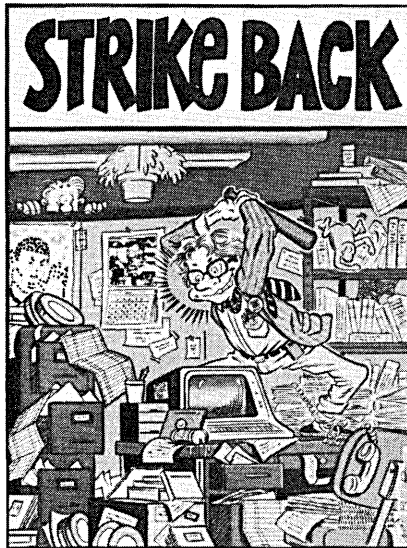
As more installations purchase equipment from multiple vendors the issue of standards becomes pressing. Yet ANSI standards groups can get so embroiled in politics that they lose track of the goal. A recent example is a corrected press release sent by the X3L2 videotex subcommittee. A typical correction was a quote from the chairman, which originally read "We made some major improvements. Now we need comments on those improvements." The revised quote, apparently altered to placate whomever proposed the draft that was subsequently "improved," reads "We made numerous clarifications and a few changes. Now we need comments on these." When these groups stop worrying about hurt feelings and get back to defining standards, we will all be better off.

One vendor who respects the need for standards is Gavilan Computer of Campbell, Calif., which announced its portable computer last April. Its original 66-column display has been modified to an 80-column format to conform with displays from other vendors.

Data General's Desktop Generation micros make quite a splash at their introduction in July, but the Westboro, Mass., vendor held back on some fronts. Company sources say that the Unix operating system may soon find its way to the system's firmware; currently, users need to interface to the Eclipse minis and then run Sphinx, DG's Unix look-alike, remotely. The company expects that most users won't want to run Unix anyway and that most programmers are already on the larger systems. Another "philosophical possibility" is that the vendor may replace the 16-bit microprocessors with 32-bit chips as they are developed, without changing any external characteristics.

## REVENGE

This one is for all frustrated computer users. The Byte Bat is a foam rubber baseball bat that is specifically designed, using the most sophisticated ergonomic techniques,



for smashing against terminals, microcomputers, printers, and any other computer equipment that is not operating the way the user wants it to be. (It may be operating the way its manufacturer intended it to, of course, but that doesn't really matter.)

The idea here, you see, is to give users a harmless way to vent frustrations that build up in the course of a day spent in front of a crt. The 17-inch bat features a number of digital interface modes and is compatible with all computers and operating systems. The Byte Bat can tolerate over 12 million baud (Basic Aggressive Units of Dissatisfaction).

Included in each red, white, and blue Byte Bat box is a complete user's manual, a user button, a multicolor poster showing the device in use, and a warning decal that advises all who approach that "This computer-friendly liveware is protected by Byte Bat." The unit costs \$10. MICROTIE SYSTEMS CORP., Walnut Creek, Calif.

**FOR DATA CIRCLE 301 ON READER CARD**

## DECNET TO IBM

This high-speed data communications link extends DECnet to include IBM mainframes running the MVS operating system. The System 3711 network controller bridges the gap between DECnet users and data residing within the IBM mainframe by allowing the IBM system to participate in any DECnet Phase III network and providing transparent direct data access and file transfer capabilities.

All major IBM dataset organizations are supported. These include VSAM entry, sequenced, relative, and key sequenced datasets, in addition to physical sequential and partitioned datasets. These datasets appear to the DEC user as standard DEC remote Record Management System sequential, relative, and indexed data files.

The System 3711 controller provides remote access to individual reports within IBM data files via standard DEC programming languages, and can complete requests for file transfers either to or from the IBM mainframe that are initiated by the DECnet user using standard DECnet commands. The unit also provides transparent data translation functions that convert IBM binary data formats to their equivalent DEC binary formats. For security protection, the unit supports RACF and ACF2.

The System 3711 interfaces to the IBM computer via a standard IBM System/370 block multiplexor channel. It appears to the DECnet as a standard node. The controller, software, and installation cost \$95,000 in prerelease versions. In January the cost will rise to \$120,000. INTERLINK COMPUTER SCIENCES, Fremont, Calif.

**FOR DATA CIRCLE 302 ON READER CARD**

## WORD PROCESSING

The One Touch word processing system essentially eliminates the need to memorize codes and keystrokes found in some other word processors. The product, which takes the same philosophical approach as the Epson QX-10 by listing wp options as single function keys, allows 32 functions to be accessed by a single keystroke.

The key to the One Touch system is

## HARDWARE

a "command panel" of 32 touch sensitive keys, each of which performs a single word processing function. For instance, the "bold" key can be depressed at the beginning of a section of text that is to be printed in boldface type; when the bold key is depressed again, the typeface is again normal. The keys are divided into six functional groups: setup, type, edit, print, store, and special uses.

The word processing software and the command panel are additions to the 16-bit microcomputer workstations manufactured by Convergent Technologies. The One Touch product uses that vendor's real-time multitasking CTOS operating system. In addition to word processing applications, the One Touch unit can also add columns and rows, merge records into form letters, check spelling with a 76,000 word dictionary, create a personal dictionary, switch to financial planning or electronic mail, change to scientific or foreign character fonts, and check a calendar for scheduling appointments and meetings. The product starts at \$7,800 and can cost up to \$16,000 in a network configuration. M/A-COM ALANTHUS DATA INC., Rockville, Md.

**FOR DATA CIRCLE 303 ON READER CARD**

### PORTABLE NETWORK

Kaypro portable computers can be linked via the Kaynet, a network that is the product of joining several vendors' technologies. The principal component of the network is the Web high-speed network transceiver and interface, developed by Centram Systems. The networking software, OPSnet, is supplied by Aquinas Inc., and supports most CP/M version 2.2 programs without modifications.

The network is a baseband CSMA/CD-CA design which operates at 125Kbps. Standard telephone wire can be used to connect the various computers on the network; any of this vendor's line of portable computers can be hooked into the network. The network uses no dedicated network file or print servers, since each cpu on the network acts as both server and local processor. In that way, any computer can replace any other to maintain the network in the event of a failure of one of the portable computers.

The networking capability, including the add-in card and the software, is available as a \$200 option to Kaypro computers at the time of purchase. A typical four-user system could consist of 20MB of hard-disk storage, six floppy disk drives, and a full software package, all spread over the resources of the network. The largest practical net can include up to about 20 computers, although the vendor says three times that many can be linked together. KAYPRO CORP., Solana Beach, Calif.

**FOR DATA CIRCLE 304 ON READER CARD**

### DISPLAY PROCESSOR

The model 3700 color display processor offers 1,280 × 1,024 pixel resolution on a 60Hz noninterlaced display. The unit—which also provides lesser resolutions at a reduced cost—has a palette of 16.7 million colors, from which 4,096 can be displayed simultaneously. The 3700's hardware architecture allows it to write in blocks of up to 80 simultaneous pixels, resulting in writing speeds as high as 42 million pixels per second. (The processor has a continuous vector write time of 750 nanoseconds per vector.) The block writing feature is designed specifically for applications that re-

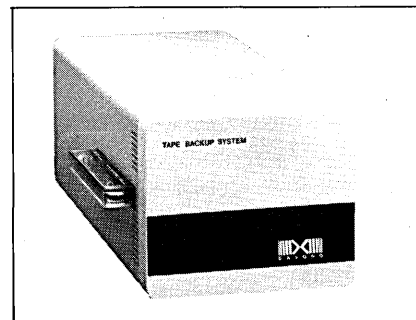
quire the writing of large numbers of pixels, such as area fills.

The 3700 user can implement her own high-speed routines with a writable control store programmability feature. Software designed on previous systems sold by this vendor is also plug compatible through the extended graphics operating system (EGOS 3) firmware. Four models of the processor are available, ranging in price from \$10,000 to \$18,700, excluding monitor. Options include hardware cursor, hardware pan and zoom, data tablet, keyboard, joystick, and trackball. Parallel DMA interfaces are available for most host computers. LEXIDATA CORP., Billerica, Mass.

**FOR DATA CIRCLE 305 ON READER CARD**

### STREAMING TAPE

This standalone streaming tape drive can back up any Winchester disk drive or floppy disk drive that is used in conjunction with the IBM Personal Computer or P.C. XT.



The tape drive copies data to a quarter-inch tape cartridge with a formatted capacity of 18MB.

Software utilities provide for initial checkout, copying from floppy or hard disk to tape, and restoring files from tape to hard disk or floppy. The also compare file dates so that the most current file with the same title is restored, preventing the retrieval of an obsolete file. Files may be restored to a different volume so that they can be found more easily. An index lists names and dates of all backup files.

The system uses a Multi-OS control system that allows backup to be accomplished by volume or by individual file. A 15MB disk can be copied in about four minutes. Four error checking methods (Check sum, Read after write, Group coded recording, and a Verify pass) ensure data integrity. The drives are shipped with all necessary cabling and adapters, software utilities, and documentation. The tape drive requires the use of one expansion slot in the P.C. The streaming tape drive costs \$2,200. DAVONG SYSTEMS, Sunnyvale, Calif.

**FOR DATA CIRCLE 306 ON READER CARD**

### GRAPHICS TERMINAL

The CGT/680 color graphic terminal has an MC68000 processor for business and engineering applications in a standalone mode or as a front end to a CAD/CAM system. In its

## HARDWARE SPOTLIGHT

### PLOTTER

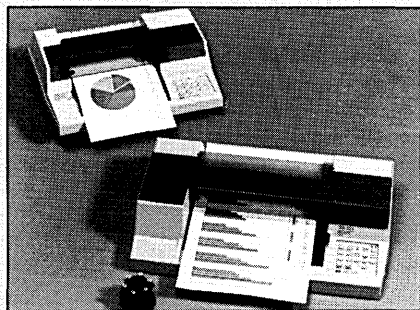
The HP 7475A six-pen graphics plotter is designed for both engineering and business applications. The desktop plotter accepts 11 × 17 inch or 8½ × 11 paper, as well as overhead transparency film. The larger size is included for time lines, PERT charts, schematics, engineering drawing, and other applications that need visual detail and a larger plot size. Lines can be plotted 0.001 inch wide, at speeds up to 15 ips.

Plotting versatility is enhanced with capabilities for area-fill commands. Pens

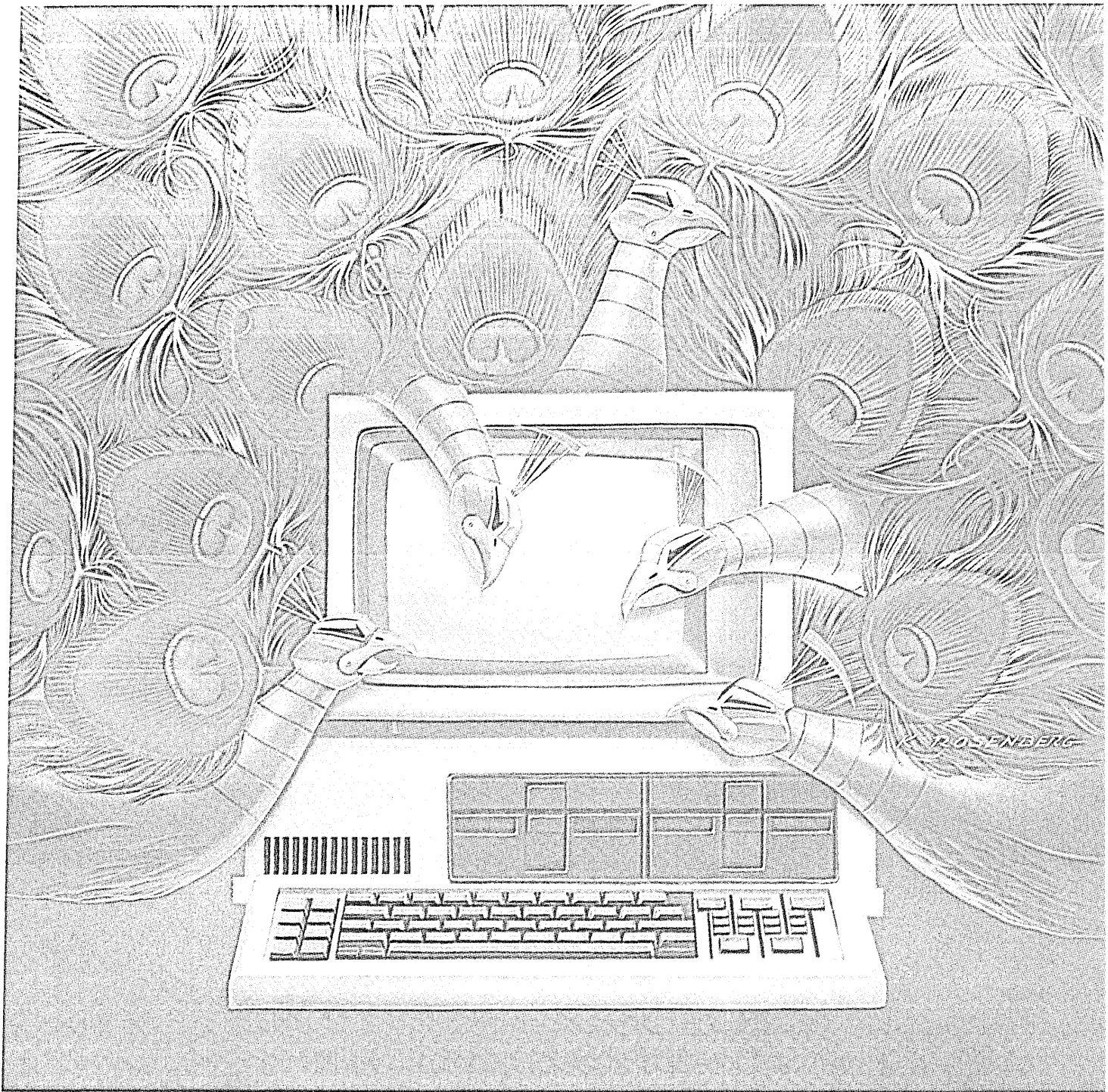
are selected from the six-pen carousel either by front panel controls or from program commands. When returned to the carousel, pens are capped automatically to prevent drying out. A damping mechanism is provided to prevent pen damage, and a pen slowdown control allows plots requiring special care to be drawn at less than the fastest speed available. A view model allows the user to stop the plot at any point and then resume where it left off. Software allows charts to be rotated 90 degrees, so that horizontal charts can be incorporated into a vertical format.

Two interfaces can be specified for the plotter—the HP-IB implementation of the IEEE-488 or a standard RS232C connection. In addition to English, the plotter has nine European character sets and a Japanese Katakana set. An optional eavesdrop cable enables users to operate the HP 7475A in series with a terminal, thereby using only one serial port. The plotter costs \$1,900. HEWLETT-PACKARD, Palo Alto, Calif.

**FOR DATA CIRCLE 300 ON READER CARD**







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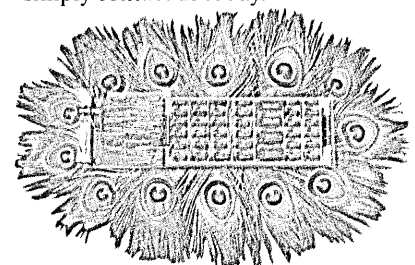
PCOX. The beautiful interface to turn your PC's into fully functioning, intelligent work stations. PCOX are the high-performance PC-to-host system connections. Just drop one into a PC slot, and you're ready to go, without any host system or application software changes.

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# Software News

Vol. 3 No. 7

SERVING SOFTWARE DECISION MAKERS

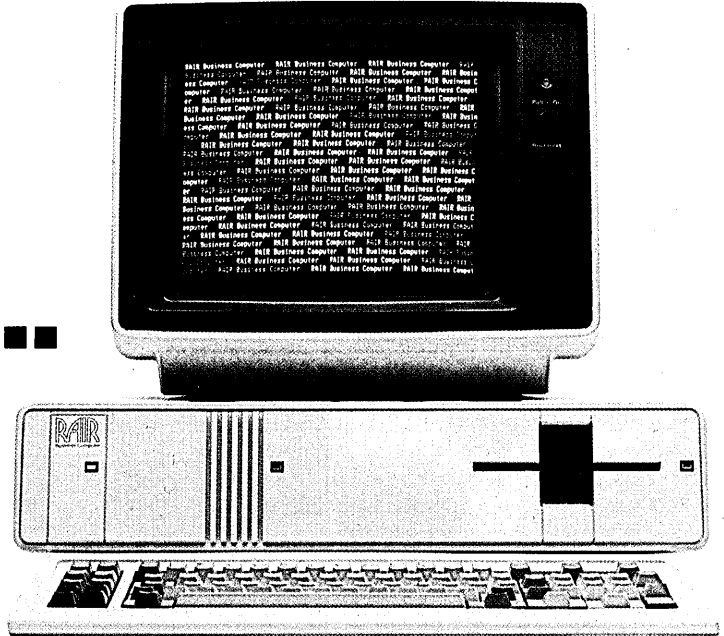
*1 mission*



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# **The RAIR Business Computer...**

**in color.**



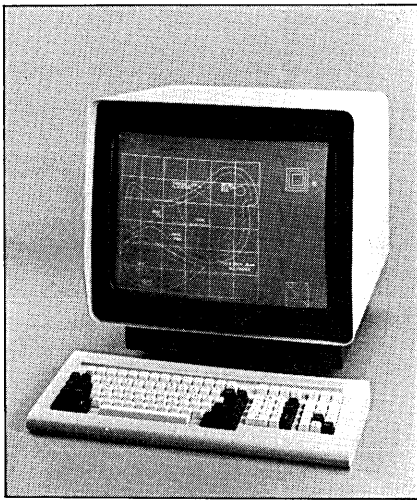
The Rair Business Computer incorporates both 16-bit 8088 and 8-bit 8085 microprocessors, up to 1024K bytes of RAM, 20M bytes of disk storage, and supports up to four workstations running CP/M\*, MP/M\* or MS-DOS\* compatible software. System prices start at \$9750.

\*CP/M and MP/M are trademarks of digital Research, MS-DOS is a trademark of Microsoft.

For further details of the RAIR Business Computer contact Mike Sayer, RAIR Microcomputer Corporation, 4101 Burton Drive, Santa Clara, CA95050, (408) 988-1790.

CIRCLE 128 ON READER CARD

## HARDWARE



graphics mode, the terminal displays up to 16 colors from a palette of 512, with a 640 × 480 resolution. Lookup tables are provided for color changes. Other graphics features include zoom, pan, and blink.

In alphanumeric mode, the CGT/680 displays up to 48 lines of 80 characters on the 19-inch monitor. Double width and double height characters are supported, as are blink, reverse, and underline.

The microprocessor is supplied with 4KB RAM and 16KB EPROM; two optional 4KB RAM or 16KB EPROM memory modules may be added in any combination. The VME four-slot backplane contains two expansion slots for floppy or Winchester disk drive, digitizer, additional memory, or a plotter. Two async/sync I/O ports are capable of supporting SDLC/HDLC.

The monitor comes with a nonglare screen. The low-profile QWERTY keyboard has a numeric keypad, cursor positioning keypad, and 20 function keys. An optional trackball and touch-sensitive screen are available. A software development system, emulation packages for the VT100, ISC 8001, and CalComp 960 display systems are available. The terminal costs \$4,500. GENERAL DIGITAL INDUSTRIES, Huntsville, Ala.

**FOR DATA CIRCLE 307 ON READER CARD**

### 32-BIT MICROPROCESSOR

The Z80,000 microprocessor offers on-chip cache and memory management and can execute up to 5 million instructions per second. The chip has full 32-bit architecture and implementation, a complete 32-bit instruction set, 32-bit internal and external data paths, and full support for all 32-bit data types. The chip is fully compatible with the Z8000 microprocessors.

The Z80,000 has four gigabytes of directly addressable memory, which can be represented in 32-bit linear, 32-bit segmented, or 16-bit compact modes. The cpu is built around a pipelined scheme that allows more than one instruction to be executed at a time, providing the faster performance.

Designed for clock speeds ranging from 10 to 25MHz, the chip can operate as fast as one instruction per processor cycle. Prototype performance tests have yielded an average of 2.2 cycles to execute all instructions, including jumps, multiplies, and divides. The throughput is also enhanced by a 256 byte on-chip cache memory, which holds copies of most recently referenced main memory locations.

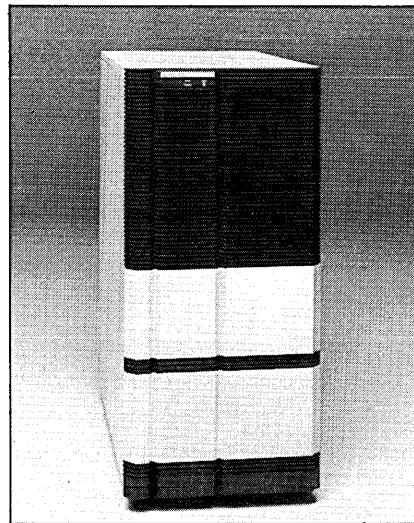
The chip is designed to protect the operating system from user interference by supporting users on one stack and the OS on a separate stack. Moreover, the system design includes privileged instruction traps and memory protection violation traps, which include integer overflow, subrange, and subscript out of bounds. These are designed to catch common run-time errors. Production quantities of the Z80,000 will not be available until a year from now, but samples will be available in the second quarter. ZILOG INC., Campbell, Calif.

**FOR DATA CIRCLE 308 ON READER CARD**

### UNIX SUPERMINI

The Pyramid superminicomputer is designed specifically for use with the Unix operating system; no other operating system is provided or supported. The Unix used here is based on Western Electric's Unix System V with Berkeley enhancements (version 4.1) and some proprietary modifications.

The unit's proprietary 32-bit cpu has a 125 nanosecond cycle time and fits on three boards. The vendor's XTend bus and 4KB cache memory are intended to accelerate system performance to levels comparable to DEC VAX 11/780 machines running Unix under VMS or in native mode. The XTend bus has an open-ended design that will allow future multiprocessor configurations to be added to the system, the vendor says. The bus has a 32Mbps bandwidth and accepts the cpu, one to four memory modules, the system support processor, and multiple I/O processors. The I/O processors allow for interfacing to peripherals, net-



works, and adapters to other buses, such as the Multibus. The I/O processors can support from 30 to 128 users, although the vendor says system performance degradation can be expected once 100 or so users are on the system.

The systems support processor, which is based on the MC68000 microprocessor, performs diagnostic and test functions for the system. It is also the operator console interface and can be used to monitor system operations, configure software, control I/O processors, and report system errors.

The vendor's modifications to the Berkeley Unix include system calls and trap recovery procedures, large memory buffer management, I/O logic offloading, and virtual memory support. An entry configuration of cpu, bus, system support processor, console, 1MB main memory, 16-user support, 9-track magnetic tape backup with controller, 75MB disk drive with controller, line printer controller, Unix C, documentation, power and cabling costs \$99,000. Other configurations range in price to as high as \$300,000. PYRAMID TECHNOLOGY CORP., Palo Alto, Calif.

**FOR DATA CIRCLE 309 ON READER CARD**

### CMOS MICROPROCESSOR

The 80C86 microprocessor offers performance similar to that of Intel's 8086 microprocessor, but uses 90% less power because it incorporates CMOS technology, the vendor says. Development of the chip followed a technology exchange agreement with Intel in 1981, which provided for the interchange of design and test information to ensure full performance and functional and software compatibility between the two microprocessor families. Intel will also manufacture the 80C86 microprocessor and associated CMOS peripheral circuits.

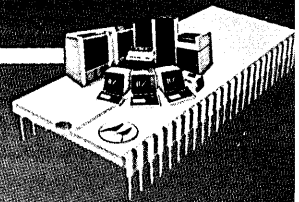
By incorporating the CMOS technology, the microprocessor generates less heat than other types of chips, has a decreased sensitivity to electromagnetic noise, and can operate over a temperature range from -55° to +125°C. The chip is intended for use in portable computers, office automation products, communication systems, industrial control equipment, and biomedical devices such as portable monitors and implantable sensors. Quantities of 100 range from \$31.25 each for 5MHz commercial temperature circuits in plastic packaging to \$266.66 each for 5MHz military temperature circuits in cerdip packaging. HARRIS CORP., Melbourne, Fla.

**FOR DATA CIRCLE 310 ON READER CARD**

### CONTROLLERS

The model 8500 series of 3270-compatible controllers and terminals can support up to 120 devices from a single controller. Each controller can support two CSMA/CD local networks with up to 60 devices each; as many as three additional controllers can be

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If you need more capacity than the System 240, move straight to the sophisticated System 260. It's the bridge between today's requirements

for low cost, and tomorrow's demands for high performance. The System 260 is a 16/32-bit computer based on Motorola's MC68000 microprocessor. It comes with up to eight terminals and features a powerful operating system derived from UNIX™ System III under license from AT&T. You'll enjoy working with the Series 2000, and all the productivity it will bring you. And if your friends don't believe how inexpensive it is to get started in office automation, just tell them who to call. Four-Phase, the leader in office automation technology, service and support for over a decade. And now, part of Motorola, the leader in microprocessor technology. Call 1-800-528-6050, Ext. 1599. Or write us at 10700 North De Anza Blvd., Cupertino, CA 95014. M/S 52-10A7.



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## HARDWARE

added to each LAN to serve individual networks, to link the system to other host computers, or to provide a fault-tolerant system.

Two controllers are available in the 8500 series: the 8500 controller is intended for networks that require computing capability only from the host mainframe, while the 8510 cluster controller is designed for installations that require local personal computing capability in addition to host processing. The 8500 uses a multiprocessor architecture that shares a megabyte of memory among three cpus. The controller can be attached to IBM standard and SNA interfaces for local and remote SNA support. The 8510 PC remote controller distributes personal computing power to eight authorized terminals at a time, with access security controlled by password and authorization matrix protection. The unit allows network elements such as disk drives and printers to be shared among installed terminals, and supports its entire network with common software.

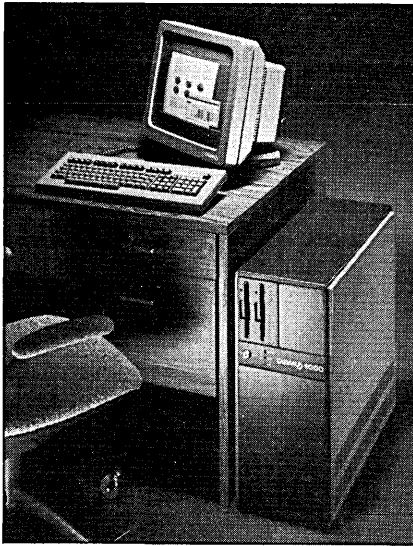
Another part of the 8500 series is the 8520 line of terminals. The 8520 is currently available in two versions, one that is compatible with IBM 3278 models 2 and 5, and the other with 3278 models 2, 3, and 4. A typical system, with one controller and eight terminals, costs \$34,300. BRAEGEN CORP., Milpitas, Calif.

**FOR DATA CIRCLE 311 ON READER CARD**

### SUPERMICRO

The Cadmus 9000 supermicro is capable of handling 1,000 terminals or 64 graphics workstations in a distributed Unix environment using a 50Mbps fiber optic link. The Unison network software is designed to offer transparent access to the total resources of the network to any terminal. The intent is to simulate a single mainframe environment where all of the corporate data are accessible from any workstation tied to the network.

The cpu is based on the MC68000 microprocessor and the DEC Q-Bus. A Mul-



tibus adapter and card cage are also available for users who want to upgrade from Multibus-based systems without losing any hardware accessories. Q-Bus options include a floating point processor and an array processor.

In the distributed Unix environment, remote nodes can be included in the standard Unix system directory structure. Logically, the network functions as an extended multivolume directory structure which includes each network node as a mounted file system in a standard Unix hierarchical tree structure. Through this structure, a Unix command or application program can access any file or employ the standard Unix piping and I/O redirection mechanisms.

From the user's standpoint, the data and peripheral resources of the entire network appear to be resident on the user's node. The Unison network places no limitations on access to the resources of each network node except those already enforced by the Unix system (e.g., the owner/group/public read, write, and execute permissions determined by the owner of each file).

A typical 9730 Unix workstation has a 10MHz 68000 (68010 when available), 512KB main memory, a 65MB Winchester disk drive with SASI controller, a megabyte floppy diskette drive with controller, four RS232C ports, Q-Bus expansion slots, and Unix. Such a system costs \$13,750. The 9790 workstation includes all of the above, as well as a 16MB streaming tape cartridge backup and controller, high resolution graphics controller, additional expansion capability, graphics display, and other accessories. The 9790 costs \$17,900 in single quantities.

The products are modifications of workstations built in West Germany; the vendor is composed largely of engineers from Pixel. CADMUS COMPUTER SYSTEMS, Lowell, Mass.

**FOR DATA CIRCLE 312 ON READER CARD**

### MECHANICAL CAD/CAM

The Comet mechanical CAD/CAM system is based on 32-bit modular architecture that allows users to upgrade from one to 12 workstations without obsoleting equipment or software. The baseline configuration consists of a 32-bit cpu with a megabyte of main memory, 160MB Winchester disk drive, 45MB cartridge tape unit, a Meteor workstation, Geometric Modeling Software (GMS), and the Agile programming language.

The Meteor workstation includes a 1,024 x 768 pixel, 60Hz noninterlaced 16-color display, and an antialias filter. Standard features include local pan, zoom, and entity pick functions, as well as entity dragging for symbol placement and entity translation functions.

The GMS package for two- and three-dimensional mechanical design in-

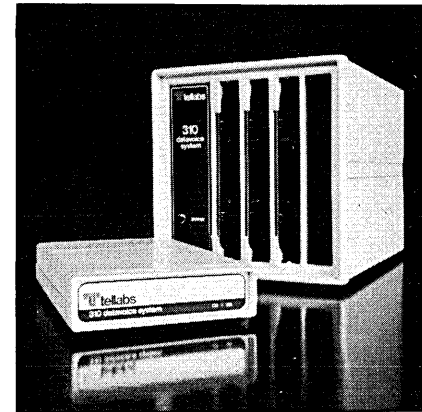
cludes drafting, extended geometry, and symbolic applications. Software options include numerical control, flow and cooling capability, solids modeling, a relational database manager, programmable controller documentation, and finite element modeling.

Hardware options include a line printer, plotter, 256-color shading at the workstation display, additional memory, additional storage devices, additional workstations, and voice input devices. The base configuration costs \$95,000. GRAPHICS TECHNOLOGY CORP., (Graftek), Albuquerque, N.M.

**FOR DATA CIRCLE 313 ON READER CARD**

### LAN

The 310 Datavoice System is a data-over-voice local area network that uses the existing PBX housewire network to connect asyn-



chronous data terminals to the central data equipment. Using a single voice pair at each terminal, the 310 system offers a speed- and protocol-transparent interface that supports full-duplex voice and data communications at up to 9,600 bps.

The 310 system is compatible with any PBX that uses analog voice pairs and has a range of up to 5,000 feet on standard 26AWG housewire. Normal PBX functions are unchanged. The 310 remains operational if the PBX fails and vice versa, because only the wiring is shared. The system can be rearranged and expanded, and moved to another location if desired. Digital loop-back circuitry is included to simplify network testing.

The network can only be used with asynchronous equipment, because no control signals can be transmitted; it is strictly intended for sending and receiving data. Each connection costs about \$450 to \$500, which includes a black box terminal interface. TELLABS INC., Lisle, Ill.

**FOR DATA CIRCLE 314 ON READER CARD**

### LAYERED PROCESSING

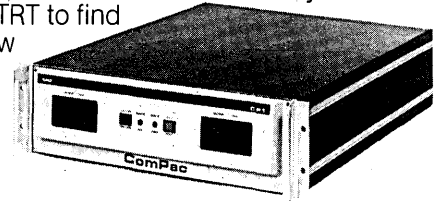
The Dialogic One system is designed to improve the efficiency of interactive processing in large IBM mainframe environments by adding a processing layer between the mainframe and the users' terminals. The

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CIRCLE 130 ON READER CARD

## HARDWARE

mainframe continues to perform batch processing and database management, while this vendor's satellite computer performs the interactive processing. The Dialogic 10, as the satellite cpu is called, appears to the mainframe as another controller unit and is transparent to the user. In this way, the mainframe runs the batch procedures for which it was originally designed, and the satellite processor runs the interactive processing applications for which it has been optimized.

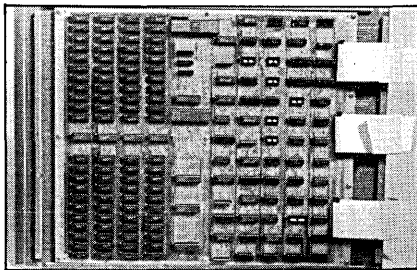
The satellite computer hardware architecture is based on multiple microprocessors working in parallel. These are connected through a wideband communications channel, sharing access to a hard disk drive system.

The Dialogic One system, in addition to the Dialogic 10 cpu, includes software for the MVS environment that replaces TSO and allows the mainframe to accept the satellite processor. Software also includes an operating system for the satellite processor and application packages that are targeted for application developers and systems programmers, as well as a command language for developing customer-written applications. System prices, including the Dialogic 10 cpu and all software, range from \$200,000 to \$385,000, depending on the configuration. Software can be paid for monthly instead of as part of the initial purchase price, depending on user needs. **DIALOGIC SYSTEMS CORP.**, Sunnyvale, Calif.

**FOR DATA CIRCLE 315 ON READER CARD**

### MINICOMPUTER SYSTEMS

The Classic II/15 single board real-time minicomputer system, the smallest member of the Classic II family of computers, comes with 512KB of main memory, an I/O processor, a floating point unit, and a console interface. The MAX IV operating sys-



tem is included in the \$8,500 to \$12,000 purchase price. The unit can be purchased as a board or in a rack-mounted configuration with a four-slot chassis and power supplies.

The Modacs V intelligent process I/O system is designed for use as both a stand-alone system interface or as a satellite in distributed industrial applications. The basic assembly accommodates 16 process I/O option cards and an integral cpu, as well as optional controllers and up to 48 additional I/O cards. The MAX IV operating system is included in the \$14,500 price.

The Modacs II supervisory data acquisition and control subsystem is a full-function process interface for the Classic II systems. The basic Modacs II assembly accommodates 16 process I/O option cards, and may be configured for single drop or multidrop networks. Prices start at \$6,200.

Finally, the 4185-X disk subsystems offer users up to 40MB of storage in a series of Winchester drives. Users can select Winchester or floppy media; prices range from \$8,300 to \$12,300, depending on configuration. **MODULAR COMPUTER SYSTEMS INC.**, Fort Lauderdale, Fla.

**FOR DATA CIRCLE 316 ON READER CARD**

### TERMINAL

The Mega II multifunction 3270/ASCII terminal adds an EEPROM to the vendor's existing 3270-A/B "Generic Terminal" product line. The idea is to reduce the risk of terminal obsolescence by using the EEPROM to update or completely change the terminal's communication protocol with a single keystroke.

The terminal provides separate communications ports for ASCII and bisync communications, so that the terminal may be connected to more than one system at a time, eliminating any need to have multiple CRTs on a desk. Options on the terminal include a 64KB CPM processor that supports a variety of off-the-shelf software packages for local processing, and compatibility with some local printers.

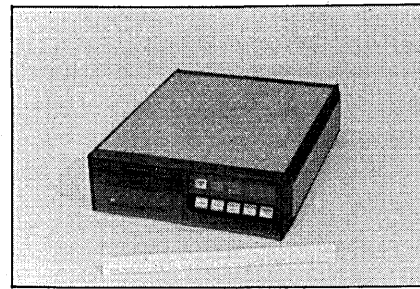
A component level diagnostic system is automatically activated on operation power-up. In the event of a chip failure, the system describes the problem and identifies the individual component that failed. The terminal is plug compatible with IBM's 3274 and 3276 controllers as a replacement for 3278 terminals. All other IBM equipment is also compatible. Communications protocols that are supported include IBM 3101-20, 3275-2, 3276-2; ADDS Regent 25; DEC VT100, VT52; Lear Siegler-3A; and Hazeltine (Esprit) 1420. The terminal costs \$2,500 or \$5,000 with the optional CPM processor. **TERM-TRONICS INC.**, San Diego, Calif.

**FOR DATA CIRCLE 317 ON READER CARD**

### TRANSPORTABLE COMPUTER

The 11/M12 is a transportable computer based on the LSI-11 microprocessor and the Q-bus. The unit, which is not a complete system in that a separate terminal or teleprinter is required, incorporates an LSI-11/23 with memory management, 256KB RAM, 10MB Winchester disk, 512KB floppy disk drive, and four serial RS232C ports. The unit includes a spare expansion card slot, and runs standard DEC software for the RT-11, TSX-Plus, or RSX-11M environments.

Although its primary intended use is as a host for a portable terminal, the unit can also be connected to a modem and be used as an intelligent workstation with dial-up



connection to a database or a remote host. Users can add graphics controllers, more storage capabilities, or other peripheral accessories. The 11/M12 does not come with a handle; it is only transportable if you're willing to put it in a box and then lift the hefty 13 x 15 x 4 inch unit. It costs \$8,400, with OEM discounts available. **ANDROMEDA SYSTEMS INC.**, Canoga Park, Calif.

**FOR DATA CIRCLE 318 ON READER CARD**

### MICRO CARD READER

The CR-510 card reader reads data from punched or marked cards and transfers them to the vendor's TRS-80 microcomputer for use with appropriate applications programs. The unit operates on a photoelectric cell principle using reflective light to read from cards measuring at least six inches long. Once the cards are read, data are sent to the CPU via serial I/O ports, where they can be compiled according to the application program. Typical uses include surveys and educational records, where punched or marked cards still are common.

The unit can only be used with a TRS-80 disk-based computer with an RS232C port. It reads cards in single feed, demand feed, or continuous feed modes. The CR-510 can read up to 150 cards per minute and can be controlled either manually or through the software. The unit costs \$1,600 at the vendor's retail outlets. Cards are available in packages of 200 for \$5. Special driver software, which is required to operate the CR-510 with TRS-80 computers, is provided at no cost. **TANDY CORP./RADIO SHACK**, Fort Worth, Texas.

**FOR DATA CIRCLE 319 ON READER CARD**

### DATA COMPRESSION

The Scotsman III data compressor is designed to double the capacity of existing phone lines and allow communications links to operate at twice their normal speed, by offering a two-to-one compression ratio. The unit's microprocessors use several encoding/decoding techniques to compress data, text, numerics, graphics, and facsimile data. Blocks of data are examined and abbreviated, permitting the same amount of information to be translated using half the number of bits. At the other end of the link, additional algorithms expand and reconstruct the data stream.

The unit is available with an optional built-in four-channel multiplexor, which



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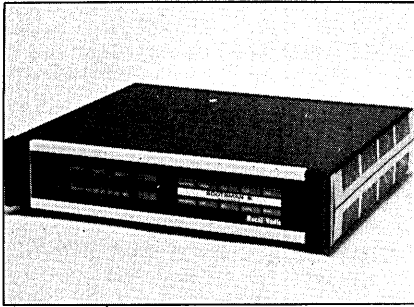
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## HARDWARE



allows four 9,600 baud bisync or two full-duplex 9,600 baud async lines to be compressed and transmitted over a single 9,600 baud line. The unit is compatible with async, bisync, X.25, SDLC and HDLC protocols. The units provide end to end transparency and are fully compatible with the RS232C and V.24 interfaces. The data compressors can also be switched out of the link, allowing a direct connection between the terminal and the modem.

The unit employs CRC to detect errors between data compression units. A self-test mode allows the Scotsman III to run through a battery of 15 built-in diagnostics to test the microprocessors, RAMS, ROMS, and other circuitry. Local and remote channel and aggregate loopback is also provided. Each unit costs \$5,000. RACAL-VADIC, Sunnyvale, Calif.

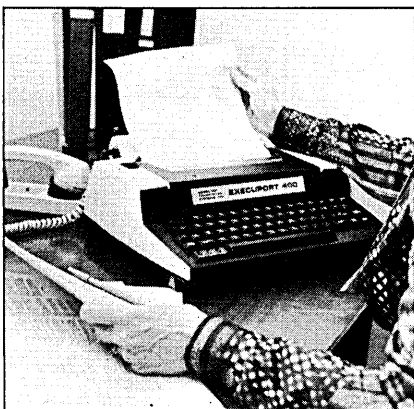
**FOR DATA CIRCLE 320 ON READER CARD**

### TELEPRINTER

The Execuport 443 plain paper impact printing terminal comes with 16KB of memory designed primarily for word processing applications and electronic mail. Several text editing functions are included in the machine to facilitate preparation of documents for mailing. The ASCII terminal is compatible with Telex and TWX networks and has a battery backup option for non-volatile data storage.

The terminal prints up to 80 cps at 15 cpi, or 30cps at 10 cpi. Communication speeds are selectable, from 110 to 1,200 baud. To avoid data loss at more than 450 bps, a choice of data pacing is provided, using break, xon/xoff, or discrete signal (SRTS/CTS) on the RS232 connector.

The text editing capabilities are de-



signed to permit data manipulation in memory locally. Reprogrammable keys allow for easy insertion of recurring phrases while building files. These keys can also be used as a way of holding data aside for later transmission while the main memory is used for another job. Files stored under these program keys can be read by a remote device and manipulated by that device. The terminal comes with 13 of the keys.

Each \$1,800 terminal comes with a built-in dialer, auto-answer capability, and a 300 baud modem. COMPUTER TRANSCIVER SYSTEMS INC., Paramus, NJ.

**FOR DATA CIRCLE 321 ON READER CARD**

### ARCHITECTURAL DESIGN

The CAD-Master 400 computer aided design/drafting system uses proprietary software and a microcomputer to permit architects, draftsmen, engineers, and designers to sit at a keyboard and create complex, multicolor drawings. The unit makes corrections, additions, and deletions to a finished drawing through keyboard entry rather than through mice or tablets or digitizers.

The system does not require that drawings be digitized before they can be reproduced, as conventional architectural CAD systems often do. The user types instructions to draw lines, in feet and inches, at any angle; circles or arcs in any degree or size; and other images, including furniture, cars, landscapes, electrical fixtures and components, doorways, and heating ducts. Each of these images can be called up through the keyboard and retained for later applications.

The system permits modifications, annotation, and repositioning instantaneously, through one or two keystrokes. A zoom capability is supported for detailed work. Routines in the system's software also allow the designer to rotate or move objects in the drawing.

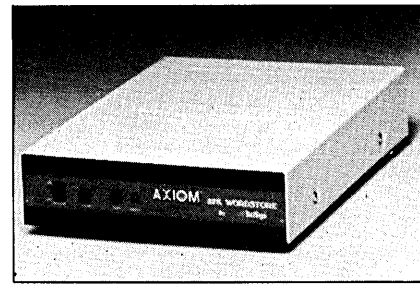
The product integrates an IBM XT with 384KB RAM with the vendor's model 3200 plotter, an IBM color monitor, a 10MB Winchester disk drive, a 5¼-inch floppy disk drive, a joystick, and proprietary software. The fully configured system costs \$27,000. DATA DESIGN LOGIC SYSTEMS INC., Santa Clara, Calif.

**FOR DATA CIRCLE 322 ON READER CARD**

### BUFFER

Wordstore is a 32KB printer buffer that is designed to work with most microcomputers and printers. The unit is specifically aimed at users who do not own multi-user or multitasking operating systems or cpus, since those are the users who are forced to tie up their cpus transferring data at the printer's data rate—typically less than 200 bps.

In addition to providing sufficient buffer space for about 20 typewritten pages of text, Wordstore also has a data compaction capability that can compress repeated



characters, such as redundant words, underlines, and spaces, so that they require less memory space. The compression technique can provide up to 20-to-1 compaction ratios on some types of graphics.

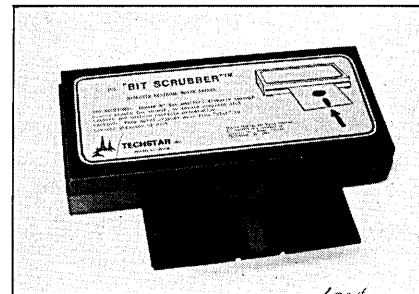
A copy mode allows a user to print multiple letters or documents while using only the memory needed to store a single message. The capability is accomplished by setting the beginning of a file, the end of the file, and the number of copies needed. All copies must be identical, however.

The printer buffer requires a parallel interface both for input from the cpu and for output to the printer. The buffer can be upgraded to 64KB if needed. The 32KB Wordstore costs \$200. AXIOM CORP., San Fernando, Calif.

**FOR DATA CIRCLE 323 ON READER CARD**

### DISK CLEANING

The Bit Scrubber is a diskette residual noise eraser that can clean 8-inch, 5¼-inch, or smaller diskettes by ensuring uniform ori-



entation of magnetic particles on the disk. The high-energy magnetic circuit, which has monolithic flux density, is designed to allow error-free retrieve/store, read/write data operation. A shielded magnetic circuit is provided to protect programmed disks from being accidentally erased. The unit can be used with single or double density, single or double sided diskettes, or any other commercially available diskette format. The five-pound unit costs \$50 and is packaged as a desktop unit. TECHSTAR, Miami, Fla.

**FOR DATA CIRCLE 324 ON READER CARD**

### SWITCHES

The 580 series of automatic preprogrammable cpu/channel switches is designed for use with IBM and plug-compatible mainframes and peripherals. The units provide electronically redriven channel signals for device placement with up to 200 feet of additional



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CIRCLE 132 ON READER CARD

## HARDWARE

cable. External connections and circuit board interconnections are gold-on-gold to ensure contact life, and TTL circuitry is used throughout for durability. All switches include a built-in backup power supply, which automatically assumes control of the switch in the event of failure by the primary unit.

The unit allows up to 10 strings of peripheral devices to be switched between cpus and channels. Panel displays are graphic and are designed to aid users in determining system interconnect relationships and making changes where necessary. Each peripheral or string supported by the switch requires two identical cards; all printed circuit boards are completely interchangeable. The switches support all devices eligible for IBM channel attachment. The switches start at \$8,000. **DIVERSIFIED DATA RESOURCES**, San Rafael, Calif.

**FOR DATA CIRCLE 325 ON READER CARD**

### PARALLEL MULTIPLIER

The SY66016 high speed  $16 \times 16$  parallel multiplier is based on NMOS technology, so that it operates at conventional bipolar speeds while consuming less power than bipolar devices. The unit is a functional replacement for the TRW MPY-16HJ bipolar multiplier on a pin-for-pin level.

The device consumes 1.5 watts of power and operates at 90 nanoseconds time multiply-clocked maximum. Two slower speeds are also offered: a 150ns and a 200ns version. The multiplier is designed for use in personal computers and other low-end products, although it can withstand military temperature tolerances.

The 90ns version costs \$147, the 150ns version \$120, the 200ns version \$75, and a military version \$292, in quantities of 100. **SYNERTEK INC.**, Santa Clara, Calif.

**FOR DATA CIRCLE 326 ON READER CARD**

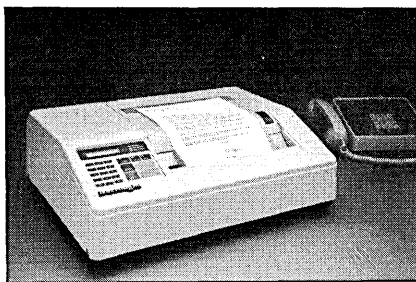
### MINI

The Orion 730 minicomputer system is based on the DEC VAX-11/730 cpu with a megabyte of memory. The system has 134.8MB of formatted storage provided by a fixed disk drive that emulates dual RM02s. Mounting space is available for an additional drive. The system also comes with an autoloading CacheTape 125 tape drive, which provides 92MB of backup storage and emulates a TS-11. The system also includes the freestanding LA120 DECwriter II printing terminal. A VAX/VMS license is included in the system price of \$45,000 in oem quantities. **FIRST COMPUTER CORP.**, Westmont, Ill.

**FOR DATA CIRCLE 327 ON READER CARD**

### DESKTOP FAX

The dex 3200 digital desktop facsimile unit is compatible with CCITT Groups 3, 2, and 1 (Domestic FM). An automatic document feed advances up to 30 documents into the scanner, where oversized originals are



automatically reduced to standard page size. The technology includes thermal printing and 20-second-per-page transmission speeds.

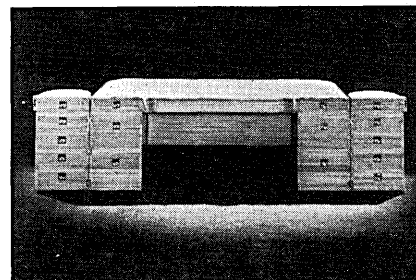
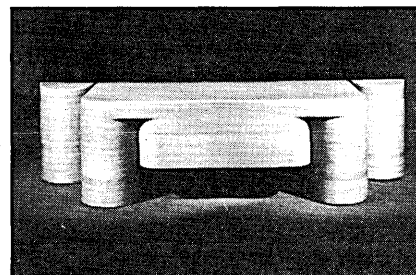
The Activity Reporting subsystem produces fully detailed send/receive journals, which record all transmission data with transmit terminal identification. This identification heads each received document with the sender's name, and the date and time received. The unit's RS232C port is intended to allow the unit to operate as a remote printer. There is a 24-hour clock display and a copy mode for convenience copying.

The dex 3200 interfaces with the vendor's dex Controller, a new autodialer. The unit stores up to 50 telephone numbers (each with up to 32 digits) for automatic sending and polling at any time of day. The dex Controller has an LCD prompter to guide the operator through the programming steps. **BURROUGHS CORP. OFFICE SYSTEMS GROUP**, Danbury, Conn.

**FOR DATA CIRCLE 328 ON READER CARD**

### DESK

Tuck this one in your James Bond file of fancy equipment. This desk is designed to hide any kind of microcomputer or terminal when not in use, so that intruders will never realize that one exists. The equipment is stored in a special compartment under the desktop, and can be elevated to a usable position with the activation of a switch near the user's chair. When the equipment is



stowed, the user has a full desktop available, without the clutter of equipment and cables.

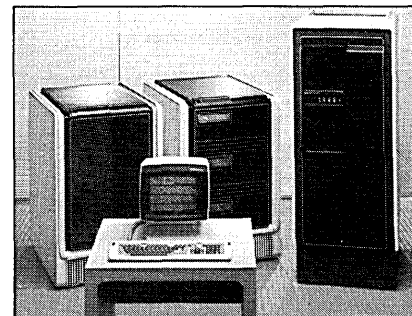
Each of these Crawford Executive Desks is custom-made so that any specified brand of computer equipment can be used with it. The computer equipment is centered in the front of the desk; on either side are curved sections that, when closed, appear to contain nothing. They can be swiveled open to reveal 16 hidden drawers of different sizes. Both the computer storage area and the side drawer sections can be locked by the user when he is not at the desk.

The desk is constructed of hundreds of laminated strips of Finland birch, which is given a final hand-sanding to produce a smooth finish and a more visible grain. The desk's base price is \$19,000, but with a computer and other options built in the price can climb as high as \$25,000. **CROU-TIER COLLECTION OF SCULPTURED FURNITURE**, Forest Knolls, Calif.

**FOR DATA CIRCLE 329 ON READER CARD**

### MINICOMPUTER

The Eclipse MV/8000 II is, as its name suggests, a sequel to the MV/8000; the same cpu and memory boards are used in both, although the MV/8000 II includes up to 8MB



of main memory and an optional floating point processor. The new unit can run 1,260 single precision whetstone instructions per second. The MV/8000 II eclipses both the MV/8000 and the lower-end MV/6000, since its base price is \$132,000, similar to the less powerful MV/6000. The system runs the same AOS/VS and AOS/RT32 operating systems and CEO office automation packages, and can be used with any of the firm's peripherals.

One such peripheral is the new 6236/7 Winchester disk storage subsystem, which comes in two varieties. The 6236 offers a 354MB capacity with an average seek time of about 20ms and data transfer rate of 1.68MB per second. The 6237 version offers 1.06 gigabytes of storage in a separate cabinet. The package includes three 6236 drives and an intelligent controller. The 6236 disk drive costs \$25,000, while the 6237 subsystem costs \$65,000. **DATA GENERAL CORP.**, Westboro, Mass.

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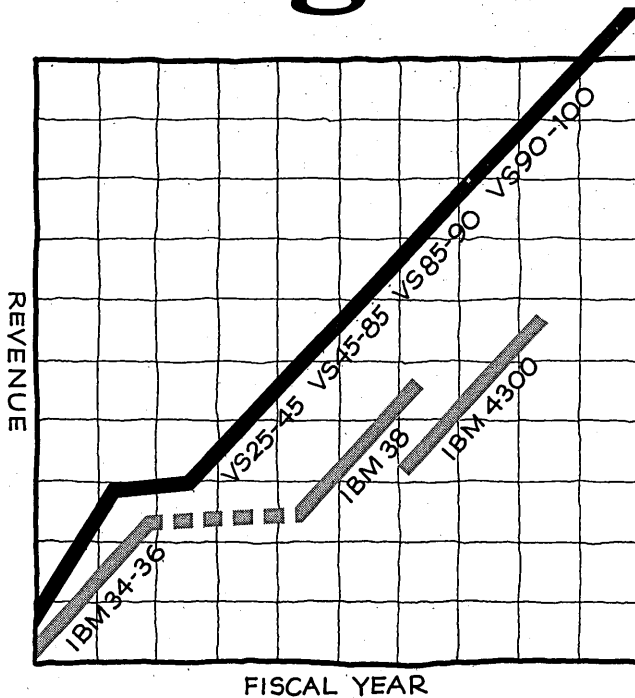
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# SOFTWARE AND SERVICES

## UPDATES

Lotus Development Corp.'s 1-2-3 integrated software package for the IBM P.C., which has captured the fancy of many users despite its lack of any word processing capability and its complicated graphics interface, can be used to access the economic database services of Wharton Econometric Forecasting Associates of Philadelphia. Lotus's drive to tie 1-2-3 to other services is one reason 1-2-3 is outdistancing competition such as Context Management Systems' MBA. Lotus reaped the fruit of the drive by going public recently at \$15 per share.

Linkdata, of Union, N.J., will announce an operating system later this month that will let IBM micros run DEC DIBOL business applications. Alas, it is not the widely installed IBM Personal Computer that can access the DEC software, but the IBM Instruments 9000 micro, which is based on the MC68000 chip. The 9000 had been seen as IBM's planned upgrade to the original P.C., but when the P.C. XT was announced, the future of the 9000 in commercial applications became more cloudy.

The Minitab Project, whose statistical software for DEC mainframes and minis has been on the market for a decade, has had something of a face-lift. The vendor recently won its independence from Penn State University, where it was formed as a research project. The University Park, Pa., company is now called Minitab Inc.

Control Data's PLATO library of 10,000 hours of computer-based education courses, games, and electronic communication services can now be accessed by the IBM P.C. through the \$50 PLATO Microlink package available from the Minneapolis vendor. Users will also have to pay normal PLATO usage charges to use the library.

## VAX SPREADSHEET

Graphic Outlook is a combination electronic spreadsheet and graphics package for the VAX/VMS operating environment. The package can be purchased with interfaces to other popular graphics programs, such as Disspla, DI-3000, DPict/B, SAS/Graph, and Plot-10.

Graphic Outlook users are able to prepare black and white or color plots of data from spreadsheets. Vertical or horizontal bar graphs, pie charts, line plots, scatter plots, and three-dimensional graphs can be produced on most graphics terminals and hardcopy devices using the software.

Spreadsheets up to 500 columns and 999 rows can be accommodated by the program. Three-dimensional spreadsheets are supported, as are spreadsheet consolidation and encryption, journaling, and iteration to a goal. Tutorials and on-line help are provided.

Special input and output files allow the program to interface with other application programs and database management systems as well as to other graphics programs. Cell labels, user-defined functions, and command files are all part of the spreadsheet package. The graphics and spreadsheet combination costs \$6,950. Sites with a different graphics software package can purchase the spreadsheet and interface to that package for \$4,500. STONE MOUNTAIN COMPUTING, Santa Barbara, Calif.

**FOR DATA CIRCLE 331 ON READER CARD**

## RESTORE SYSTEMS

The BRS-VM backup restore system manages the backup and restoration of CMS files for the VM computing environment. BRS-VM allows for personnel productivity improvements through the on-line restoration of lost or damaged data files, while also providing for improved operating efficiencies of backup processing. The on-line access to saved data files reduces the amount of time spent by end users and support personnel in retrieving data. The product employs an installation-based approach to the backup process that offers security and management control. The product is also designed

to reduce the requirements for computer resources in backup by optimizing tape storage use.

The archive restore system ARS-VM manages the archiving of CMS files in VM environments. ARS-VM allows an installation to implement an archival process for VM on a system-wide basis. User participation is an option but not a requirement, the vendor says. A simulation and active mode of operation, over the entire system, enables ARS-VM to reclaim a third of used CMS space with a 120-day archive period, the vendor says. Restoration of archive files may be initiated on-line by end users at any time, without requiring the assistance of the MIS staff.

The BRS-VM package costs \$8,000, with a free 30-day trial. ARS-VM costs \$8,000 with a free simulation run included. If purchased together, the cost is \$12,000. CALVIEW MANAGEMENT, Danville, Calif.

**FOR DATA CIRCLE 332 ON READER CARD**

## PROJECT MANAGEMENT

The PMS II critical path project management system is a full scale project management system designed to operate on almost all CP/M-based micros. The product can handle up to 1,250 activities in a single project using a 64KB microcomputer; with super- and sub-networking features, the vendor says, the project size can be much larger.

The project generates six different kinds of management reports: activity reports, Gantt/bar charts, activity-on-arrow diagrams, net change reports, funding schedules, and earned value analyses. The package employs the Critical Path Method for project management and has been tested in several major U.S. corporations. It comes with a 100-page step-by-step user manual for basic instruction. The menu-driven package also has editing and error-checking features to facilitate ease of use. It costs \$1,300.

The product can be used in conjunction with RMS-II, a resource management system. That package is a tool for handling up to 96 resource centers and more than 32,000 allocations of resources. The software keeps track of resources, manages

## SOFTWARE AND SERVICES

their effective location, tracks their use, monitors their cost, and allows leveling of the work load so that people, materials, space, and equipment can be used more productively. The RMS-II package costs \$1,000.

Both products require a micro with 64KB RAM and a CP/M operating system that supports CBASIC 2 or a CP/M-86 operating system with CBASIC-86; an 80x24 video display, a 132-column printer, and two 8-inch disk drives with 1MB of on-line storage (or an equivalent hard disk) are also required. An extra 512KB is needed to run the two packages simultaneously. JOHN WILEY & SONS, New York, N.Y.

**FOR DATA CIRCLE 333 ON READER CARD**

### COMPATIBILITY

UniForm is a set of programs for the Kaypro II portable computer that allows owners to read, write, and initialize diskettes for other CP/M computers. As such, Kaypro owners can partake of intercomputer program transfers by taking disks created on other computers and using them on the Kaypro II. They can also create disks on the Kaypro that will be read and used on other machines.

The UniForm programs facilitate compatibility with 15 non-Kaypro machine formats: Osborne I single and double density; Superbrain junior format; NEC PC-8001 double density; Xerox 820 single and double density; TRS-80 model I Omikron CP/M and model III Mem. Merch. CP/M; Morrow Micro Decision double density; Heath/Zenith Magnolia board; Zenith Z-100 double density; and Access Matrix double density.

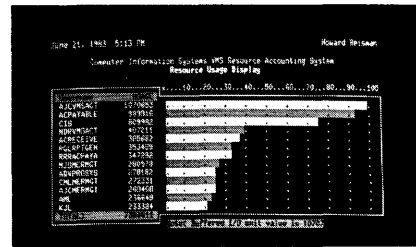
Uniform is a set of two programs. The Initdisk program allows users to initialize a disk to any of these formats and the Setdisk program is used to select the desired disk format for drive B on the Kaypro. Once the drive is set to a different format, familiar commands may be used to manipulate the data. The programs together cost \$50. MICRO SOLUTIONS INC., DeKalb, Ill.

**FOR DATA CIRCLE 334 ON READER CARD**

### RESOURCE ACCOUNTING

VMSACTSYS is a menu-driven resource accounting package for VAX computers running the VMS operating system. The package monitors and bills for system resources and software usage on single VAX/VMS systems or networks connected by DECnet. Billable resources include connect time, cpu time, page faults, buffered I/O, volumes mounted, pages printed, disk storage, and software license fees.

The product maintains statistical information on interaction jobs; subprocesses; detached, batch, and print jobs; log-in failures; peak working set size; and peak page file usage. Rate assignments can be set per resource and per node on a user by user basis. Extraction of resource usage infor-



## SOFTWARE SPOTLIGHT

### STRUCTURED COBOL

Superstructure is designed to rewrite users' COBOL applications into structured COBOL programs that are easy to understand and maintain. Programs created by Superstructure execute all paragraphs under the control of a PERFORM statement; all ALTER, GOTO DEPENDING ON, FALL THRU, and interparagraph GOTO statements are eliminated.

The structured COBOL programs are written so that each is divided neatly into independent modules of procedure division code. Each module has a single entry point and a single exit point, and can be invoked only by PERFORM statements linked hierarchically to the main-line routine. The only GOTOs that are allowed are those that loop back to the paragraph in which they reside. All dead code, within and between modules, is converted into comments. By performing these modifications on the code, the Superstructure program reduces the complexity of the applications code, the vendor says.

The structured code is formatted with each statement beginning on a new line, with indentations for IF-ELSE and other

conditional statements. A four-digit sequential module number is appended to each paragraph name as a suffix, so as not to conflict with any paragraph prefix numbering scheme in the original version. In that way, the vendor says, the meaningfulness of the paragraph names in the unstructured version is not lost on the structured version.

Output from the program includes a listing of the unstructured COBOL program input (if desired), a listing of the structured COBOL program, a structured COBOL program output file, and a scorecard that lists a comparison of key statistics for each version.

The product also comes with a static analyzer that automatically documents structured programs throughout their maintenance life cycles for quality assurance. It can also be used to evaluate existing programs to determine candidates for structuring. Superstructure runs on all IBM and compatible operating systems and costs \$48,000. GROUP OPERATIONS INC., Washington, D.C.

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mation can be set to run automatically at a user-specified time or can be executed interactively. A variety of reports is produced.

VMSACTSYS is a part of the vendor's applications architecture. The software standardizes input and report formats, minimized input errors, resolves multiple user access conflicts, and creates a controlled environment, the vendor says. The product costs \$3,000. COMPUTER INFORMATION SYSTEMS, Braintree, Mass.

**FOR DATA CIRCLE 335 ON READER CARD**

### CAD

The Architectural Interactive Design System (AIDS) is a graphics tool specifically developed for architects and engineers in the design and construction community. The package, which runs on VAX hardware, comes with a library of standard symbols and details that can be modified or expanded to suit the needs or preferences of the user.

A wall layout system allows the user to draw the center lines and then use commands to expand the walls, cut openings, locate windows and doors, and insert wall symbols. Intersections are automatically resolved. The system uniformly enforces drafting standards, precision drawing techniques, line weight control, pattern fill, and dimensioning capability. It also coordinates all architectural and engineering disciplines in a given project through the use of on-screen overlays. The work of each discipline can also be isolated.

Other features include production of plots at most desired scales; drawing and plotting at all common architectural and engineering scales; conversion between English and metric measurements; several text styles; capacity to produce three-dimensional "walk around" drawings; and commands to measure lengths and calculate areas, to take inventory of components and total their costs, and to load information into a relational database. For a fully configured installation with multiple workstations, the AIDS software costs \$14,000. AR-CAD, Los Angeles, Calif.

**FOR DATA CIRCLE 336 ON READER CARD**

### PROBLEM SOLVING

This package is essentially an automation of the Morphological Box technique for problem solving. It implements that heuristic in providing a structure for describing problems and a process for finding solutions to them. With Brainstormer, as the package is called, the user is led through a series of steps to produce a structured representation of the problem she is interested in solving. Brainstormer then guides the user through a process of examination and reconsideration of the structure of the problem by generating new ways of looking at it. The user refines the process by controlling the occurrence of particular themes and variations



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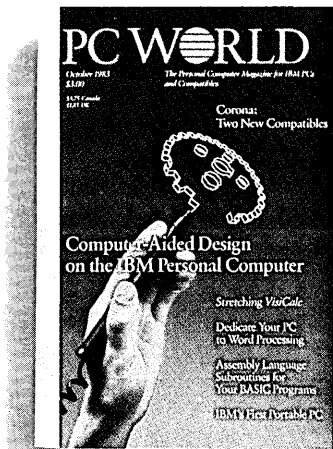
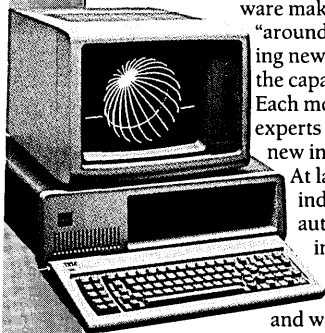
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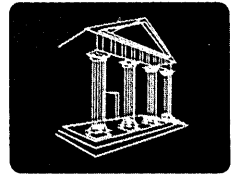
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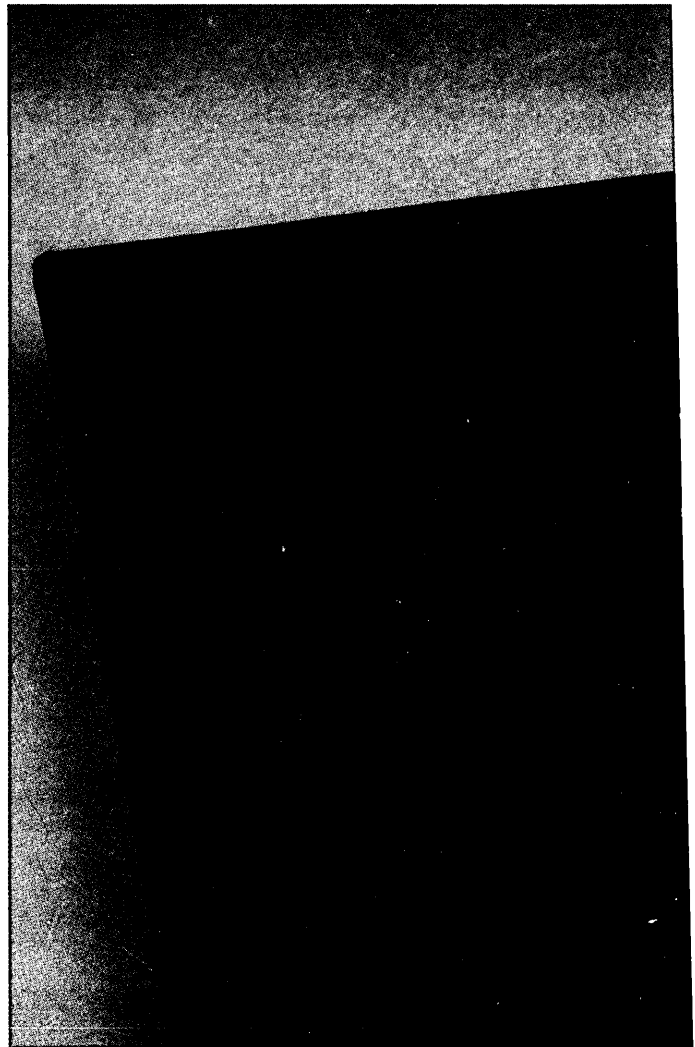
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## SOFTWARE AND SERVICES

until a sufficient quantity of potential solution strategies is produced. Up to 10 billion "idea probes," as the vendor calls potential solutions, can be generated for a problem.

Brainstormer is supplied with a set of files covering sample applications. These files are used with self-paced demonstration/tutorial exercises from the user's guide to achieve mastery of the program. The user manual also includes selections covering the detailed use of each command. The product can be used for a variety of applications because the program does not depend on the content of the problem. The package is available on the TRS-80, Apple II, Osborne, and Kaypro II microcomputers running the CP/M operating system. All systems require MBASIC, two single-sided 5¼-inch floppy disk drives, and 48KB of RAM. SOFT PATH SYSTEMS, Eugene, Ore.

**FOR DATA CIRCLE 337 ON READER CARD**

### DATABASE MANAGER

PowerBase is a database manager for the IBM Personal Computer that allows executives to design custom tailored applications and perform business functions without learning computer languages. The system's user interface is a command line at the bottom of the crt display, which lists all of the relevant commands that can be used, and which dims commands that should not be used in any given instance. Two function keys control movement of the cursor on that line; when the cursor is over the chosen command, typing another function key activates the command.

An auto-save command automatically saves a user's record when new or additional information is input. A user must reconfirm a deletion request before PowerBase will delete a file. Files can be defined and rearranged without the use of any procedural language. If data in a derived or calculated field are changed (i.e., a field whose values are dependent on the values of other fields), all affected data are recalculated. The structure of files may be altered without loss of data; the data in the file are formatted into the new structure automatically. A DataZoom feature allows users to build applications that link files to other files where related information is stored. For example, a general ledger file may be built to accept a zoom to an accounts receivable file where specific information relating to the transactions listed in the GL is kept. Up to 10 levels of zooming can be programmed into the product.

PowerBase runs on an IBM P.C. with at least 256KB of RAM, a PC/DOS operating system, two 330KB or greater disk drives, and a printer. The package can accommodate 65,000 records of 1,600 characters each. Each record can hold as many as 40 fields of up to 80 characters each. The package costs \$475. GMS SYSTEMS INC., New York, N.Y.

**FOR DATA CIRCLE 338 ON READER CARD**

### MANUFACTURING

Answer is a vertically integrated manufacturing and financial software system for the discrete, repetitive, or process manufacturer running the HP 3000 minicomputer system. The manufacturing software includes more than 250 individual reports, a report writer, and database access. Subsystems provide information and control in the areas of inventory control, production bills of material, purchasing/receiving, work-in-progress, shop floor control, capacity planning, master scheduling, cost accounting, MRP, project tracking, and costing.

There is a separate work-in-process module for the process manufacturer; it includes lot tracking, standard device flow with yield variance reporting, and line loading with material and labor requirements.

Order management and financial modules are integrated with the manufacturing system. These include subsystems in forecasting, order entry, backlog tracking, order history, field service, accounts receivable, accounts payable, general ledger, and budgeting.

The \$80,000 package is supported by the vendor's database management system, which allows the user to add or modify prompts at any time, without programming knowledge. FINAL SYSTEMS INC., Cupertino, Calif.

**FOR DATA CIRCLE 339 ON READER CARD**

### ASSET/LIABILITY

The ALAMO line of asset/liability tools is designed for use by banks, saving and loan associations, and credit unions. ALAMO comprises two computer models and supplemental service by the vendor. The two computer models are written in proprietary planning languages (IFPS from Execucom Systems Corp. for the mainframe model and DDS/F from Ferox/Addison-Wesley for the microcomputer model). The service is designed to provide interest rate risk analysis and reporting for financial institution audits.

ALAMO asset/liability management specialists conduct an analysis of rate risk and provide other audit reports, using data supplied by the vendor's audit teams. The service is intended to assist the client board of directors in meeting public and regulatory responsibilities by assessing risks as well as financial results.

The vendor provides a training program for the microcomputer model and post-delivery support through publication of research results. A quarterly newsletter is also sent to users. DELOITTE HASKINS & SELLS, New York, N.Y.

**FOR DATA CIRCLE 340 ON READER CARD**

### AI SPREADSHEET

Expert-Ease is a decision-making spreadsheet that incorporates artificial intelligence techniques in the software and operation of the program. The package can analyze data

and render decisions for novice computer users by learning from its experience. The software is designed for the IBM Personal Computer.

Expert-Ease presents three sets of screens to the user. In the first screen, the user defines data fields by columns in a manner similar to other spreadsheet programs. Initial data, of either engineered parameters or actual baseline values, are entered into the computer. The program then uses its artificial intelligence capability to structure the relationships between various data elements through a complex tree of IF-THEN-ELSE statements, which are presented to the user on the second screen. Possible errors or incomplete logical relationships are flagged by the software for correction or completion by the user.

In the third screen, the user is allowed to have the computer evaluate new data in the context of the information on file. As an example, an established database might contain either historical records or policy-defined limits on corporate expense accounts. When the user responds to requests for data elements such as an executive's position, locations visited, the distance traveled, and duration of trip, the program will automatically evaluate its database and determine whether or not the tendered expense voucher falls into an acceptable range for payment. At the same time, the entered data may be stored to modify the database and change what the program considers "an acceptable range," in this instance.

The \$2,000 package is not yet easily available in the U.S. because the vendor currently has no U.S. distributor. EXPORT SOFTWARE INTERNATIONAL, Edinburgh, Scotland.

**FOR DATA CIRCLE 341 ON READER CARD**

### CASE-MIX ANALYSIS

The Hospital/Map computer service includes case-mix analysis for financial and clinical management in hospitals and supports strategic planning models. The service is designed to help hospitals cope with the introduction of product line pricing and management in the health care industry.

The system allows hospitals to identify and analyze resource utilization and overall financial performance from several perspectives. The system can be used to analyze income contribution and resource consumption per in-patient stay on a case-mix adjusted basis, sorting by any of several classifications. These include diagnosis related group (DRG), physician, operative procedure, diagnosis, and payer. All told, the service supports a library of more than 60 reports.

The system supports strategic planning through reporting that covers geographic patient origin data correlated to DRG, diagnosis, and procedure. It can also provide reports for quality assurance, oper-



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# 3M

## SOFTWARE AND SERVICES

ations, and administration. In areas where either state or regional patient abstract data are available, the Hospital/Map service can be customized to provide interhospital reports. The service was developed by Cohen, Rutherford, & Blum, a hospital consulting firm. CONTROL DATA BUSINESS INFORMATION SERVICES, Greenwich, Conn.

**FOR DATA CIRCLE 342 ON READER CARD**

### INVENTORY TRACKING

The Mechanized Inventory Tracking System (MITS) is designed to track, control, analyze, and report on capital assets such as furniture, office equipment, motor vehicles, tools, and manufactured goods. The system allows aggregation of all or specific groups of assets either for a single location or multiple locations. It gives timely information about the cost, location, use, life, and value of assets, and aids in inventory control, planning, and budgeting.

MITS is intended to allow a corporation to maintain accounting controls for fixed asset values and to take advantage of tax law changes, depreciation credits, and investment tax credits.

Standard reports can be generated as needed, and built-in query capabilities allow ad hoc reports on specific items. All information is stored for future use. Most intelligent terminals or microcomputers can use the system off-line for data entry and editing. Error verification automatically checks for validity of entries. Information can then be loaded into MITS through the use of a bar code scanner. MITS is available on either a timesharing or in-house basis. In-house versions cost from \$50,000 to \$300,000 depending on configuration and customization. TYMSHARE INC., Cupertino, Calif.

**FOR DATA CIRCLE 343 ON READER CARD**

### CP/M WP

The TeleStar package allows TeleVideo terminals and systems to use the WordStar word processing package. Facilitated by 57 logically grouped, color-printed replacement keycaps and a software overlay to WordStar, TeleStar is intended to turn the TeleVideo system into a fully featured word processor. Many word processing functions are available with a single keystroke from printed legends on the keyboard.

TeleStar keys replace 40 standard keys in addition to the top row of function keys. The functions are grouped in such a way as to allow the operator's hands to remain on the standard "home row" of keys during input. The software includes redesigns of the option controls, help, and print controls menus, removing unrelated functions. The help key and help menus aid the instruction of advanced word processing features of the print controls, page format commands, and option control toggles.

The software requires CP/M 1.4 or 2.2 or MP/M 1.1 or 2.1, as well as WordStar

3.0. It is supplied on 8-inch standard single density IBM diskettes or 5¼-inch TeleVideo format diskettes. The package costs \$200. PORTOLA SOFTWARE, Mountain View, Calif.

**FOR DATA CIRCLE 344 ON READER CARD**

### ACCOUNTING

Three packages form the MAP/38 accounting package for IBM's System/38 minicomputer. The Map/38 purchase order system uses an interactive database of material/service requisitions, purchase orders, inventory, and buyer and vendor history. Updating of inventory records is handled through the purchase order creation and subsequent material receipt. The multistation data entry capabilities include on-line entry of requisitions, receipts, purchase orders, and buyer and requisitioner security authorizations. Authorized requisitions, requests for quotations, and purchase orders are created for the buyer.

The Map/38 accounts payable system provides for automatic payment of recurring bills and the option of select or defer vouchers for payment. With both the purchase order and accounts payable systems installed, users can produce integrated accounting and purchasing reports, including vendors and buyer performance, open receipts and purchase orders, projected cash flow, and a cash disbursements journal. On-line inquiry of several variables is available.

The Map/38 accounts receivable system uses an interactive database of customers, invoices, cash receipts, and miscellaneous cash. Payments are permitted on either open item or balance forward accounts. Entry of five different types of cash receipts is allowed. The accounts receivable system provides the same on-line inquiry capabilities as the accounts payable system.

The Map/38 purchase order system costs \$8,500; the accounts payable and receivable packages cost \$5,000 each. PIONEER SOFTWARE INC., Cleveland, Ohio.

**FOR DATA CIRCLE 345 ON READER CARD**

### PASCAL COMPILER

Pascal-2 is an optimizing compiler for the Unix operating system on the 68000 microprocessor that produces smaller and faster code than C, FORTRAN 77, or other Pascals on Unix, the vendor says. The compiler performs nine kinds of code optimization normally performed by language compilers on larger machines.

Pascal-2 programs may call subroutines written in C, FORTRAN 77, or assembler, allowing the user to take advantage of existing Unix software when building new programs. The product's language extensions are designed to facilitate I/O handling and access to low-level Unix operations. Other program development aids include an interactive source-level debugger, an ex-

ecution profiler, program and text formatters, and cross-referencers for program analysis.

The Pascal-2 compiler supports all capabilities of standard Pascal and conforms to Level 1 of the draft international Pascal standard, which includes conformance parameters. Optimizing techniques provided include global register allocation, common subexpression elimination, expression targeting, array index simplification, branch tail merging, range tracking, constant folding, dead code elimination, and short circuit evaluation. The compiler alone costs \$600, while a complete Pascal-2/Unix system, including the debugger, other tools, the compiler, and a year of software support, costs \$1,650. Documentation includes the Pascal-2 user manual and detailed language specifications. OREGON SOFTWARE, Portland, Ore.

**FOR DATA CIRCLE 346 ON READER CARD**

### COMMUNICATIONS PROTOCOL

The Microcom Networking Protocol (MNP) allows file transfer to and from a variety of microcomputers over voice-grade telephone lines. Based loosely on the ISO's open systems integration model, the MNP accommodates real-time interactive communications. The protocol is independent of any microprocessor, personal computer, or operating system, so dissimilar systems can exchange files using a virtual file format.

Each of the layers in the protocol—there are four, corresponding to all of the ISO layers except Network and Transport—provides services for the layers above it, but the operation of each layer is independent. This enables the protocol at one layer to change without affecting any other layer.

Layer one, the physical layer, currently supports dial-up or leased lines using either synchronous or asynchronous transmission with Bell-compatible modems. Layer two, the link level, guarantees accurate transparent delivery of packets of data for the higher levels. Both block oriented and stream oriented transmission types are supported, for file transfer and full duplex interactive communications.

Layer three of the MNP incorporates the services provided at session and presentation levels of the ISO model, since the need for file translation is decided at the session establishment. The seventh layer of the ISO model corresponds to the fourth layer of the MNP. The protocol is currently supported on Apple and Radio Shack computers and costs \$2,500 for a one-time license. MICROCOM INC., Norwood, Mass.

**FOR DATA CIRCLE 347 ON READER CARD**

### FORTRAN ACCELERATOR

The RealFast 1 FORTRAN accelerator runs under MS/DOS on the IBM Personal Computer and compatible machines. The program uses the Intel 8087 numeric coprocessor

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## SOFTWARE AND SERVICES

chip, which was recently approved by IBM for use with its P.C., to maximize both I/O and number crunching.

The accelerator does not require re-compilation of existing Microsoft FORTRAN 77 programs, nor does it require purchase of any new compilers. The 8087 must, however, be present in the computer and the .OBJ program modules must be linked with the RealFast 1 .OBJ program module. The product routes all 32-bit integer and 32/64-bit floating point arithmetic to the 8087 chip for addition, subtraction, multiplication, division, trigonometric, exponentiation, log, modulo, max, min, real, float, and encode/decode operations. Formatted I/O operations are also accelerated by faster conversions between binary and ASCII code.

The product is designed to increase the efficiency of the cpu so that multi-user systems will be more practical and less draining on cpu power. Applications can be processed twice as quickly with the RealFast 1, the vendor says. Future accelerators for BASIC (compiled and interpreted) and Pascal are promised; each costs \$160. GEOSTAT SYSTEMS INTERNATIONAL INC., Golden, Colo.

**FOR DATA CIRCLE 348 ON READER CARD**

### MICRO-MAINFRAME LINK

The C-N-Comm software facility enables IBM Personal Computers to upload and download data from an IBM mainframe. The package uses an error-checking protocol to ensure data integrity during the transfer process.

The package is an offshoot of the vendor's support for remote users of its 3081 utility, and can be installed in any IBM mainframe environment that supports MVS/TSO. (A version for VM/CMS is promised for the near future.)

The C-N-Comm package runs on a P.C. equipped with 128KB of RAM, at least one single-sided disk, and MS/DOS version 1.1 or 2.0. An asynchronous communications card with an acoustic coupler, a smart modem, or a board modem is required to support communications at rates up to 1,200 baud. Either the monochrome or the color graphics board and display is required. A printer is supported.

The package costs \$400 per copy, with multiple copy discounts available. UNI-COLL CORP., Philadelphia, Pa.

**FOR DATA CIRCLE 349 ON READER CARD**

### DRG ASSIGNMENT

The DRG Grouper software for Apple micro-computers is designed to automate DRG (Diagnosis Related Group) assignment for hospitals. Accurate DRG assignments are crucial to equitable payments under Medicare's prospective payment system. This package automatically assigns both the MDC and the DRG from information keyed in on the patient's age, sex, discharge status, diagnoses, and procedures.

The operator can choose to enter and process patients individually or in groups of up to 20 at a time. DRG Grouper identifies potential coding problems resulting in assignments of patients to DRGs 468, 469, and 470 before the data are submitted and payments are lost.

The \$700 package can be integrated with the vendor's PAS+ basic patient abstracting system. Hospitals can maintain timely case-mix information using the two packages, for use at any time. COMMISSION ON PROFESSIONAL AND HOSPITAL ACTIVITIES, Ann Arbor, Mich.

**FOR DATA CIRCLE 350 ON READER CARD**

### INTERACTIVE INSTRUCTION

ActionCode is an interactive instruction system designed to simplify training and retraining for high technology jobs. Designed for self-paced learning, the system provides individualized, simulated on-the-job training through the integration of print and visual images. The system is operated through the use of an optical scanning wand and push buttons. A touch-sensitive video screen eliminates the keyboard interface, in order to reduce the likelihood of student error.

The ActionCode system is activated by scanning a bar-coded workbook with the wand, calling up images on the screen. Working at his own pace, the student proceeds through learning sequences. Testing is interwoven throughout the program, allowing—or directing—the trainee to repeat sequences to ensure maximum success with little intervention. Repeated incorrect responses to test questions trigger branching, the presentation of video sequences that elaborate on the topic in need of reinforcement.

The system currently has an electronics curriculum, but the vendor says that other curricula, in robotics, hydraulics, pneumatics, and servomechanisms, will also be available. The system can be leased for under \$1,000. ICS-INTERT DIVISION, NATIONAL EDUCATION CORP., Westport, Conn.

**FOR DATA CIRCLE 351 ON READER CARD**

### ELECTRONIC MAIL

TerraLink lets Tandem computer system users send and receive local, domestic, and worldwide messages by way of Western Union's EasyLink service. The package automatically forwards electronic mail messages from the user's Tandem system to the EasyLink network, eliminating the need for telex or TWX service. Users can elect to employ EasyLink's mailbox facility to collect messages at their convenience.

TerraLink provides for messages created in a standard Tandem edit file to be dialed automatically and, optionally, at a specified time. Incoming messages directed to a Tandem site's EasyLink subscription number will automatically be forwarded by the Tandem cpu to the proper user.

Outgoing messages may be passed to TerraLink using any standard Tandem file and may also be created by using the vendor's COMPOS/MENTIS document processing system or standard application programs. Each licensed copy of TerraLink, including object tape and manuals, costs \$5,000. In addition, users must pay Western Union \$35 for each EasyLink account number and password. The manual can be purchased separately for \$50. TAFT CONSULTING CORP., New York, N.Y.

**FOR DATA CIRCLE 352 ON READER CARD**

### LINEAR PROGRAMMING

LP/PROTRAN is designed to solve linear programming problems that are presented in either symbolic format or matrix/vector format. The product is optimized for large sparse problems, in which most elements of the constraint matrix are zero.

Users of LP/PROTRAN need little knowledge of computers or programming, the vendor says. More advanced programmers can mix FORTRAN statements with PROTRAN statements to allow a more tailored approach to problem solving. Linear programming applications can also be mixed with mathematical and statistical applications from the vendor's other products.

An annual license for LP/PROTRAN includes the object code, a user's manual, maintenance, and consultation. The initial year costs \$6,000, with subsequent annual licenses costing \$2,000 each. University subscriptions are offered at a 50% discount, and cost \$500 if placed before Jan. 1. The product runs on DECSYSTEM 10/20 mainframes and VAX superminicomputers. IMSL INC., Houston, Texas.

**FOR DATA CIRCLE 353 ON READER CARD**

### ETHERNET TESTING

This service certifies compatibility of vendor implementations of the Xerox Network System higher-level protocols. The procedure is designed to increase the compatibility of XNS protocol implementations among the various Ethernet systems on the market. The testing will initially involve the network and transport layers of the ISO seven-layer model; all Ethernet systems are compatible at layers on lower levels.

Specific XNS protocols to be certified in the service include the Internet Datagram protocol and the Sequenced Packet protocol. Xerox will provide the equipment used in the certification procedures, which will be conducted at this vendor's headquarters. The test environment will include special software programs that will be used to determine compatibility at each of the published XNS protocol layers. Fees for the certification service are in the range of \$5,000 to \$10,000, the vendor says. BRIDGE COMMUNICATIONS INC., Cupertino, Calif.

**FOR DATA CIRCLE 354 ON READER CARD**  
—Michael Tyler



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# SOURCE DATA

## BOOKS

### **WHAT'S WRONG WITH OUR TECHNOLOGICAL SOCIETY— AND HOW TO FIX IT** by Simon Ramo

It is easy to expect too much from a book called *What's Wrong with Our Technological Society—and How to Fix It*. Such titles, after all, tend to get our hopes up.

Simon Ramo's credentials elevate our expectations even further. A native of Utah, he is a director and one of the founders of TRW Inc., the \$5 billion (sales) industrial conglomerate. As members of John von Neumann's Strategic Missiles Evaluation Group in the early 1950s, both Ramo and Dean Wooldridge resigned to form Ramo-Wooldridge Corp. That company subsequently received the federal contract for the technical direction and systems engineering of the Atlas missile project. Ramo was also cochairman of the Transition Task Force on Science and Technology for President-elect Reagan. Dr. Ramo served as scientific director of the U.S. intercontinental ballistic missile program from 1954 to 1958 and is currently visiting professor at California Institute of Technology. He is the 1983 winner of the Presidential Medal of Freedom.

There are many things obviously awry in our society, and some of them are detailed here by Ramo: the advancing possibility of nuclear war, the burdens of inflexible government regulation, and the effects of unfair offshore competition. Ramo even thinks up some plausible solutions for many of these problems. But either by choice or through necessity, the author overlooks some critical areas so while the book has value, it doesn't really deliver on the promise in the title.

Ramo is at his best when writing of nuclear war and the need for disarmament.

In a simple manner reminiscent of Leo Szilard's *Voice of the Dolphin*, Ramo dismisses as suicidal the premise of limited or direct nuclear war. His clarity and direct presentation are deserving of wide attention. Nuclear war is simply not possible to Ramo, and the contemplation of it urges direct action: both the U.S. and the U.S.S.R. should give a prearranged quantity of U-235 or plutonium to a neutral facility, where it would eventually be converted into electrical power in a conventional nuclear reactor.

Ramo constructs a model of our civilization, a triangle of society, technology, and liberty. Liberty is the force ensuring individual freedoms, and society is the force representing the rules and ethics of our culture. Technology is a kind of semi-autonomous but immutable force—a cultural Amtrak of sorts. Dr. Ramo feels quite strongly about the liberty and technology focuses, but he doesn't seem to hear too many voices beckoning from the society camp.

The author is most critical of government regulations. He does permit that "enlightened leadership of the free enterprise segment of our hybrid economy recognizes the need for government regulation as much as does the public." But he still makes the distinction between that leadership and the public, as if they were separate. Nor does he hesitate, a few pages later, to set up government meddling as the source of many of our nation's problems.

Some of his potshots have merit. Ramo questions the soundness of a system that relies so heavily on the judiciary for the clarification of congressional objectives. He questions the logic of having strict OSHA standards while simultaneously discouraging and subsidizing cigarette smoking. He notes that many environmental problems are controlled to an extreme, while others, such as the level of lead permitted in gaso-

line, are illogically and contradictorily regulated. He astutely writes that rigid governmental regulation allows for no opportunity to compare risks with benefits. There is no authority to direct the efforts of our society in a proper, unified way. Our EPA, for example, will not allow us to trade off a given amount of pollution for a number of jobs.

Ramo dismisses the notion of a science court to settle scientific aspects of safety, health, and environmental protection issues, because it is often impossible to extract and isolate the scientific aspects of an argument. The testimony on the part of the scientist would merely express that scientist's value judgments. So it is with Dr. Ramo in *What's Wrong*. While recognizing the plight of Cleveland or Pittsburgh and the danger of tariffs, Ramo is also a businessman. As a result he carries with him a few Whiggish encumbrances.

What Simon Ramo feels is wrong with our society is not necessarily what Lewis Mumford thought was wrong with it. He is not concerned, as was Mumford, with the ossifying effect technology can have on our lives. He does not appear to be overly concerned with defects in distributing industrial income, nor with acid rain, nor with many of the wastes and unfairnesses of our society. While admitting that we may someday feel like "anonymous cogs in a society of enmeshed and coupled signals, gears, vehicles, flowing chemicals, and electrical power," he seems more concerned with immediate topics: fleeting corporate profits, congressional myopia, and the increasingly litigious nature of American society. The author does not deny that society has had and will continue to have trouble adjusting to technological advances. He admits that runaway technological advance has brought detriment along with its benefits. While Ramo agrees that more attention must be paid to technology's social effect, he does not grant much space

## SOURCE DATA

in *What's Wrong* toward the proper contemplation of such ends. Perhaps Dr. Ramo would feel uncomfortable addressing these more personal concerns, but it is regrettable that he has not done so.

How does Ramo propose to correct what is wrong with our society? Mostly with committees: a SHEP regulation board, to trade off risk and benefit in safety, health, and environmental protection matters; a World Commerce Agency, which would be empowered to allow antitrust violations for the express purpose of international competition; a Federal Communications and Computers Commission for the control of information technology. Ramo even suggests that a group of "top basic scientific researchers from the appropriate universities" be "invited by the Secretary of Defense to be guests at some appropriate hideaway for a week." Ramo is offering no mere luncheon committees. He suggests helicopters, police escorts, and big support staffs. What could these committees of Big Men—scientists, industrialists, soldiers—achieve? One wonders whether they would be much of an improvement on the Congress. As Norbert Wiener once wrote: "Men of ambition for power are not entirely unknown in scientific and educational institutions." Or, as H.G. Wells wrote: "No public thing, no collective thing, has ever had the sanity of men thinking quietly in a study."

One particular area where Ramo is

emphatic is education. The number of U.S. PhD graduates in engineering declined by one third during the 1970s. Ramo is distressed with the cuts of federal aid to education and to the NSF. He proposes a guns-for-education trade-off, with the Department of Defense funding doctorates in science and engineering in place of a few of its weapons programs. The Reagan Administration has expected corporations to assist in science and technology education. It is, the argument goes, where industry has been getting its trained workers, free, for years. But the business community feels that education is a governmental responsibility, and has not picked up the slack. Ramo feels that more engineers are required for our national security. Indeed, already 40% of the combined public and private R&D budget in the U.S. is DoD based. Ramo believes everyone has a duty to improve our educational system.

If the number of pages given to any subject is an indication of what the author believes to be wrong with our technological society, then government regulation must play second fiddle to the danger of the Soviet Union. Perhaps Dr. Ramo's long association with the DoD has influenced his perception of the world. War may be our greatest current concern, but disease, famine, racism, and overpopulation deserve more than the idle paragraph.

Ramo seems too worried about the idea of conventional warfare in Europe (to the point of considering the paths that Sovi-

et tanks would take). He suggests the dissolution of NATO as a way of assuring European self-defense in the event of a conventional Soviet attack. This is an undeniable problem, but how plausible is the all-out war in Europe, the modern Napoleonic struggle for territory? The days when wars were settled with the triumphant march of troops into the vanquished capital may be gone. Wars of proxy preserve cathedrals and dachas alike. The likelihood of Soviet tanks roaring across the North European Plain toward Hannover might be less likely than Dr. Ramo fears.

One of the more remarkable things about *What's Wrong* is its author's almost mystical faith in an unfettered market system. The hidden hand of the marketplace is a genial, though somewhat brute, force to Ramo. It is a tireless hand that directs mankind with an almost flawless grace. The author views the free market system as a sort of benevolent despotism. But the relative impeccability Ramo assigns to the market is an unrealistic one, and his distrust of the federal government is a little overblown.

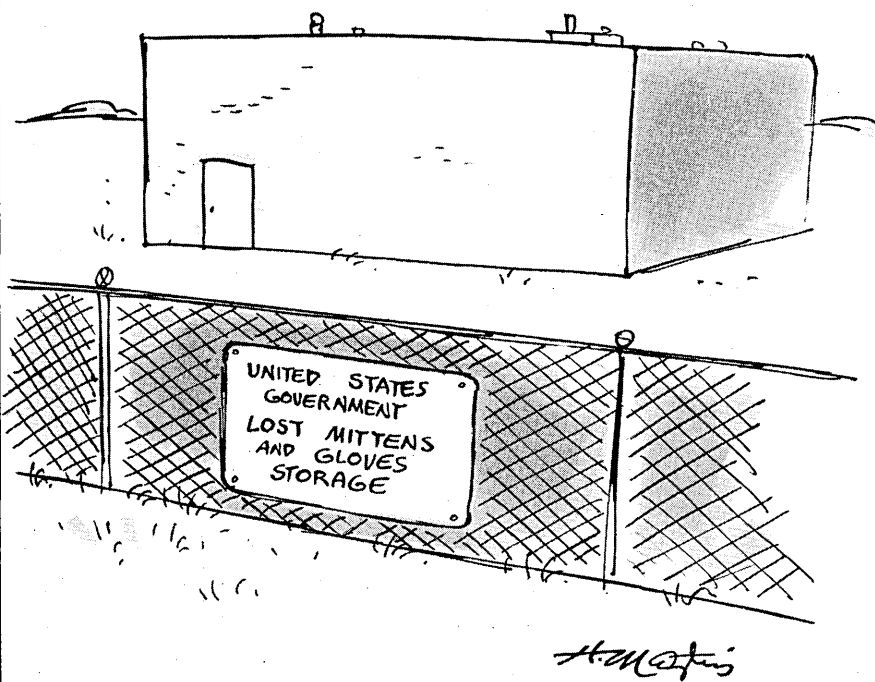
Few people other than congressmen would deny that a lot of bunkum originates from the floors of the House and Senate. But there are few indications in *What's Wrong* that Ramo remembers some of the White House's and the Pentagon's less inspiring moments. And even the most proficient business leader has a bad day now and then, as Ramo points out with his example of the Ariane missile. The French government foresaw a market for a nonretrievable booster system for satellites where U.S. private industry did not.

Ramo confesses that a certain amount of "inelegant grasping for government money" goes on in industry as well. Yet he is reluctant to acknowledge that elected officials, imperfect though they are, have a legitimate role in determining our social goals. However poorly their regulatory efforts may proceed, they are nearly always better than what might have proceeded without them, with only the hidden hand to show the way. It is easy to accentuate the blemishes of a hybrid economy. It is tougher to define, and defend, its virtues.

Maybe the author is correct, and a less adversarial relationship between government and business would help. But not everyone that would be involved in such a chummy relation would prove so enlightened as Dr. Ramo.

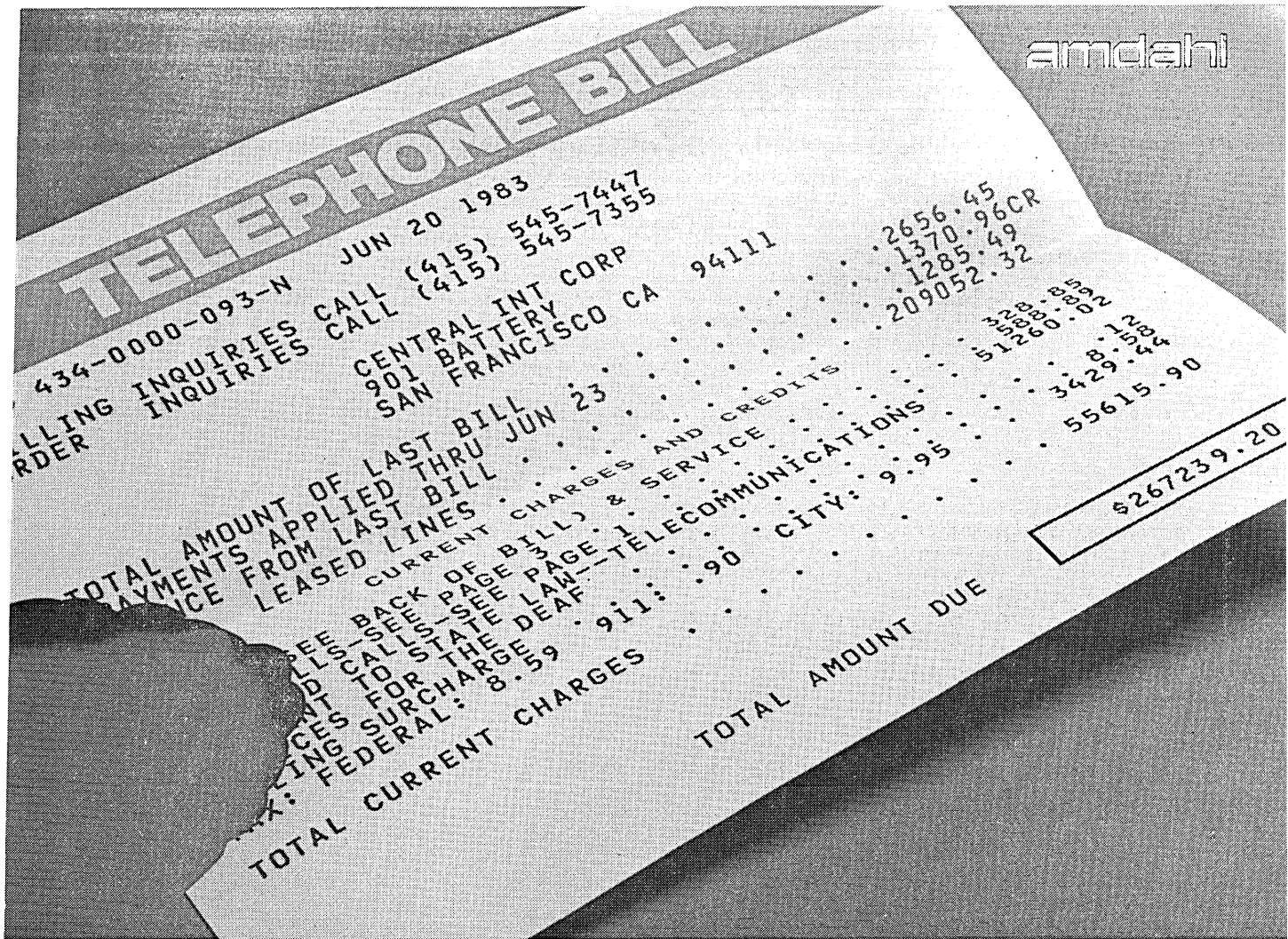
What Ramo has offered with *What's Wrong* is not so much a repair manual for our society, but a lamentation and a wish list that could be endorsed by the Business Roundtable. Although it is an interesting and occasionally compelling book, *What's Wrong* is simply another attempt at a beginning. McGraw-Hill, New York, N.Y. (1983, 280 pp. \$19.95).

—Leopold Froehlich



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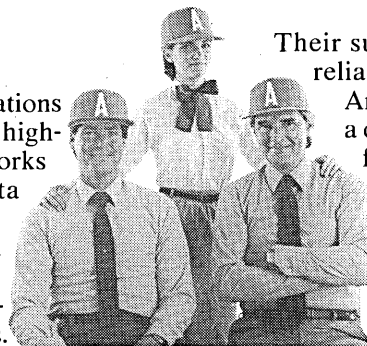
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CIRCLE 140 ON READER CARD

## SOURCE DATA

### BOOK BRIEFS

#### **SIMULATION OF COMPUTER COMMUNICATIONS SYSTEMS** by Charles H. Sauer and Edward A. MacNair

Understanding complex networks has always been a goal of serious computer researchers. Internally, there is a problem within system design as one seeks to deal with such pseudorandom events as requests for I/O service, and so on. Externally, a similar problem arises when the system is required to serve nodes on a multipoint network.

Tradition holds that the way to design such networks is to use analytic techniques. For a variety of reasons, simulation has never been popular. Recently, however, the building of general tools for software simulation has led to an increased emphasis on this method. While several packages are available, the authors elect to demonstrate their approaches using RESQ, the Research Queuing Package, produced at IBM's Thomas J. Watson Research Center (where MacNair is based).

This small volume clearly describes the way RESQ works and the kind of results that may be anticipated when simulating various queuing networks. Examples seem well thought out and are presented in a highly readable fashion. Rather than stick totally with communications networks, the authors have elected to show RESQ at work on a number of other functional components, including multitasking and spooling.

It would seem time for practitioners to reexamine long-held notions regarding simulation as an appropriate tool for system modeling. Given a tool such as RESQ, it appears increasingly viable to bypass the complexity of developing analytic equations in favor of simulation.

A special note on the book itself—it is very readable even for the mathematically unsophisticated. The layout and typography are beyond reproach. Production was fast: rather than the usual interminable delays, the book reached reviewers only three months after the date in the authors' acknowledgments. It was not surprising to find a mention of Karl V. Karlstrom (a senior editor at Prentice-Hall), recently honored for his editorial contributions to computer science literature. He has earned his award, yet again. Prentice-Hall Inc., Englewood Cliffs, N.J. (1983, 150 pp., \$25).

—P.H.D.

#### **TUTORIAL ON SOFTWARE MAINTENANCE**

by Girish Parikh and Nicholas Zvegintzov

Published by the IEEE Computer Society, this book deals with the aspects of software maintenance "not only as an essential ele-

ment in the life of software systems, but as a process with its own rules and techniques." The book is divided into six sections: the World of Software Maintenance, which looks at empirical and observational data on maintenance activity; Understanding Software, which deals with the techniques for deriving or reconstructing the development framework (goals, requirements, specifications, design, etc.) from an operational system; the Modification of Software, a look at the tools and techniques for modifying the function of a system; the Evolution of Software, which describes the lifetime of a software system in terms of growth, renewal, and survival; the Death of Software, which deals with the disappearance of software systems—scheduled, premature, and frustrated; and a final section on the Management of Software Maintenance.

The book contains 31 articles by 37 leading authorities on software maintenance, with each author's humor, wit, and personal anecdotes in the accompanying introductions.

Copies can be ordered from the IEEE Computer Society, P.O. Box 80452, Worldway Postal Center, Los Angeles, CA 90080, (714) 821-8380, or from Shetal Enterprises, Dept. IEEENR, 1787B West Touhy, Chicago, IL 60626, (312) 262-1133. The price is \$18.75 for IEEE members and \$32 for nonmembers.

—L.D.

### REPORTS & REFERENCES

#### **GUIDE TO INFO SYSTEMS**

The "Directory of Office Information Systems, Reference & Buyer's Guide" has been published by the Information Clearing House Inc. for the Association of Information Systems Professionals (AISP). The book is a guide to office information systems equipment, software, supplies, and services. It contains product information, articles, and reference and educational tools. The book features a step-by-step program for the development of corporate computer literacy. Also covered are personal computers, integrated office systems, wp/phototypesetting systems, and wp software. The directory is organized by product categories for easy access to company listings and contains resource information for further reading and research. The book costs \$34.95, plus \$1.50 for postage and handling; add \$20 for overseas shipment. Contact Dorothy Logan, AISP, 1015 N. York Rd., Willow Grove, PA 19090, (215) 657-6300.

#### **ADA AID**

IEEE's Computer Society has published a new book on Ada. Entitled *The Ada Programming Language*, the book was designed for engineers and computer scientists interested in Ada and its applications to software projects and embedded comput-

ers. The book contains many of the early papers on the language and its environment, and covers such topics as the history and current status of Ada; basic language; schedule for industry and the Department of Defense; preventing errors; readable, maintainable, modular systems; real-time features; portability; environments for Ada; a glossary; and a lengthy bibliography. It has reprints of papers praising the language and others written by Ada's harshest critics. The book costs \$22.50 for IEEE members, \$30 for nonmembers, and can be purchased from the IEEE Computer Society, P.O. Box 80452, World Way Postal Center, Los Angeles, CA 90080, (714) 821-8380.

#### **GLOSSARY OF TERMS**

The Computer Language Company Inc. and Prentice-Hall have published a soft-cover desktop reference book for nontechnical business managers and home computer users. *The Computer Glossary, It's Not Just a Glossary* defines over 1,100 computer and vendor terms for quick reference or detailed comprehension. The publishers claim the book is unique because "it covers terms for the home computer user as well as those for business managers of large and small corporations." The author, Alan Freedman, has helped bring computer literacy to more than 7,000 managers from 200 companies in the last five years. These companies include AT&T, New England Telephone Co., and the Connecticut General Life Insurance Co. The book costs \$14.95 and can be purchased from the Computer Language Company Inc., 140 W. 30th St., New York, NY 10001, (212) 736-8364.

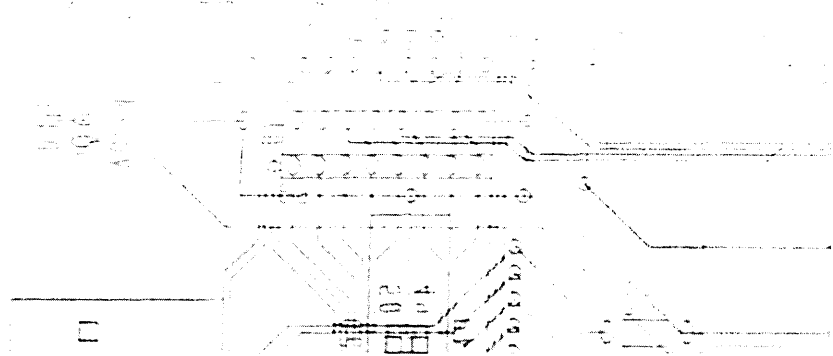
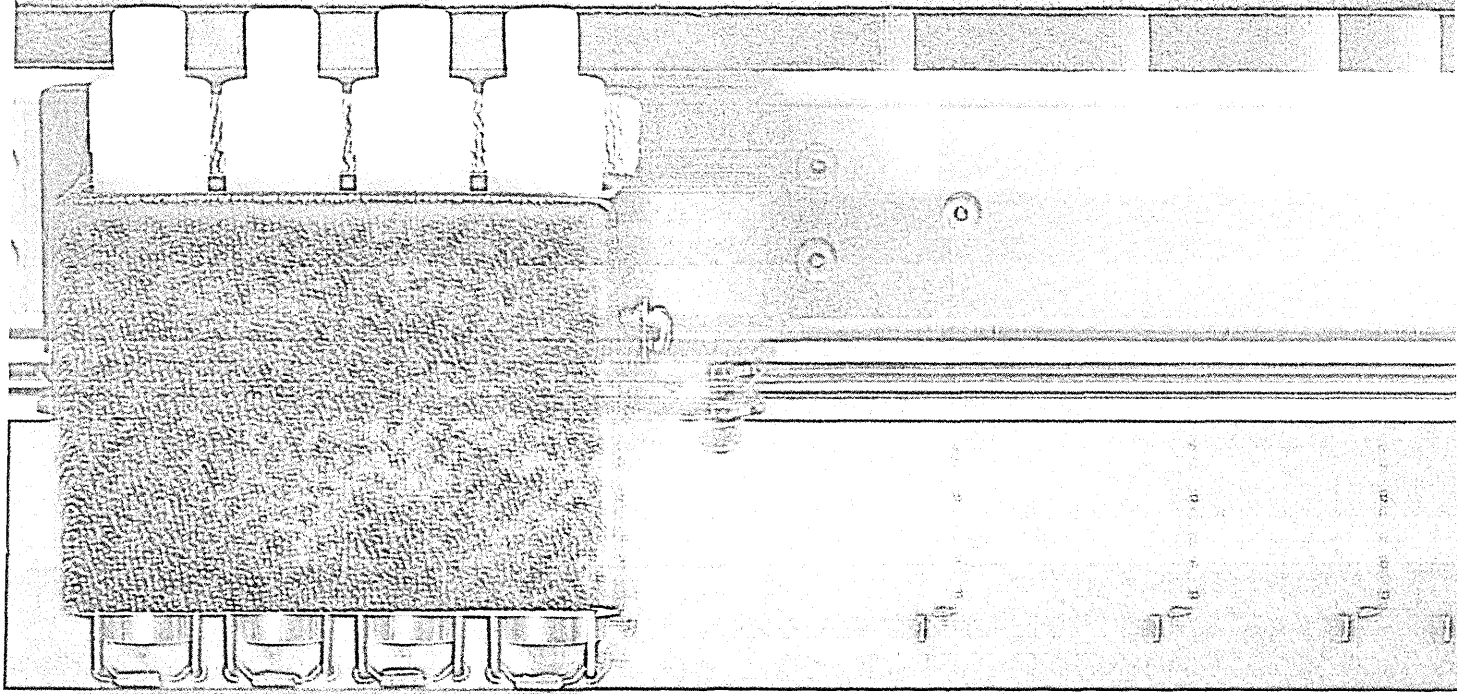
#### **PERSONAL/MICRO SURVEY**

"Personal Microcomputer Survey" is a 56-page report by Data Decisions, a New Jersey-based research firm. The report starts with a summary index of information on operating systems, cpus, number of users supported, basic configurations, hard disk capability, and prices. Product descriptions include classification, system software, applications software, systems hardware, display and keyboard characteristics, and pricing and support availability. The report is priced at \$25. Contact Data Decisions, 20 Brace Rd., Cherry Hill, NJ 08034, (609) 429-7100.

#### **PRINTS AMONG MEN**

"The 1983 Printout Annual" is now available from Datek Information Services Inc. The 100-page reference guide features a 1982 printer market report, detailing unit and dollar volumes in all printer technology areas. The company profile section contains background, product histories, and market activities of 34 printer manufacturers. Datek calls this the industry's "most complete printer product directory," which gives phone numbers and addresses of over

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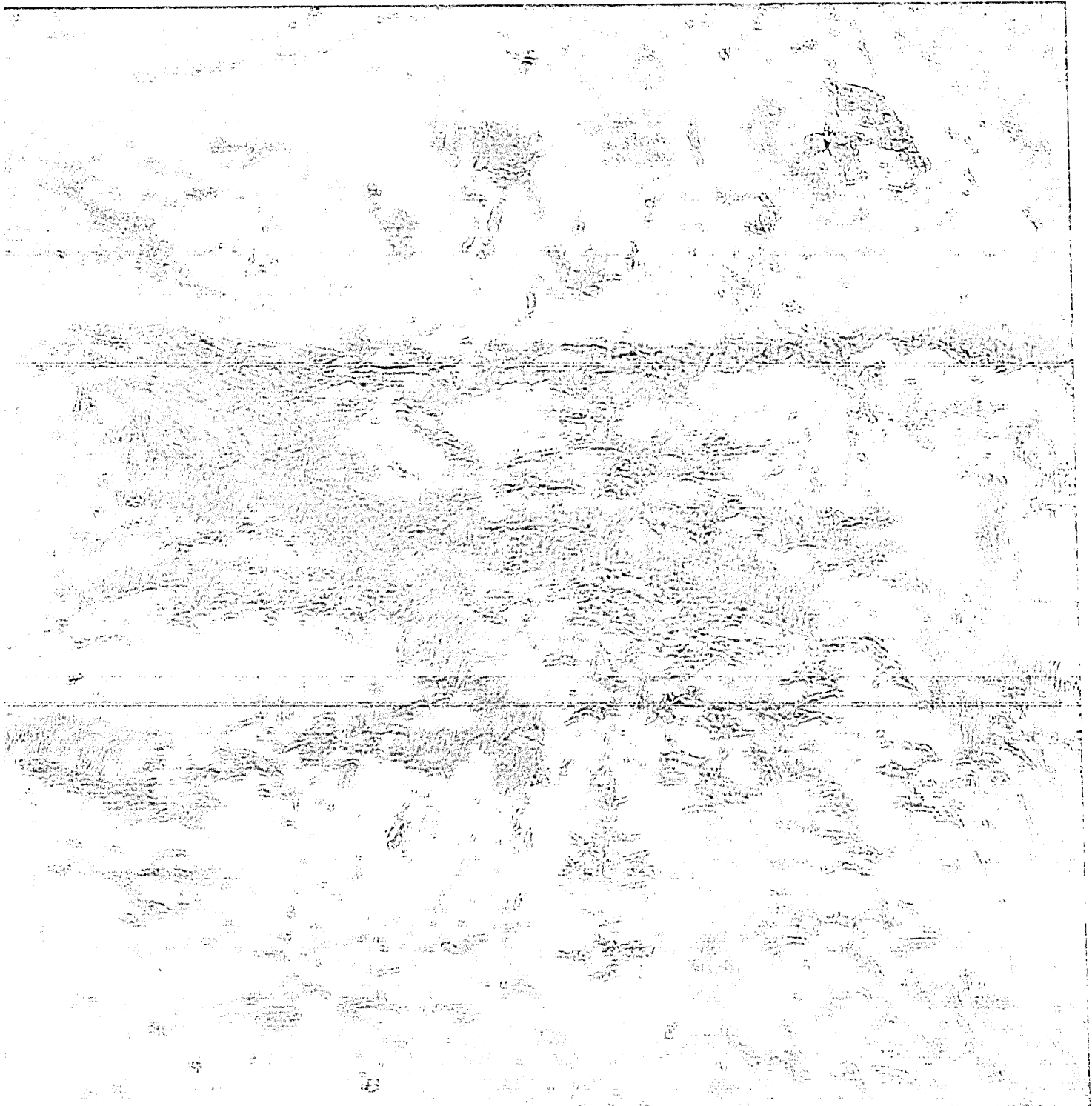
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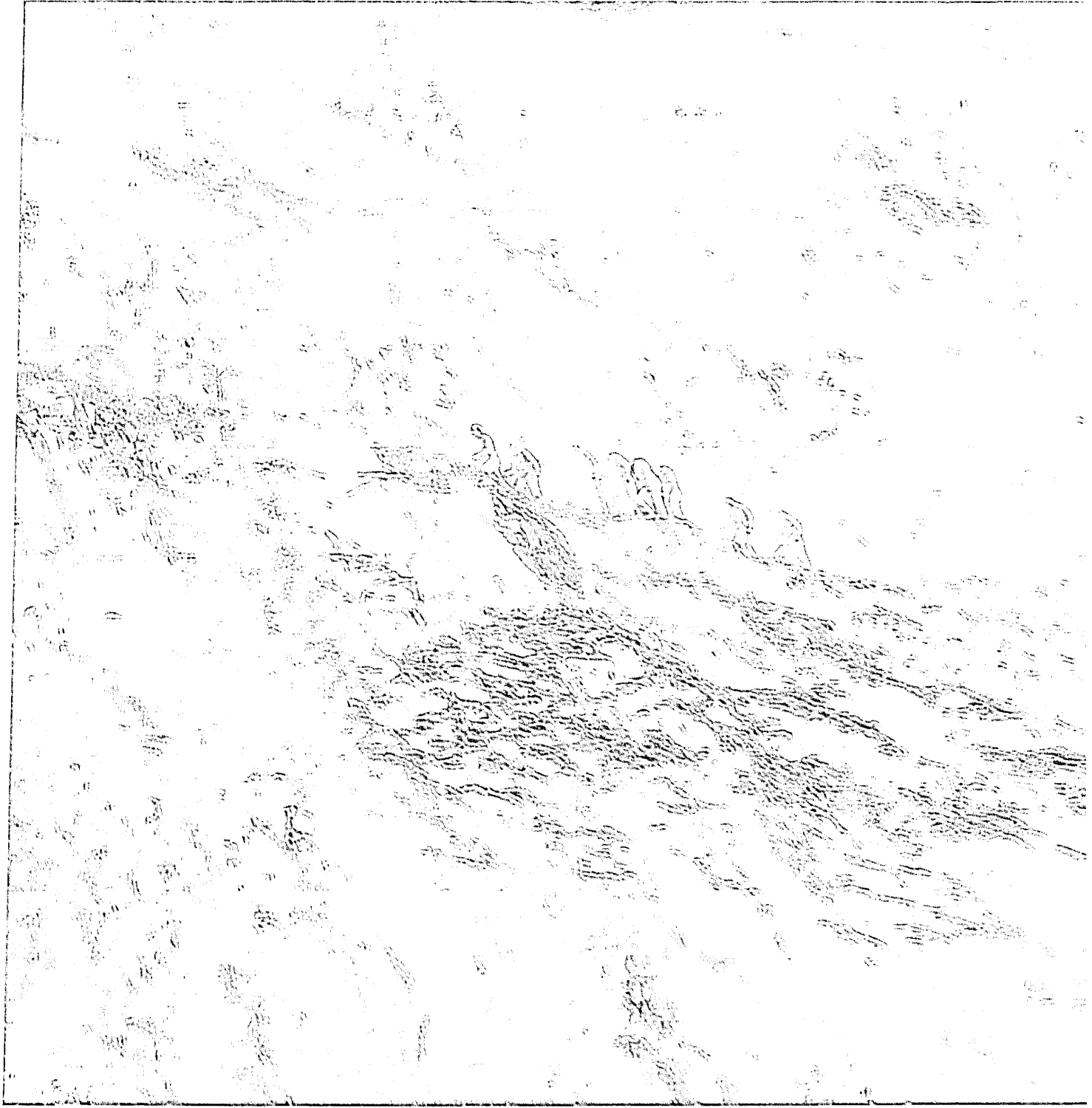
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## SOURCE DATA

140 printer manufacturers and the basic specs of more than 600 printer products. This is the third year the directory has been published, and, in addition to market analysis, it contains articles on printers in the computer store, high-resolution impact matrix printing technology and application case studies, and the growth of the intelligent copier/printer market. "The 1983 Printout Annual" costs \$25 in the U.S., \$30 elsewhere. Contact Datek Information Services Inc., P.O. Box 68, Newtonville, MA 02160, (617) 244-2290.

### ETHER OR. . . .

The second edition of the *Ethernet Handbook* is now available. The guide covers the benefits and costs of installing Ethernet, as well as how many vendors support it. Topics also include the affect of an Ethernet/ personal computer link on productivity in the office, and the latest developments from the IEEE 802 Committee on Ethernet. It includes selected product descriptions for over 509 vendors, Ethernet 2.0 specifications, articles on Ethernet and personal computers, and the marketing of Ethernet through retail stores. The 532-page book costs \$125 (\$100 prepaid) and can be bought from Shotwell and Associates, 130 Golden Oak Dr., Portola Valley, CA 94025, (415) 851-0077.

### SMALL SYSTEMS SOFTWARE

The "Small Systems Software and Services Sourcebook and Supplement" were designed to help readers determine which software would satisfy their individual needs. Information Sources, publishers of the book, organized it in a uniform manner for easy comparison, with important details about application, systems, database, word processing, graphics, and other software. The listings include operating systems, hardware, languages, prices and terms, number of installations, training, documentation, sources, and services. There are over 3,000 listings in these directories. Editions of both the sourcebook and its supplement are available for \$125. Contact Information Sources Inc. 1807 Glenview Rd, Glenview, IL 60025, (312) 724-9285.

## SEMINARS

### TECHNOLOGY UPDATE

Innovation, Entrepreneurship, Technology and Trade '83 (IETT '83) will be held Oct. 10 through 13 in Dallas. This conference and exposition is for companies interested in business opportunities derived from new and available technologies. IETT '83 is sponsored by Control Data Corp., with help from the U.S. Department of Commerce, the Small Business Administration, Texas A&M and Southern Methodist Universities, the International Trade Association of Dallas, and others. The show will feature seminars and exhibits describing technology op-

portunities to help companies, universities, and communities improve or create new products, revenue, and jobs through the process of technology transfer. The emerging technology workshops will feature sessions on developing technology in chemical and biomedical engineering, electronics, materials, information and office automation, energy, manufacturing, and packaging technology. The entrepreneurship seminars will examine the details of starting a high-tech business. Other seminars will cover buying and selling innovations, technology transfer in the international arena, emerging technologies, and government roles in technological business establishment and expansion. Registration costs \$125; contact IETT '83, P.O. Box 0, HQV005, Minneapolis, MN 55440, (800) 328-1870.

### ART ATTACK

The third annual Symposium on Small Computers in the Arts will be held Oct. 14 through 16 at the University City Holiday Inn in Philadelphia, Pa. Attendance is limited to 300 to provide an atmosphere that will encourage interaction among the participants. Events at the symposium include the sixth annual Philadelphia Computer Music Concert. It is sponsored by the Small Computer Arts Network, the IEEE Computer Society, IEEE Philadelphia Section, Delaware Valley ACM/SIGGRAPH, and is held in cooperation with ACM SIGGRAPH. Registration for three days is \$65, which includes exhibits, the concert, and a copy of the proceedings published by the IEEE Computer Society Press. For information write Symposium, Box 1954, Philadelphia, PA 19105, or electronic mail to SOURCE ID TCH 163, COMPUSERVE 73125, 165.

### MANUALS MADE EASY

PromptDoc Inc. is offering a one-day seminar entitled "How to Write Better Software User's Manuals, Faster." The course is designed for software authors, and MIS management, software marketing managers, and anyone who develops or manages documentation. The seminar costs \$195 and includes a comprehensive documentation development manual and lunch. The course will be held Oct. 11 in Seattle at the Sheraton-Renton Inn, and Oct. 13 in Los Angeles at the Century Plaza Hotel. For more information contact PromptDoc at 833 W. Colorado Ave., Colorado Springs, CO 80905, (303) 471-9875.

### NET WORTH

Systems Technology Forum has a three-day seminar entitled "Network Management and Control," designed to help you improve network reliability, availability, and maintainability. The course presents an in-depth discussion of the tools and techniques required to successfully manage the operations of a data network. The seminar will be held Oct. 24-26 in Washington, D.C. For

more information, contact Systems Technology Forum, 9000 Fern Park Dr., Burke, VA 22015, (703) 425-9441 or (800) 336-7409.

### PHONE HOME IN COLOR

The Institute for Graphic Communication is presenting a three-day conference on "Multi-Media Teleconferencing" at the Andover Inn in Andover, Mass. The event will explore current teleconferencing applications and systems to provide attendees with a working knowledge of what teleconferencing is and how to use it. For more information contact Richard D. Murrery, Director of Conferences, Institute for Graphic Communication, 375 Commonwealth Ave., Boston, MA 02115, (617) 267-9425.

### CAD AT THE BEACH

Automation Technology Institute Inc. will hold the Fifth Symposium on Automation Technology in Engineering Data Handling and CAD/CAM, Nov. 2-4 in California. In addition to exhibits, the conference will offer tutorials on CAD/CAM, business graphics, and graphics design; technical sessions addressing state-of-the-art applications in defense, business, and industry automation; as well as defense, automation groups addressing problems arising in weapon systems engineering data handling. The conference will be held at the Monterey Conference Center, Monterey, Calif. For more information contact the Automation Technology Institute, P.O. Box 242, Pebble Beach, CA 93953, (408) 624-5892.

### JUST BECAUSE

The theme for the CAUSE '83 conference, held in San Francisco on Dec. 11-14, will be "Information Resources and the Individual." The conference promises to analyze the changing environment that institutions will face as a result of information processing capabilities in offices and departments throughout colleges and universities. It will attempt to provide a forum for discussing the special problems and opportunities that challenge managers of the information resource in higher education. Contact CAUSE, 737 29th St., Boulder, CO 80303, (303) 449-4430.

## PERIODICALS

### COM TRENDS

Economics and Technology Inc. publishes a monthly newsletter devoted to regulations in the telecommunications industry. The publication, *Trends in Communications Regulation*, reports on current issues, future developments, and the impact of federal and state regulatory proceedings on telecom services. With your subscription, you will also receive 53-page report on the AT&T antitrust settlement. A one-year subscription to the newsletter costs \$145 for the

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Menus of features and functions, visual prompts and terminal-resident soft keys guide even novice data users through correct operation easily. And soft keys can also be downloaded from your host computer for single key activation of program commands. As an advanced business telephone, the Displayphone unit brings the convenience of voice features such as directory dialing to data calls, and allows simultaneous voice and data communications.

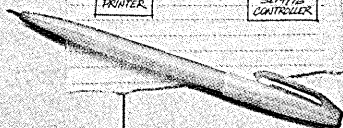
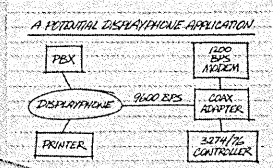
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It is an asynchronous terminal that can also be configured to operate in IBM 3270 and other sophisticated computer environments. This flexibility gives users high speed access to a full range of corporate and public data bases.

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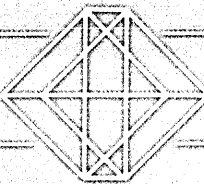
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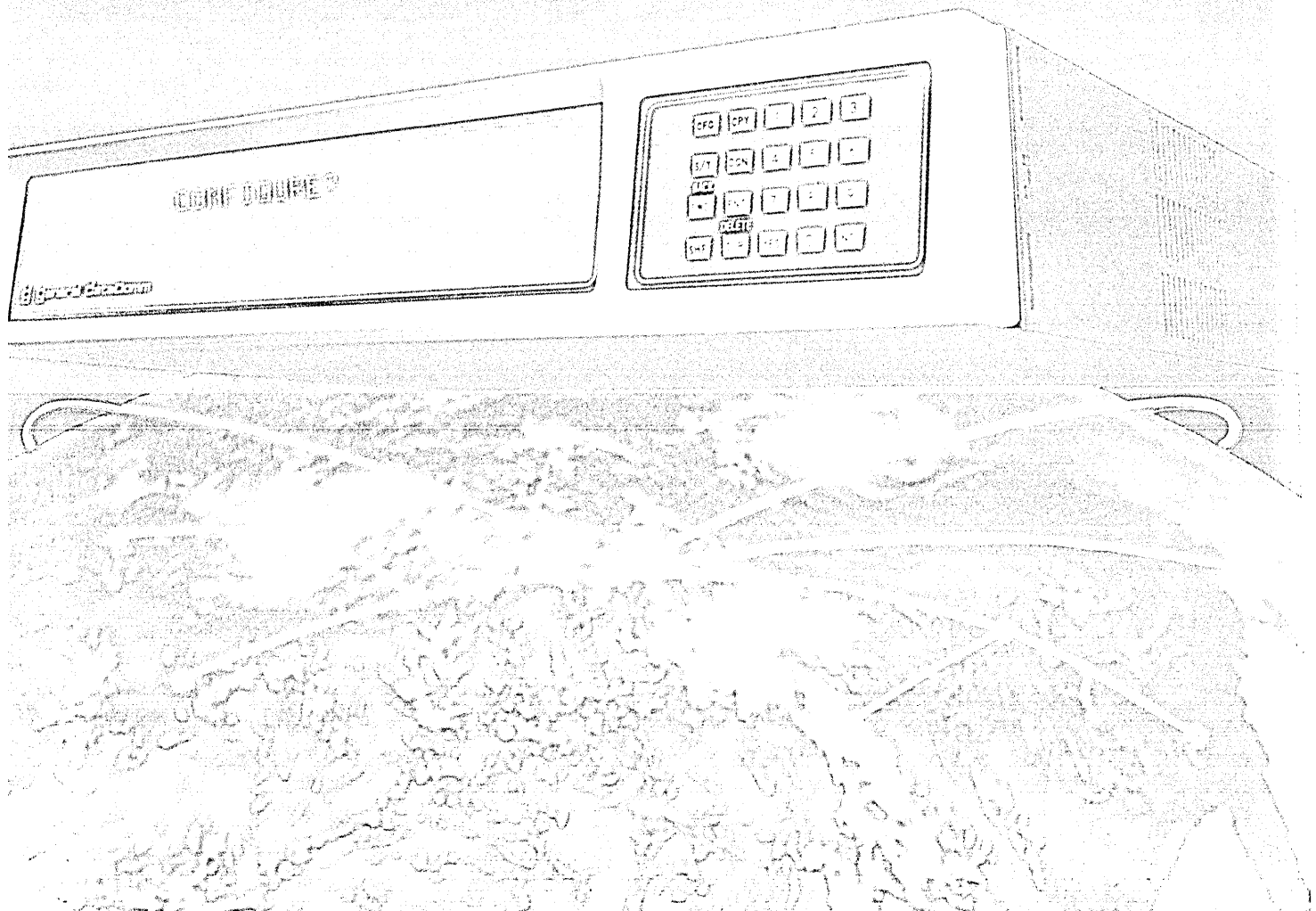
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### ABACUS IN TECHNOLAND

A new journal for the computer professional makes its debut this month. Entitled *Abacus*, the journal aims to probe "the social, economic, political and ethical impact of the rapidly changing world of computing." Articles contained in the first few issues will include such titles as "Why Computers Can't See (Yet)," "United States vs. IBM: An Exercise in Futility?" "The Human Rights of Computer Scientists," "Digital Filmmaking," and "Languages for Teaching Computer Science." Springer-Verlag New York Inc., publisher of the journal, plans to explore the state of the art while entertaining and educating its readers. *Abacus* will have regular features on personal computing, computers and the law, plus book reviews, editorials, and challenging computer problems and puzzles. The journal will be published four times a year, and subscriptions are \$18.95 per year for the first 10,000 subscribers. Contact Mark Langweiler, Springer-Verlag New York Inc., 175 Fifth Ave., New York, NY 10010, (212) 477-8200.

### PERSONAL COMMUNICATIONS

A communications magazine for personal computers will premier in November. *Micro Communications* will focus on all aspects of microcomputer communications and will cover the developments in on-line

databases, micro to mini/mainframe communications and terminal emulation, local area networks, and communications hardware and software. The magazine will have an initial circulation of 25,000 with a cover price of \$2.50. For more information contact Marshall Freeman, Miller Freeman Publications, 500 Howard St., San Francisco, CA 94105. (415) 397-1881.

### TEL THE WORLD

Telecom Library Inc. publishes a magazine called *Teleconnect*. Professing to be the "voice of the telephone interconnect industry," the magazine claims one simple mission—to help its readers make more money. Regular features of the magazine include the Insider's Report, a look at people in the industry, where they're going and why; companies and installations; innovations; news on products and services; and others. A one-year subscription to *Teleconnect* is \$15. Contact *Teleconnect*, 205 W. 19th St., New York, NY 10011, (212) 291-8215.

### MEMORY VISION

*The Optical Memory Newsletter Including Interactive Videodisks* covers topics such as interactive video simulations and their production, digital draw developments, image storage news, read-only developments, SALT conference highlights, and medical use of videodisks as shown by VMR. The bi-monthly newsletter contains "the latest developments" in the optical and interactive videodisk fields. *Optical Memory Newsletter*, Box 14817, San Francisco, CA 94114, (415) 621-6620.

## VENDOR LITERATURE

### ERGONOMIC FURNITURE

Data-MATE has just released a new brochure on the subject of fatigue from operating computer terminals over long periods of time. The brochure features its line of ergonomic furniture, DATA-MATE, Nashua, N.H.

**FOR DATA CIRCLE 350 ON READER CARD**

### LOCAL AREA NETWORK

Micom's Instanet Local Area Network is the subject of a new eight-page brochure. It examines local area networking applications, and notes that most users share the problem of providing orderly access for a number of asynchronous terminals that connect to one or more computers. MICOM, Chatsworth, Calif.

**FOR DATA CIRCLE 351 ON READER CARD**

### COMPUTER BOOK CATALOG

The fall '83 catalog of books is now available from Osborne/McGraw-Hill. The 24-page brochure describes all of its publications, including 12 new books and five DiskGuides. The catalog covers the whole product line, including general interest books, user guides, programming handbooks, assembly language, and technical reference titles. OSBORNE/MCGRAW-HILL, Berkeley, Calif.

**FOR DATA CIRCLE 352 ON READER CARD**

### FIRING LINE

The University Research Center Inc. has compiled a report on the latest trends that counter employers' right to fire employees at will. The booklet offers preventive advice aimed at reducing the growing number of damage suits filed by employees. UNIVERSITY RESEARCH CENTER INC., Chicago.

**FOR DATA CIRCLE 353 ON READER CARD**

### DIRECT TO YOU

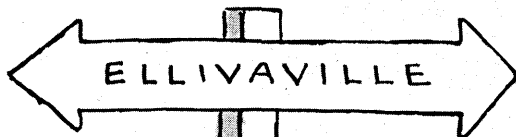
The new summer 1983 edition of DECdirect, a direct sale catalog, is now available. The 128-page catalog contains prices and descriptions of equipment available from DEC's Installed Base Group, including accessories, supplies, terminals, and documentation. DIGITAL EQUIPMENT CORP., Merrimack, N. H.

**FOR DATA CIRCLE 354 ON READER CARD**

### MEMORIES

"Memory Products from Systems That Can't Stand Failure" is the title of a new brochure from Vermont Research Corp. The six-page brochure covers the company's complete line of memory products—head-per-track drum memories, eight- and 14-inch cartridge drives, and compatible controllers and interfaces—covering a capacity range from 4.7 to 52 megabytes. VERMONT RESEARCH CORP., North Springfield, Vt.

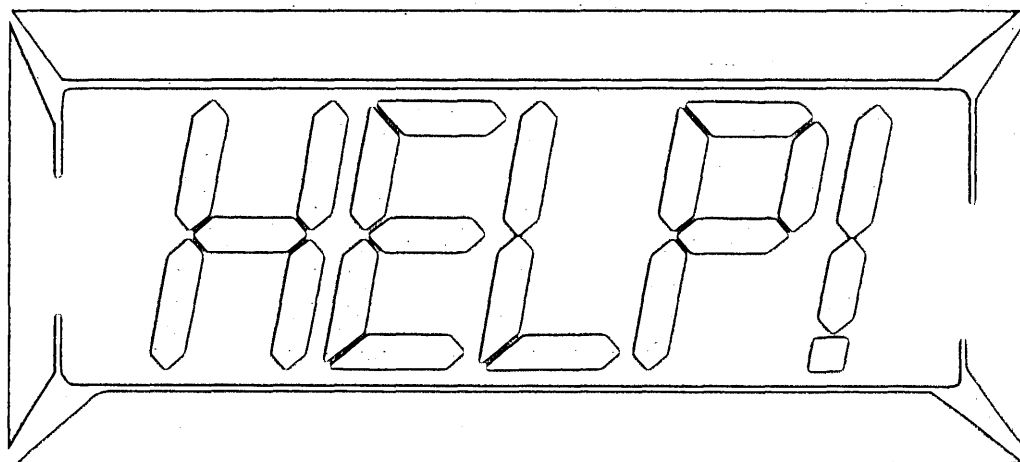
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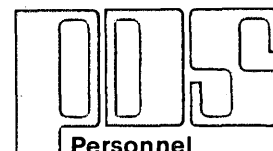
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## Employment Scene

# ON THE JOB

### COUNTERPOINT

The computer's down again; whom do you call? Your vendor, of course, and they send the same person you've been dealing with for six months, the one with the funny little mustache: your field engineer (FE). You know him well—you've seen pictures of his wife and kids, and heard all about his vacation (though you find his fish stories a bit hard to believe). This man—call him John Smith of Big Systems Corp.—is a hard worker. He is also quite knowledgeable about his company's equipment. Each year, for at least a couple of weeks, he leaves his family, goes to school, and learns how to repair his employer's latest innovations. Some FES, especially the new ones, may find themselves away from home up to three months a year for training. Along with being on call when scheduled, he may be told at any time, "you're on call tonight," so his personal life must remain flexible. Since he works for one of the larger dp vendors, Smith makes monthly preventive maintenance calls (PMS) in addition to his daily service calls. These average out to a couple of PMS per day, but he sometimes falls behind when he receives a lot of service calls. Don't get too antsy if he isn't there exactly on the 30th day; he'll be there just as soon as he can.

Some of the things Smith and his peers have seen on service calls might surprise you. Smith tells of a "system down" complaint that came in during the winter a couple of years ago. As an economizing measure, this particular user shut down its heating system on weekends. When Smith got there, he pulled the board out of the processor and saw two tiny eyes staring at him. A rat, seeking warmth through the cold weekend, had made its nest inside the processor. Well, that's not the type of foul-up you can reach in to repair, so Smith began poking a coathanger in the airholes on the side of the machine to chase the rat out the back. No luck. After several futile attempts, Smith told his user that what he needed was an exterminator, not an FE.

Smith has also encountered mouse-crashes. But four-legged creatures aren't the only ones that cause downtime. Smith recalls the time when another FE was repairing a crt for a government agency. A citizen, discouraged by the long lines he'd been waiting on, threw a perfectly good crt against the wall. Smith's crony worked longer on that job than he'd anticipated.

Another favorite story: when the FE arrived to make a service call, he was greeted by a hysterical user whose processor, crt, and disk had vanished. Later, police found the remains stripped and abandoned on a lonely roadside.

Sometimes FES worry for their personal safety. Smith recounts a case in which the user was so irate because of extended downtime that he wouldn't let the FE leave until his computer was up and running. When the FE said he had to go back to the office for parts, the user blocked the door and said, "You can't go, I won't let you, I know you won't come back." Finally, the FE called his boss, who told the user that if he didn't set the FE free immediately, the police would be called. It worked, and after two hours as a hostage, the FE was released.

For the most part, Smith finds his users easy to get along with. But, he says, their politeness is directly proportional to the amount of uptime they've been having. And, since he had an editor's ear, Smith decided to point out a few of the most common mistakes he's encountered.

The sign in your shop that says "No food or beverages allowed near computers" should probably be enlarged. Smith has seen many cases where soda spilled onto keyboards and then leaked down to the circuit boards and dissolved part of them.

Keep paperwork off the equipment. You're guaranteed another service call when the paper clips and staples wind up inside keyboards, crts, and circuit boards.

Before the call goes in for service, make sure—especially if you have many users on the same equipment—that 1) the printer has paper, 2) the crt is plugged in, 3) the processor's lock is off before you say it won't boot, and 4) that you've turned up the intensity on your crt before claiming you can't see what's on the screen.

Remember that most FES have a wide range of equipment to work on; they can't be experts on each and every piece. So if your FE is having a hard time and you see him on the phone, realize that he's getting technical expertise from someone whose specialty will resolve your problem.

Smith and his coworkers want you to know that they probably have more pressure on them than you do to get your system up and running, and to keep it that way. After all, they're working for two parties, you and the vendor.

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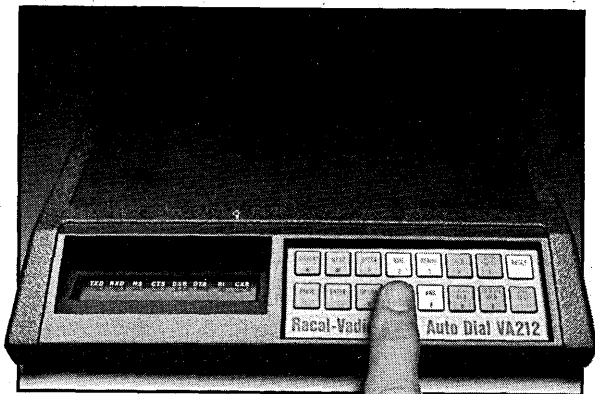
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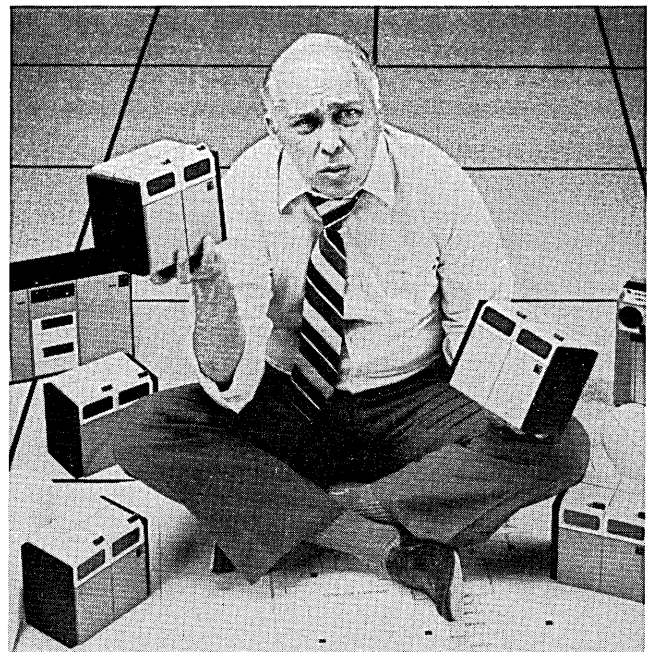
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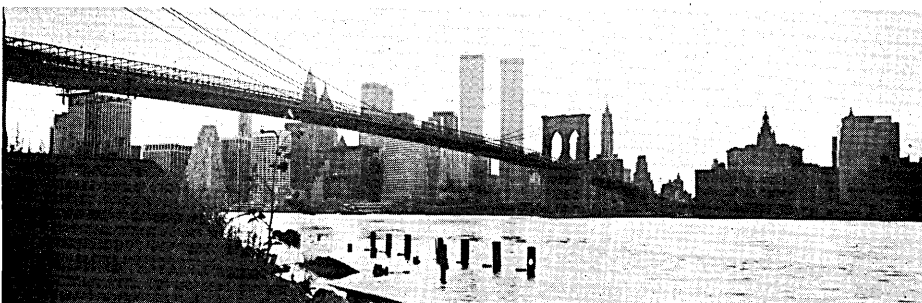
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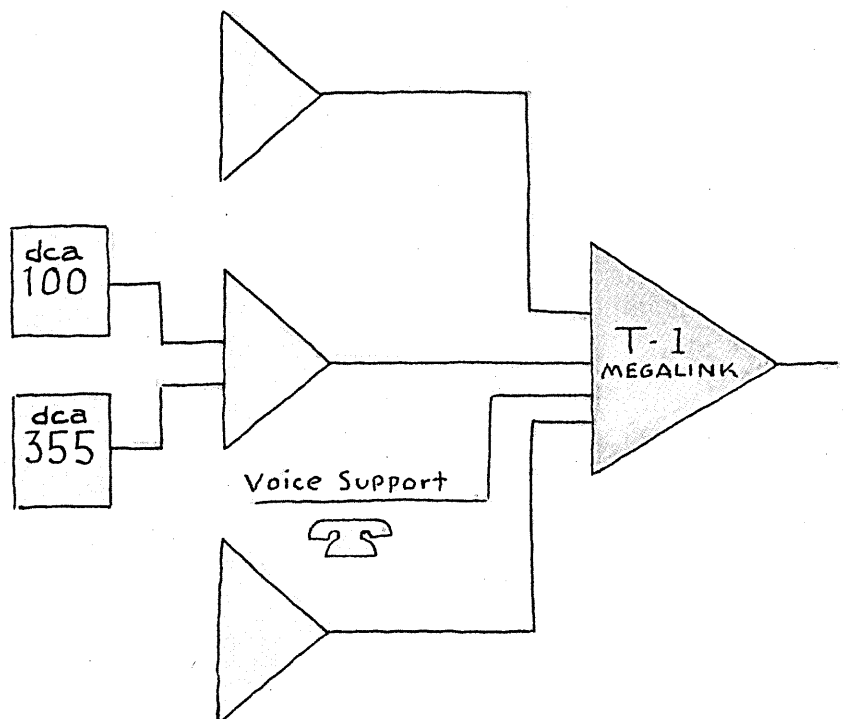
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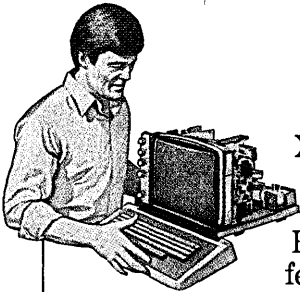


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# READERS' FORUM

## THE MOUSE TRAP

Because the microcomputer market is poorly understood, we often compete with important-sounding technology and catchy phrases that are more impressive than functional. The microcomputer industry is in the throes of intense competition for the consumer dollar.

The current example of this phenomenon is the "mouse," a small wheeled box that sits beside the computer. The operator rolls the mouse around on the desk surface, and the computer's cursor (which indicates position on the screen) moves accordingly. The mouse is cute. The mouse is simple. The mouse is easy to use. But does the mouse represent the wave of the future? Probably not.

It is merely one of a number of alternative input devices that are being explored, such as light pens, joysticks, trackballs, touch-sensitive panels, touch-sensitive screens, and voice recognition. It is alleged that these devices will accomplish two significant goals. First, they will cut down the training time normally required by a computer novice to get up to productive speed; and second, they'll lure those in the business community who still suffer from technophobia into the ranks of microcomputer converts.

Most of these devices are electromechanical, and hence more subject to wear, abuse, and malfunction than the purely electronic components of a computer system. This is a general rule. There's no guarantee that the disk drives that come with most computers are any more or less reliable than mice. The addition of one more electromechanical device, however, means the addition of one more potential problem to a computer system.

The mouse is unique in that it requires a certain amount of flat, unobstructed surface area adjacent to the computer. The mouse needs a relatively large area—certainly the size of a sheet of typing paper—any smaller and the limits of human coordination are felt. Desk space is already cramped enough for most office workers; is it reasonable to expect room for a mouse?

When entering data at a keyboard, use of almost any alternative input device means an interruption of the work flow and a series of hand position changes. The mouse is the major offender here, while other devices are little better. Touch sensitive panels and screens require a series of gestures as the operator traces his moves with a fingertip. Track balls and joysticks (cursor positioning devices borrowed from the world of arcade video games) could certainly be incorporated into an enlarged keyboard, but the operator would still have to move away from the keys. Eye-hand coordination is also a difficulty. Only the light pen and the touch-sensitive screen allow for exact one-to-one positioning of the cursor; all the other devices demand precise coordination that can be both annoying and time consuming. Are any of these solutions a major advance over the arrow keys on most modern keyboards or the detailed one-keystroke-per-option "menu" displays found in much of the business software?

The speech recognition devices now under development offer a partial solution. Unfortunately, they are a long way from perfection and at this time can only "understand" a limited vocabulary from a small number of speakers. Imagine shouting "indent!" at the start of every paragraph as you type a letter—that's about the best we can do at the moment. Until the day dawns when a computer can take dictation as well as be a stenographer, voice recognition will not be a useful approach.

The notion that alternative input devices are "the coming thing" is based on the belief that resistance to computers is dependent on the machinery itself. "If we could somehow make the keyboard easier to use," this reasoning goes, "then people would have less antagonism toward computers."

The argument is fallacious. The middle-level executives who need the speed and power of modern computers, as well as the typists and secretaries using word processing equipment, do not seem particularly upset with keyboards and video screens; nor do the thousands of children receiving computer aided instruction in our schools. If anything, it's the software that causes problems, not the hardware. Novices are confused by unfamiliar jargon, commands, and new ways of thinking about habitual tasks.

The success of most mouse-driven systems depends as much on clearer, more understandable programming, as it does on the mouse itself. This sort of program design and implementation is being developed for systems minus the extraneous gadgets, and they've been well received by the user community.

Do high-level managers reject computers because they are difficult to use, or are they merely rejecting the impression of doing "work" (the tasks they hire others to perform), in the same way that they avoid shuffling papers? If indeed the latter is true, then alternative input machinery is not about to appear on corporate desktops, unless some mystical status can be attached to them, similar to that accorded to ridiculously high-priced automobiles. In fact, much of the advertising directed to this group is predicated on just such an appeal to conspicuous consumption—not on the simplicity of operation.

On lower levels of the corporate ladder, will alternative input have a pronounced impact on training? Here, the reviews are a bit more mixed. It is possible that introductory sessions on a mouse-equipped computer will ease the process of first-time use by making it more fun than typing. Keyboards, however, represent the only means of high-speed data entry at present; any mouse training will have to be supplemented with retraining on the keyboard. Will this double training be less time consuming than starting right away with keyboard instruction?

Alternative devices do make some sense as training aids but not as an adjunct to mastering computer skills. The administration of a computer-based multiple-choice test could be quicker if the test-takers did not have to familiarize themselves with computer keyboards. On the other hand, most of us have little trouble typing in responses when necessary.

## READERS' FORUM

What about graphics? Alternative devices can trace curved lines, while keyboard arrow keys are restricted to an x-y coordinate grid, true. But for professional applications, the software already exists to convert statistical data into meaningful visual representations—graphs, charts, etc.—in a wide variety of colors. Freehand drawing does not have much use in a business environment. For art and design training, alternative input could work, but selection of variables like line thickness and color would still have to be specified on a keyboard.

Computer technology is advancing by leaps and bounds, and most professionals have been quick to realize the advantages of computing for productivity and efficiency. Judging by market penetration, much of the antipathy toward computers seen just a year or two ago has dwindled away to almost nothing. Computers have become a common item in the business environment; hurdles such as staff fear and corporate resistance are disappearing as the benefits become more apparent. The purely manual operation is on its way out—computers and data processing are no longer a trend for the indeterminate future—they're part of the present.

There are many obstacles to overcome. We have just begun to tap the potential of this new resource. We're still thinking in terms of easing the familiar burden of paperwork, not exploring new horizons. But this will change.

Alternative input devices are presented as the perfect way to fight a battle for computer acceptance that has already been won. Computers are everywhere in business and they're creeping silently into our homes. Our children use them constantly with no questions about "user friendliness" or "human-engineered interfaces." They accept computers for what they are—computers.

The mouse and its friends are merely diversions in this process. What sounds revolutionary does not necessarily help anyone with anything, and therein lies the true test of commercial longevity. We will be fascinated with mice for a while and then move on to the real issues.

The entire history of computer development, if one will forgive an old metaphor, has been an ongoing process to design a better mousetrap.

—David A. Kay  
Solana Beach, California



"A businessman's lunch and a fish dinner."

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Dr. Ratigan received his BSEE from California Institute of Technology in 1965, with a cumulative GPA of 3.998/4.0. In his first professional position, he worked for Control Data Corp. as a computer design engineer from 1966 until 1970. In connection with his duties for CDC, he singlehandedly designed and implemented the first CDC Star, a pipelined processor capable of execution speeds approaching 100 MIPS.

Isn't that impressive? Beginning to get some idea of the person who is being presented for your consideration? But that's not all! That's only part of the astonishing package of talents you're investigating. Evaluate these features in view of your company's needs:

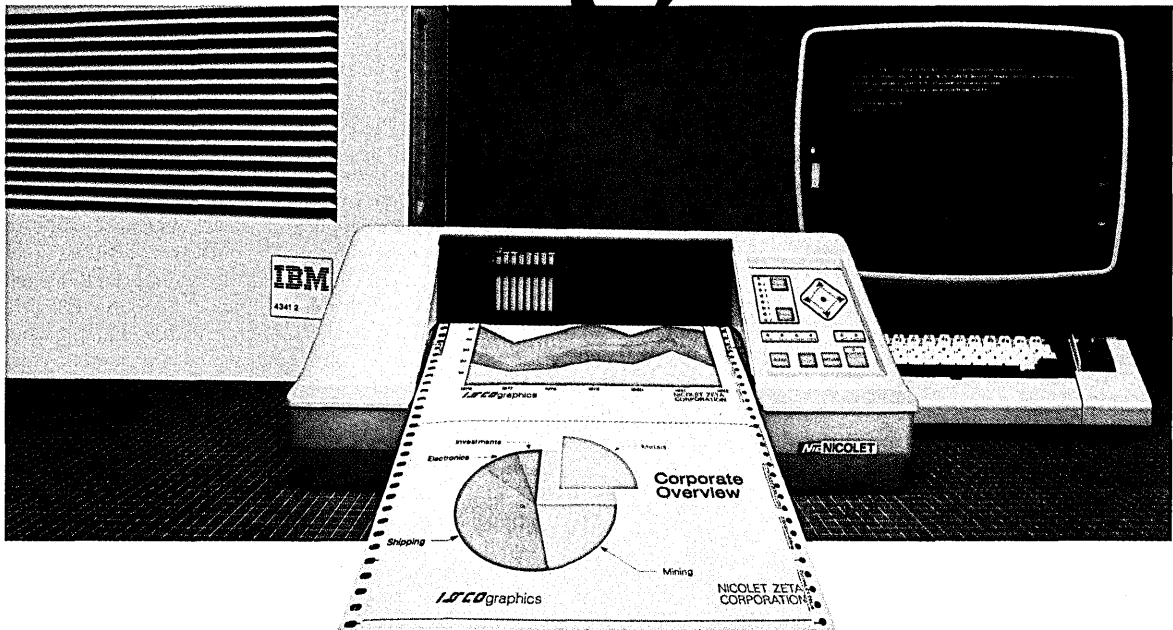
Dr. Ratigan received his master's degree in computer science from Massachusetts Institute of Technology in 1971. The title of his thesis was "The Best Design of an Operating System for Any Large Multiprocessor System." In his second professional position (from 1971 to 1974) Dr. Ratigan designed and implemented for the Nuclear Regulatory Commission an integrated network operating system for a complex of 14 tightly coupled heterogeneous large mainframe computers (two Univac 1108s, two IBM 370/168s, three XDS Sigma 9s, etc.). The operating system was optimized for a specific application; hence, design of the operating system required Dr. Ratigan to perform a detailed design of the application programs as well. This application required the solution in real time of a system of 200,000 simultaneous differential equations with 200,000 unknowns, representing the core temperature in a fast breeder reactor. This solution was then used in a feedback loop by many of the available mainframes to control the fast breeder reactor used for experimental verification of various hypotheses.

Hoo-hah. This is quite a collection of skills, no? Now ask yourself again what you would be willing to pay for all this. Certainly has gone up, hasn't it? And you still haven't seen anything yet. Consider this:

In 1975 Dr. Ratigan was awarded his PhD in political science from Georgetown University. The title of his dissertation was "Optimal Usage of Data Communications Techniques for Restructuring Political Organizations." From 1975 until 1977, Dr. Ratigan was an independent consultant for International Telephone and Telegraph. In connection with his duties for ITT, Dr. Ratigan performed a thorough analysis of transnational data-flow patterns (current, anticipated, and unanticipated) in the Northern Hemisphere, including the political ramifications of increased data availability. He then designed a telecommunications network spanning the hemisphere that will remain unaffected under any possible political realignment of the 71 participating nations. He also specified the communications equipment, interfaces, and protocols to be used in this network to meet current, evolving, and future North American and Europe-

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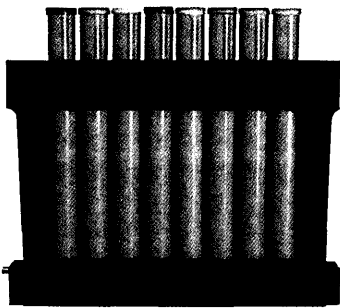
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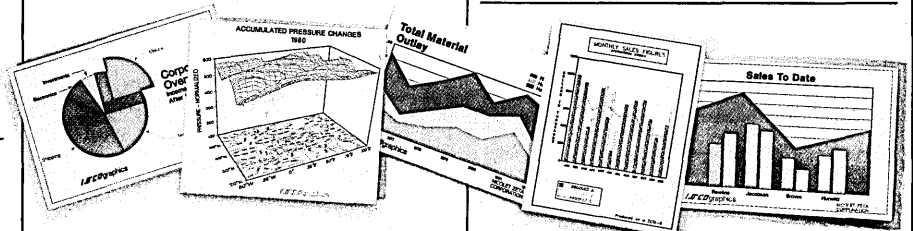
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Last year, drawing upon his multitasking background, Dr. Ratigan designed and implemented a microprocessor-based handheld video game that was an immediate success in all civilizations based upon the Judeo-Christian ethic. Dr. Ratigan then designed and implemented an arcade version of the same game that can be connected to as many as 255 other such games. He also upgraded the handheld version to have this same extended capability. He then established a network of video arcades throughout the Northern and Southern Hemispheres, which ensures that everyone can compete with players throughout the world with absolutely no degradation in game response time under any combination of interplayer distances, team sizes, or political realignment of the various nations housing the arcades.

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—David A. Cohn  
Littleton, Colorado

# THE EVOLUTION OF COMPUTING ORGANIZATIONS

For nearly 10 years forecasters have been saying that computer hardware is getting cheaper at the rate of 25% to 30% per year. Those forecasts were right, and by the looks of things, there are more improvements to come.

Managers and planners dealt with this environment by escalating applications development. They emphasized finding and training application developers and then managing their efforts for the highest productivity. Even so, hardware gains have not been matched by gains in application development.

The trouble with this approach is that it treats the 25% to 30% annual change as a quantitative, incremental thing and fails to recognize that it will change qualitatively, too. So today's computing handling resembles the computing of 1973 at all. Changes have occurred in who uses computing, who buys computing, what people demand of computing, and what people expect of computing organizations. What's more, we anticipate even more fundamental and qualitative change during the next five years.

Computing organizations have not changed qualitatively. They are basically the same as they were in the mid-1970s, with functionally oriented application development units and supported by computer centers and staff groups. It seems safe to predict that computing organizations will change, and perhaps it's time we speculated a bit about how they will change in the next five to 10 years. I say speculate because qualitative change is not something one can predict with any large degree of rigor.

The term "computing organization" refers to the unit of a larger company that supports computing for the business. The question of how vendors will evolve has been treated amply by industry consultants such as Arthur D. Little and The Yankee Group, so it will be omitted here.

These forecasts are organized according to the major units of a computing organization as they exist today, namely:

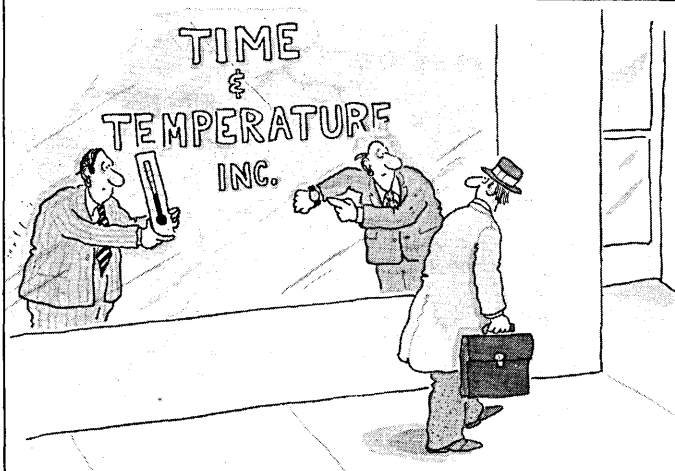
- application development (sometimes called "systems"),
- computer center (sometimes called "operations"),
- information center or other end-user support organization, and
- technology assessment, planning, or other staff groups.

The basic technology premises for these forecasts are that computers will continue to become cheaper, more powerful, and easier to use. The organizational premises are that more company departments will be demanding more hands-on access to computers. Some of this increased demand will be satisfied by expansions that computing organizations carefully plan and manage with the businesses' overall welfare in mind. The rest of it will be satisfied despite the computing organizations, and at their expense.

Application development was the glamour area of computing in the late 1970s. It was staffed with young, bright people who understood the needs of the business and who created computer systems to meet those needs. The emphasis was on business orientation. Understanding the technology of computers was of secondary importance.

The business emphasis at technology's expenses, was a reaction to failures of the '60s. In those days, computer people were fascinated with the machines. Predictably, they built many applications that turned out to be inadequate, ineffective, or even unusable in the business. In the 1970s, the assumption was that if one could understand the business problem, the application problem would be mostly solved.

In the late '80s there will be less need for computer people to understand the business because, for the first time, business

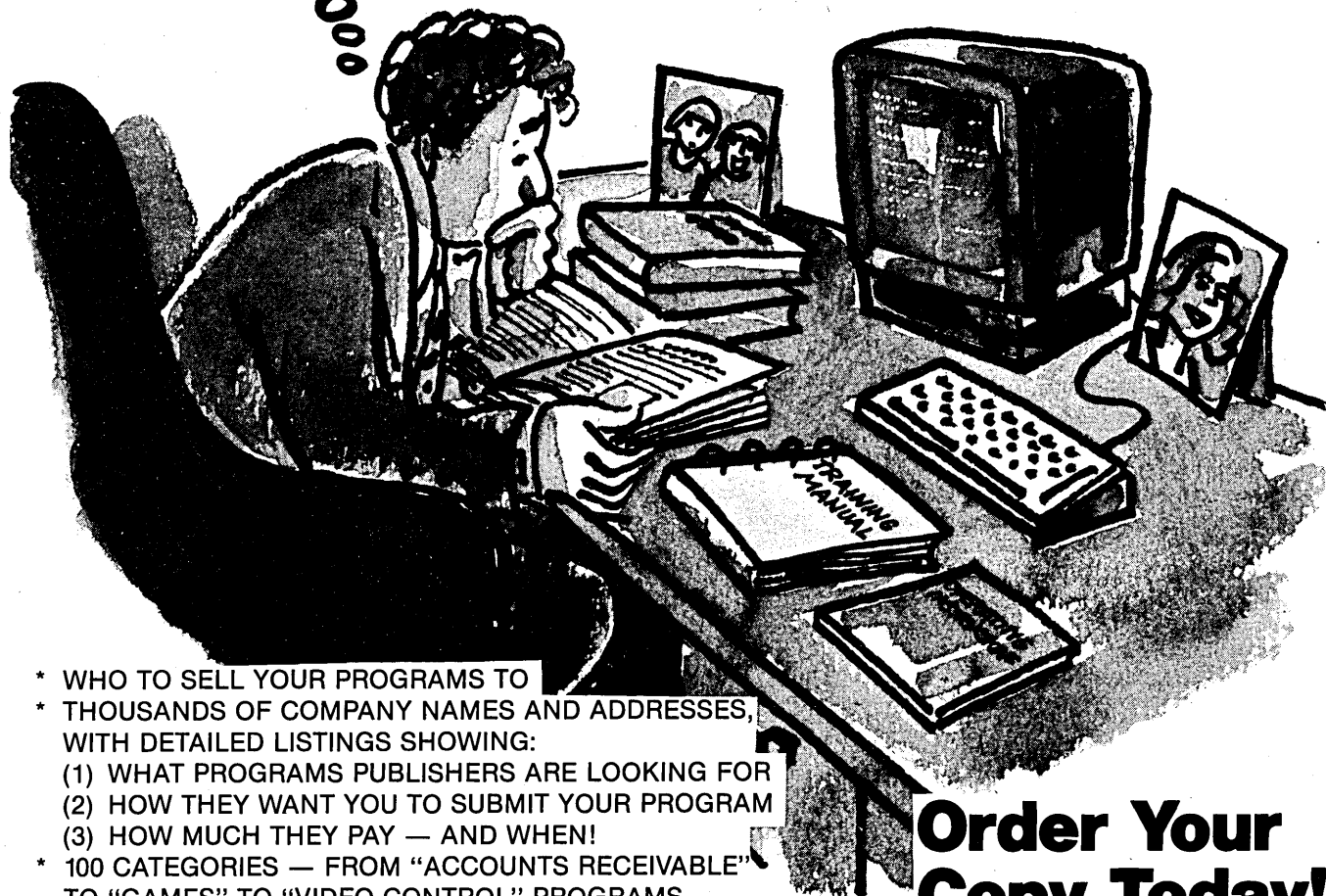


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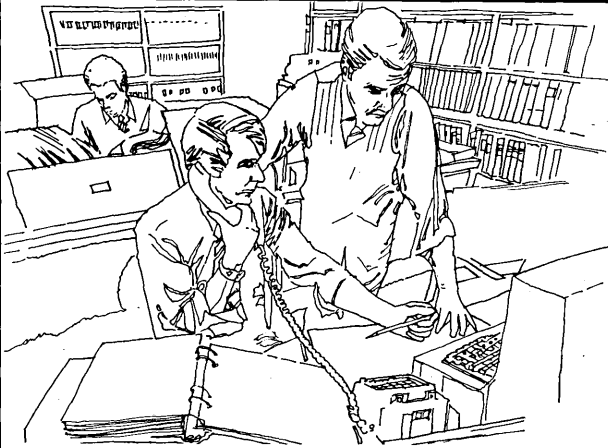
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people will understand the computer. This is not to say they'll become technically proficient, but computers will be easier for lay people to use. Many computing requirements will be met by individuals manipulating flexible and general computer tools; custom developed applications will often not be needed. This is what is meant by end-user computing.

What, then, happens to application developers? They'll still be needed because there will always be key aspects in any business that require custom treatment. For example, the applications to implement an airline reservation system, an automated bank teller system, or a worldwide command and control system will never be built by end users. Nor will such applications be available off the shelf. In addition, applications developers will be needed to maintain all of the applications written since the '70s. These old applications will still be needed by certain parts of the business. Maintenance isn't glamorous, but it is unavoidable. Thus, although applications developers will still be needed, their influence will decrease substantially from what it is today. They will no longer mediate all access to the company computer system, but instead be left with only a small part of it.

Certainly by 1990 there will be fewer application developers than today. In fact, it may not make sense for future applications developers to be part of a computing organization. Rather, they may be decentralized as parts of other business units where customs applications are most needed or where old applications must be maintained.

The application development unit of the future will be analogous to a freight train. Once, it was the ultimate, high-tech way to apply transportation technology to a business problem. Today, it is still ideal for certain specific assignments. But it represents a small part of the cargo transportation industry, and customers elect to use faster or more flexible means whenever practical.

Computer centers were the glamour areas of the '60s and early '70s. They were often encased in glass and placed conspicuously on display. To many programmers, the position of system programmer was something to strive for.

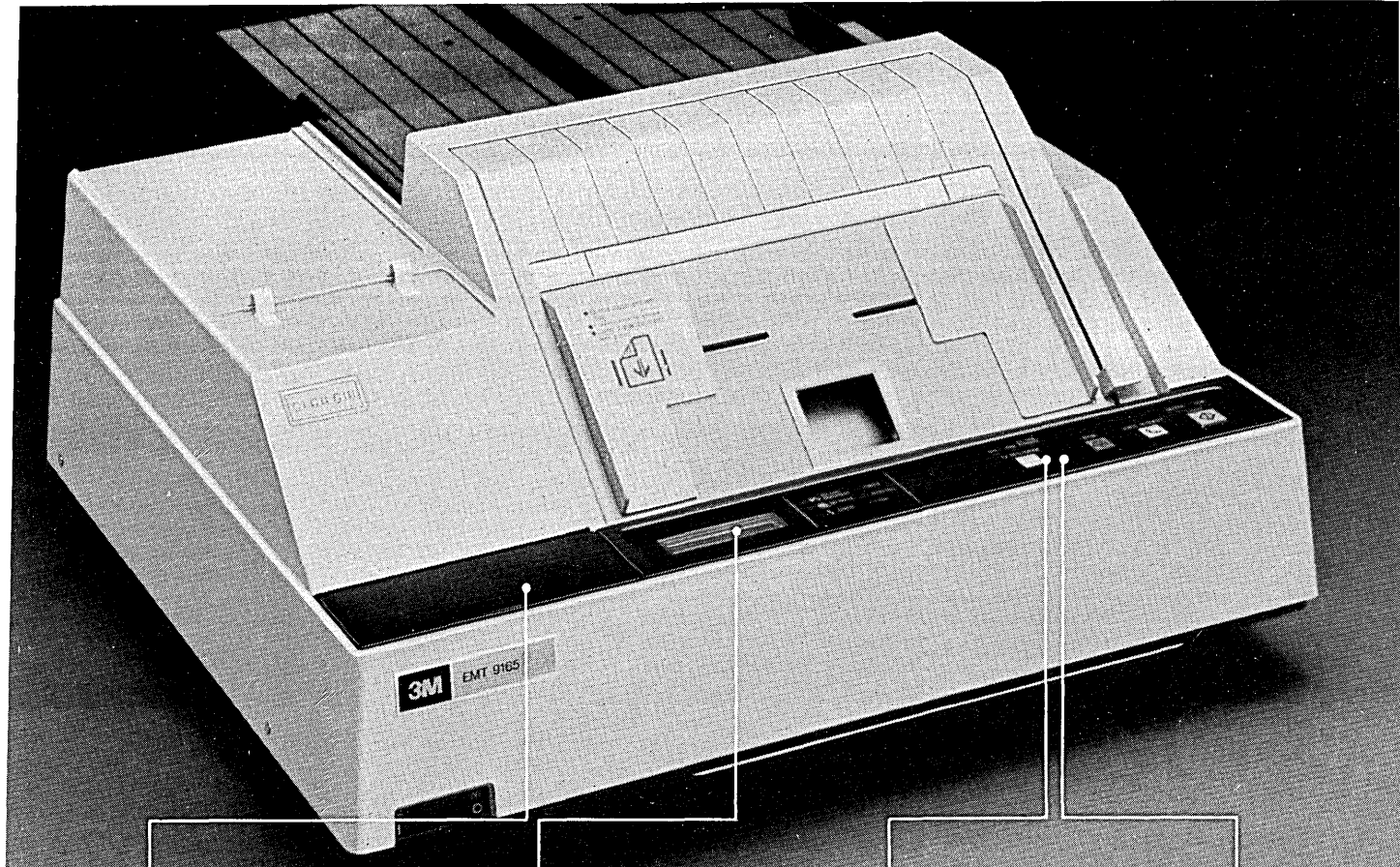
With the ascendancy of application developers in the late '70s, computer centers were seen more as engine rooms than as high-tech citadels. The glamour was now associated with those who were closer to the business. Technology, the computer center's stock in trade, was considered a secondary matter. It was the computer center's job to keep things running. If it succeeded, it was mostly invisible. If it failed, it was a clear target for the blame.

There is no reason to expect this trend to reverse. Quite the contrary, there are now forces afield that are decreasing the influence of computer centers. For one thing, hardware and operating systems have matured to the point that businesses no longer depend entirely on highly intelligent and creative computer center staffs. As a corollary, it is harder to attract quality individuals to computer centers.

Also, users now have many economic options for obtaining computer service. There are various minicomputers, personal computers, and workstations competing with the computer center's services. People usually choose a resource under their own control in place of a central service, whenever it makes sense to do so. This is particularly true when the central service is perceived as less than responsive to user needs. There seems to be a consensus forming that it doesn't "make sense" to have control of one's own printers or corporate databases, but it makes powerful sense to control one's own computer.

There is no doubt that computer centers and the people who run them will continue to be needed. Their primary role will be as custodians of the databases that management requires be kept centrally. They may have additional roles such as supporting distributed minis or personal computers, maintaining printing services, or acting as a central hub for datacom, but their work will be almost totally operational. They will be neither glamorous nor influential.

Information centers are a relatively recent phenomenon popularized by IBM as part of their marketing effort. The center is



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easily accessible to end users and helps them make direct use of computing facilities. From a computing organization's point of view, an information center is the leading edge of support for end-user computing.

One might suppose there is a rosy future for information center units, now that end-user computing is all the rage. And, in the next two or three years, existing information centers will grow and new ones will be founded. But there is reason to believe that in the long term, information centers will be less important than they are now.

For one thing, information centers compete directly with vendors. Competition among vendors is forcing them to market directly to end users, and they are using sophisticated tools such as carefully targeted television campaigns. Furthermore, the marketing now includes classroom or personalized instruction and various kinds of consulting and other hand-holding. These are the very services that make an information center attractive.

If a person needs access to central corporate files as part of his computing, he cannot go directly to a vendor. But, he can get only limited help from an information center. If he needs an application to be written, the information center performs little more than the clerical function of directing him to an application developer. If an application is not needed, it is still likely that access authorization must be obtained from whoever manages the particular corporate data. Again, the information center is in the clerical role of referring the user to those in charge.

The most important factor limiting growth of information centers is that computing is simply not a hard discipline to master. Many college, and even high school, graduates now come equipped with basic computer literacy. The information center's stock in trade is literacy, training, and answering questions. These will continue to be needed, but they will become less important as time goes on.

The information center function will become increasingly more clerical. It will involve enrolling people in classes; instructing them in simple tools such as VisiCalc; arranging to get them terminals or personal computers; directing them to other computing people if access to controlled files or a custom application is needed; and calling for service when the equipment breaks. Eventually this function might become a part of an administrative or general services organization.

Smaller businesses have individuals in staff roles, and larger businesses have entire units. In either case, the staffs are responsible for planning, working with top managers from other parts of the business, establishing commonality among the computing technologies used by others, and evaluating and choosing new technologies.

The staff unit may be attached to the top manager, in which case its title will be something like "planning and coordination." Alternatively, it may be a part of the application development organization, and its title might be "technology assessment." Or, it could be connected to the computer center, with a title like "computer sciences." It can even be some combination of all of these. Whatever the title, such a unit exists in most organizations, and its role is as previously described.

Planning, communicating with top managers, and technology assessment will still be required, even as computing organizations change. In the short term, these activities will be even more important because they serve to manage the evolution.

On the other hand, activities to promote common technology in the company may be perceived as unduly restrictive in today's environment, where end users are constantly subjected to various forms of hard-sell advertising. A restrictive posture today risks loss of credibility and effectiveness in the future. In any case, future computing organizations will no longer have sole dominion in the choice of technology. They will have to share with the users.

Not much can be said more specifically about staff units in the long term besides the fact that they are likely to exist in some form. For them, it is the short term that counts. It is the staff units



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that gain the greatest opportunity from the evolutionary environment. Depending upon how they operate, plan, and communicate, they will be perceived as leaders of the evolution or resisters of it. The entire computing organization will be perceived accordingly.

If one knows a change is coming, it is usually possible to prepare for and benefit from it. In anticipation of the changes in future computing organizations, I'd like to present some suggestions. Underlying these suggestions are two basic strategies:

1. Diversify. Take the approach that a computing organization must master both the technology and its effective application to business problems.

2. Become user oriented. Revive the ethic that "the customer is always right."

Here are some ways that computing organizations can apply the strategies. Application units already understand business problems, and they have a means to work with end users. They must get more involved with technology. When customers ask about personal computers, local networks, workstations, graphics, SNA, MVS/XA, and so on, the applications units must be able to respond competently. Otherwise, customers will turn elsewhere and the application unit will lose its influence.

This kind of diversification is simple and obvious in theory. In practice, it may create an issue with sister units that perceive themselves as in charge of the technology. In the right environment, this issue can be handled to mutual advantage. If it isn't, and if a serious conflict develops, the entire computing organizations will lose authority in the business. To the extent that any winner emerges from such a conflict, it will probably be the application unit because it is most closely allied with the business.

Computer centers already understand the technology. But if their technology is seen as old or rigid, they will not be consulted when new ideas are considered. Accordingly, computer centers must become involved with the newer technologies as perceived by the users. Users see personal computers, office automation, and relational databases as new. They consider MVS/XA, TSO/E, and ISPF as old. Although these latter technologies may be important improvements, they are seen as complex, arcane, or, perhaps, "too little, too late."

One way for computer centers to become more user oriented is to sponsor an information center. Another way is to take the lead in supporting personal computers in the company and integrating them with mainframe services. Computer centers should work to make their image less mysterious and aloof and more open and participative. To be sure, this is easier said than done. But it is required nonetheless if a computer center is to preserve its participation in company decisions about computing.

Staff groups probably already understand both old and new technologies. They probably also have the best access to decision-makers in computing and elsewhere in the business. What they don't have is access to the users. This might be dangerous because the staff could lead the business in a direction that does not reflect current realities. Ultimately that can decrease influence for the entire computing organization. The key strategy for staff groups, therefore, is to get closer to the users, by whatever means possible.

One way to get closer to users is by alliance with application units. Another is by travel, visits, telephone calls, and other fairly intense and personal means of communication. A third is by written communications carefully tailored to be of maximum and obvious use to line readers.

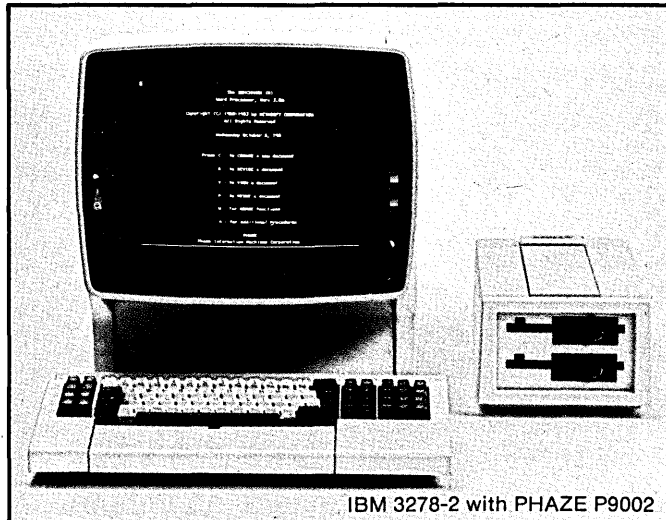
If the users come to perceive the computing staff as reliable leaders who are sympathetic to the needs of the business, the entire organization will benefit.

—Jay Michlin  
Florham Park, New Jersey

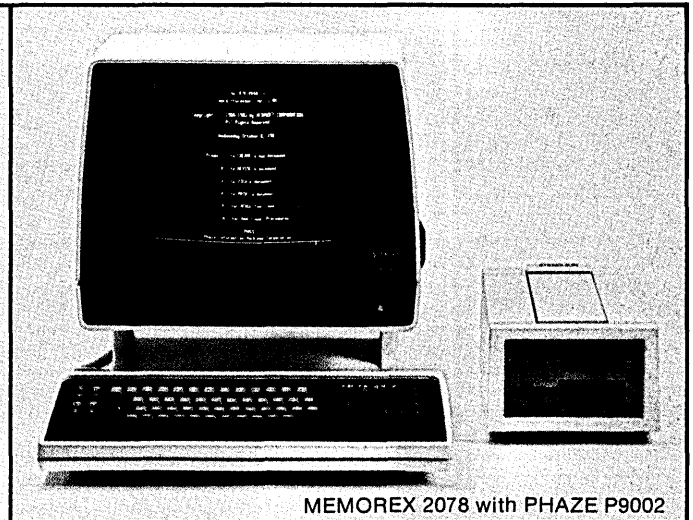
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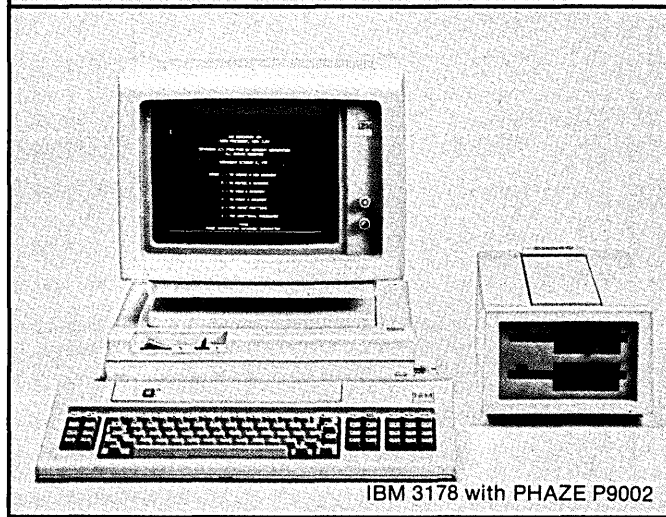
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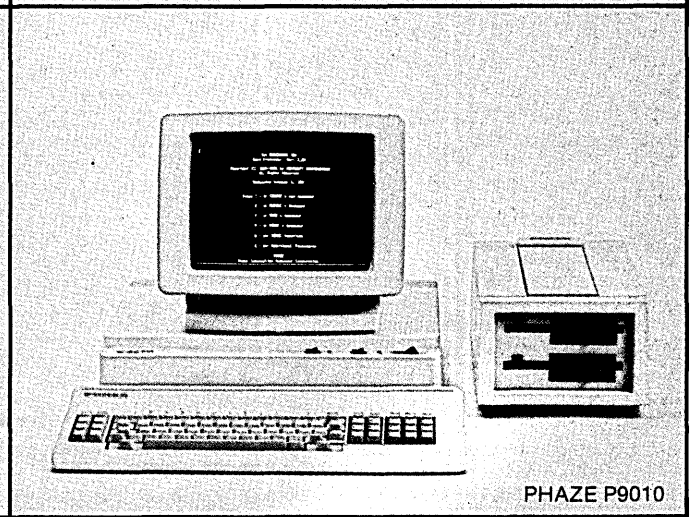
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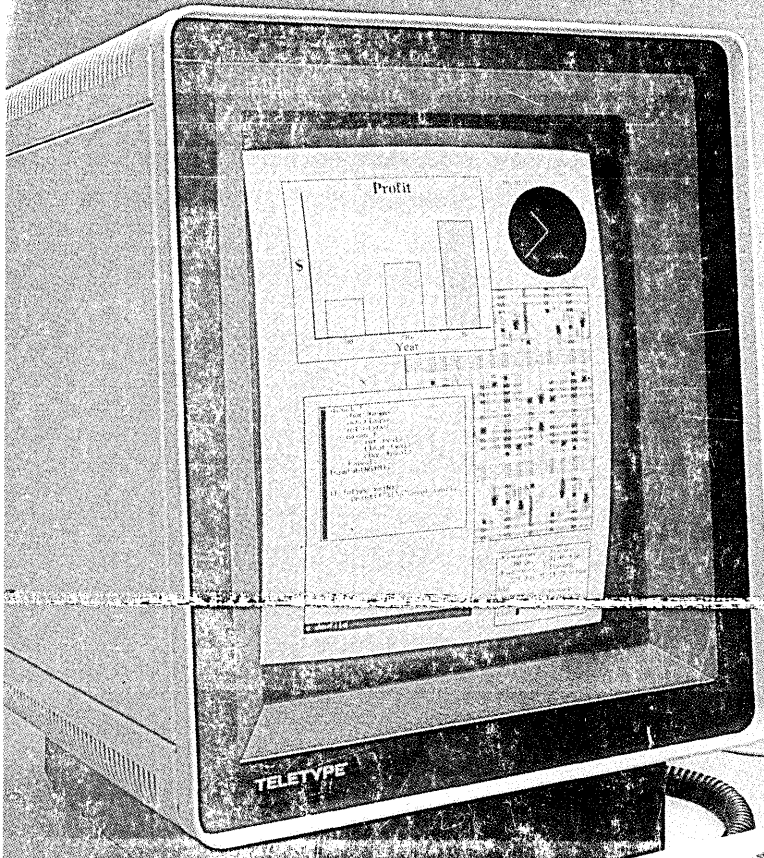
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