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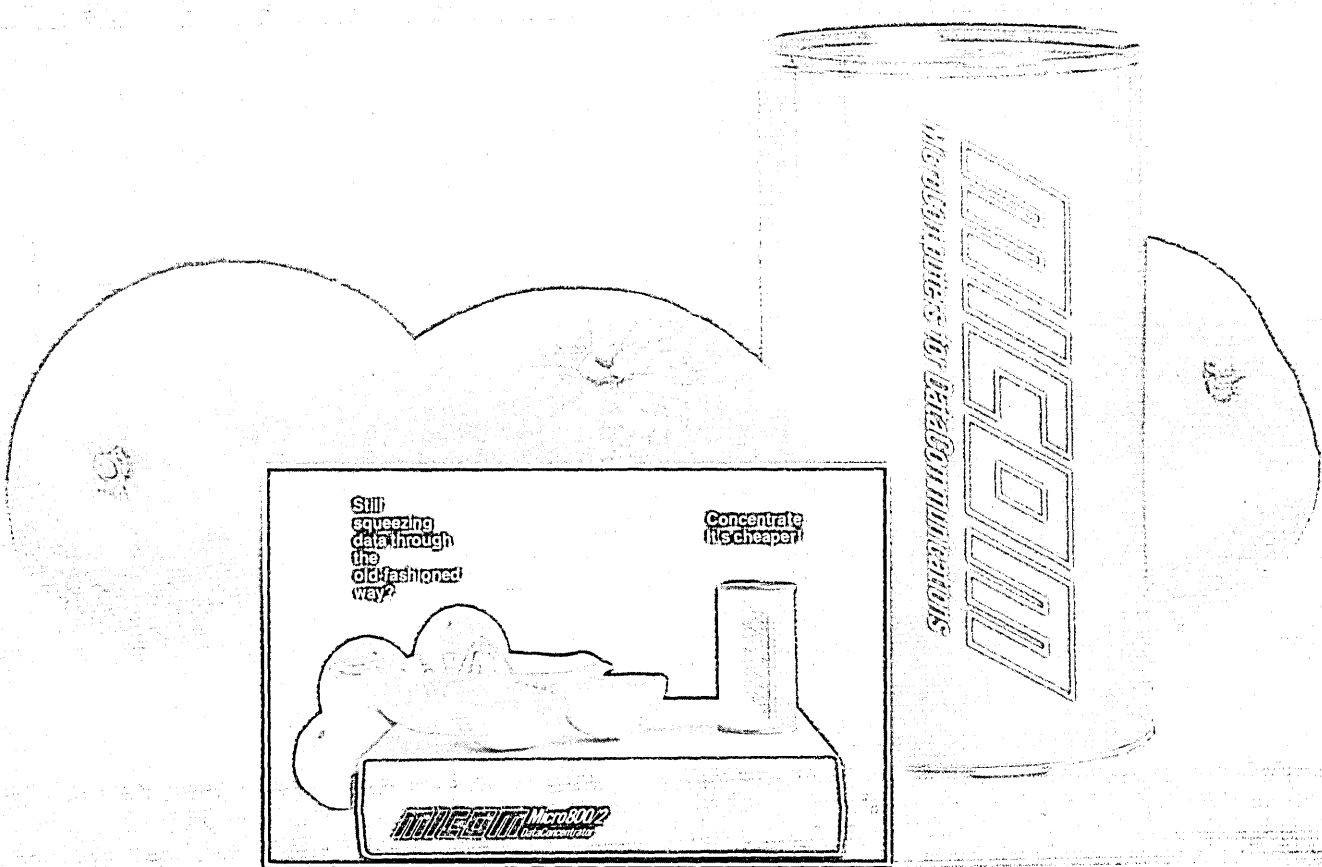
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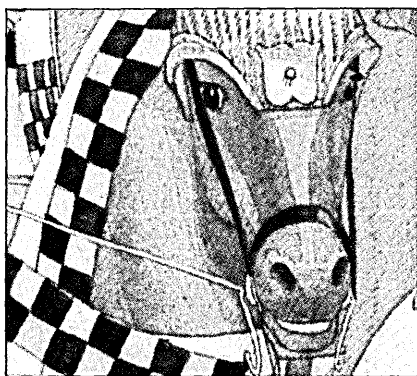
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Art Director Kenneth Surabian
Assistant Art Director Susan M. Rasco
Production Manager Kathleen Monaghan

EDITORIAL OFFICES

Headquarters: 875 Third Ave., New York, NY 10022. Phone (212) 605-9400. **New England:** 1 Chaucer St., RFD 2, Sandwich, MA 02563, (617) 888-6312. **Midwestern:** 3607 Garfield Ave. S., Minneapolis, MN 55409, (612) 827-4664. **Western:** 1801 S. La Cienega Blvd., Los Angeles, CA 90035, (213) 559-5111; 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **International:** 6605 Burlington Pl., Springfield, VA 22152, (703) 569-3383. **European:** 221 Blvd. Raspail, 75014 Paris, France, (331) 322-7956. **New York, N.Y. TELEX 429-073.**

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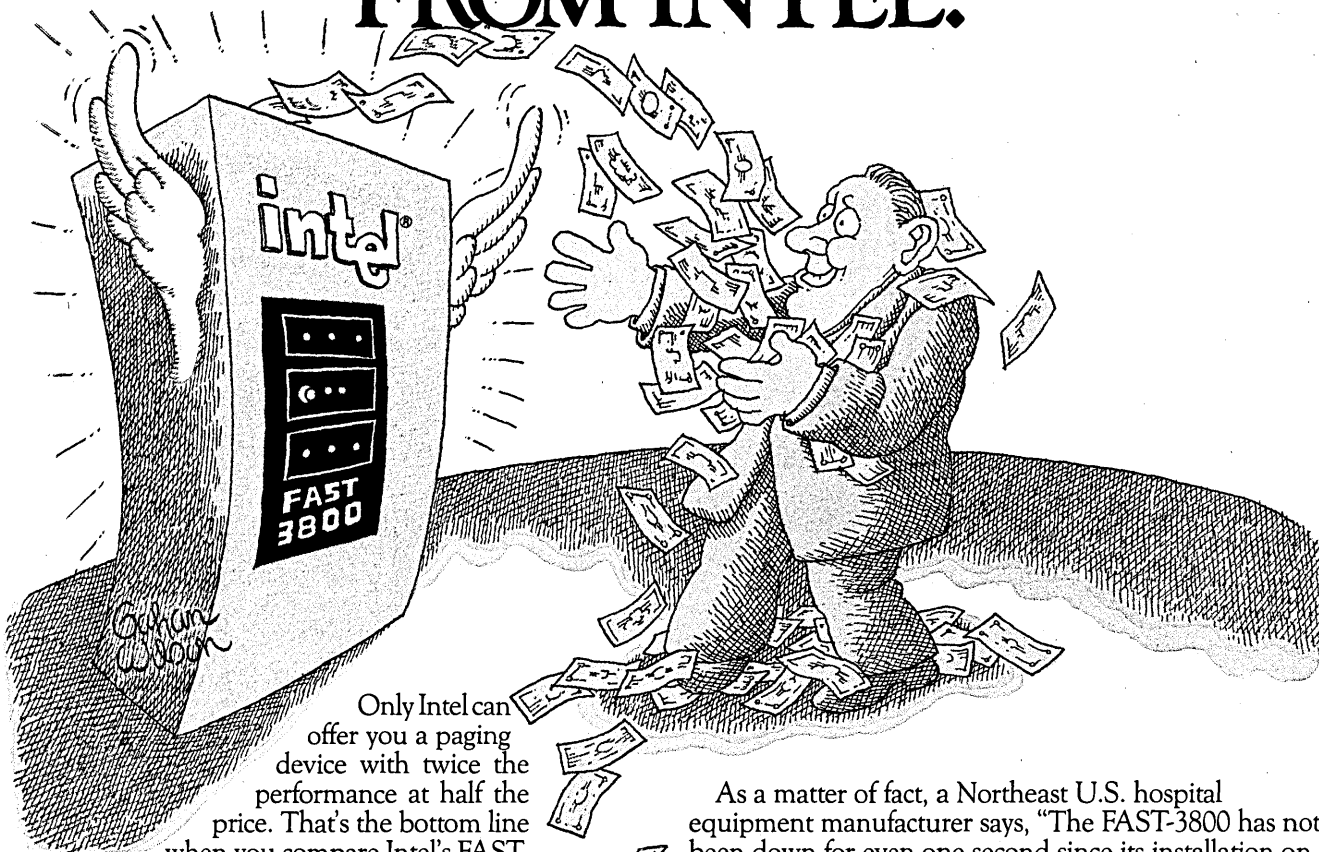
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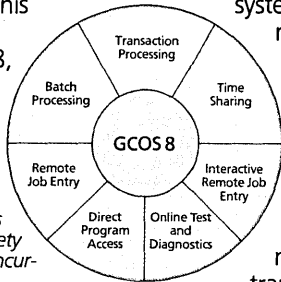
tional TTL. CML achieves high switching speeds, and uses about 50% less power for cooler, more reliable operation.

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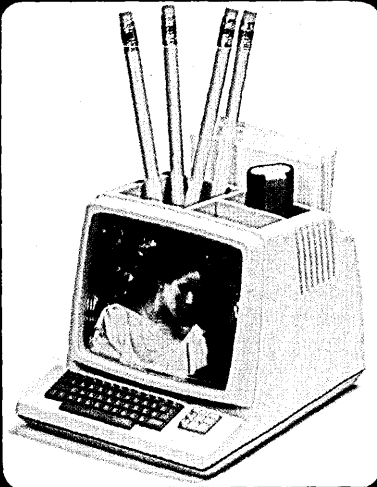
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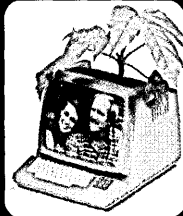
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LOOKING BACK

THE SCAPEGOAT INDUSTRY

November 1962: As must be the case for any young industry, the computer business was highly conscious of its image, and with good cause. In the industry's infancy, and even for quite some time after the first computers were installed, there was very little to worry about, according to a DATAMATION editorial: "Nobody knew we existed, except for an occasional giant brain story and the tv election night nonsense." But round about 1958, people found out that computers were able to do in 3.2 seconds what would take 400 mathematicians six centuries, and computer professionals enjoyed a short-lived celebrity. That celebrity, however, rapidly turned into notoriety, and even villainy, as people began to realize that computers might be able to replace workers.

Indeed, the computer industry became a popular scapegoat for a downturn in the economy and for higher unemployment. But the negative image was born, according to the editorial, at least partly out of "a huge ignorance about any possible difference between a computer and an 'automated' coal mine, or, for that matter, an automatic pencil sharpener. It's all automation. And automation means unemployment. And that gets right down into J.Q. Public's pocketbook."

Of course, computer people could have responded, there is a difference between a computer and an electric pencil sharpener, and the effect of computers per se on the unemployment rate is far from clear. But try telling that to the public. Skeptical readers were invited to try a little exercise: "Write an effective answer, in 17 words or less, to this statement: 'There will be 10,000 computers installed next year, and each of them will lay off 44 clerks.' Make it catchy, give it as much emotional appeal to feelings of economic insecurity, and find a way to say it to 15 million people watching on television."

Not an easy exercise. And, as a result, the computer industry would get all the blame for unemployment and no credit for anything, the editorial argued. The consequences might not be pleasant. "I wouldn't be surprised to hear of a union contract that

specifies that a computer must not be installed. Social ostracism of computer people within a plant will surely become commonplace. I predict, finally, that within this decade a computer will be bombed by a deranged unemployed worker."

What to do? "Our turn as public whipping boy is coming, and soon . . . maybe it will go away if we ignore it." The same could not be said about the unemployment problem, however.

FJCC, MEET NCC

November 1972: Once upon a time, there was no National Computer Conference. Instead, AFIPS put on spring and fall Joint Computer Conferences. But these semi-annual shows got so big—in 1969, a record 36,000 users jammed Boston's War Memorial Auditorium—that AFIPS began hiding them in "such remote places as Atlantic City, Las Vegas, and Houston."

Then the tables turned. The mainframers, with their big booths and big bucks, decided they couldn't be bothered to display twice a year. A recession put many of the smaller companies out of business. The JCCs floundered. In Las Vegas in 1971, only 15,000 people showed up. So AFIPS moved the 1972 FJCC back to Anaheim in the hope of attracting more exhibitors and attendees. But the exhibitors, who would pick up the tab, had already decided that the time had come for a change. The 1972 FJCC was the last of the joint conferences, and the following June the NCC was launched in New York.

The JCCs went out with a bang. Bigger than any previous conference (with 59 sessions and no time for a keynote speaker), the 1972 FJCC had some 150 companies scheduled to display in 410 booths. Thirty of the companies introduced new products at the show. Among the sessions were an update on the use of magnetic bubble materials in a general purpose computer; an exhaustive treatment by 30 speakers in five sessions on measuring the performance of computer systems; a discussion of privacy and security in databank systems; and a speech on information technologies and public policy.

—Michael Tyler

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Company _____

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CPU _____ Operating System _____

SOFTWARE AG
OF NORTH AMERICA, INC.

CIRCLE 10 ON READER CARD

DM 1182

Before you buy any the features of

Mean Time to Repair

Our simple design, quality components and modular construction make service easy and quick. Our average MTTR is a mere 15 minutes.

Drawing Solutions on Screen

The 950's powerful graphics capability can express complex data as clear charts, diagrams, graphs, line drawings or other visuals to facilitate communication.

Status and User Lines

TeleVideo's 950 checks on its own operational status. What is the edit mode? Baud rate? Intensity mode? The 950 reports its condition while functioning without interfering with ongoing work.

Programmable Function Keys

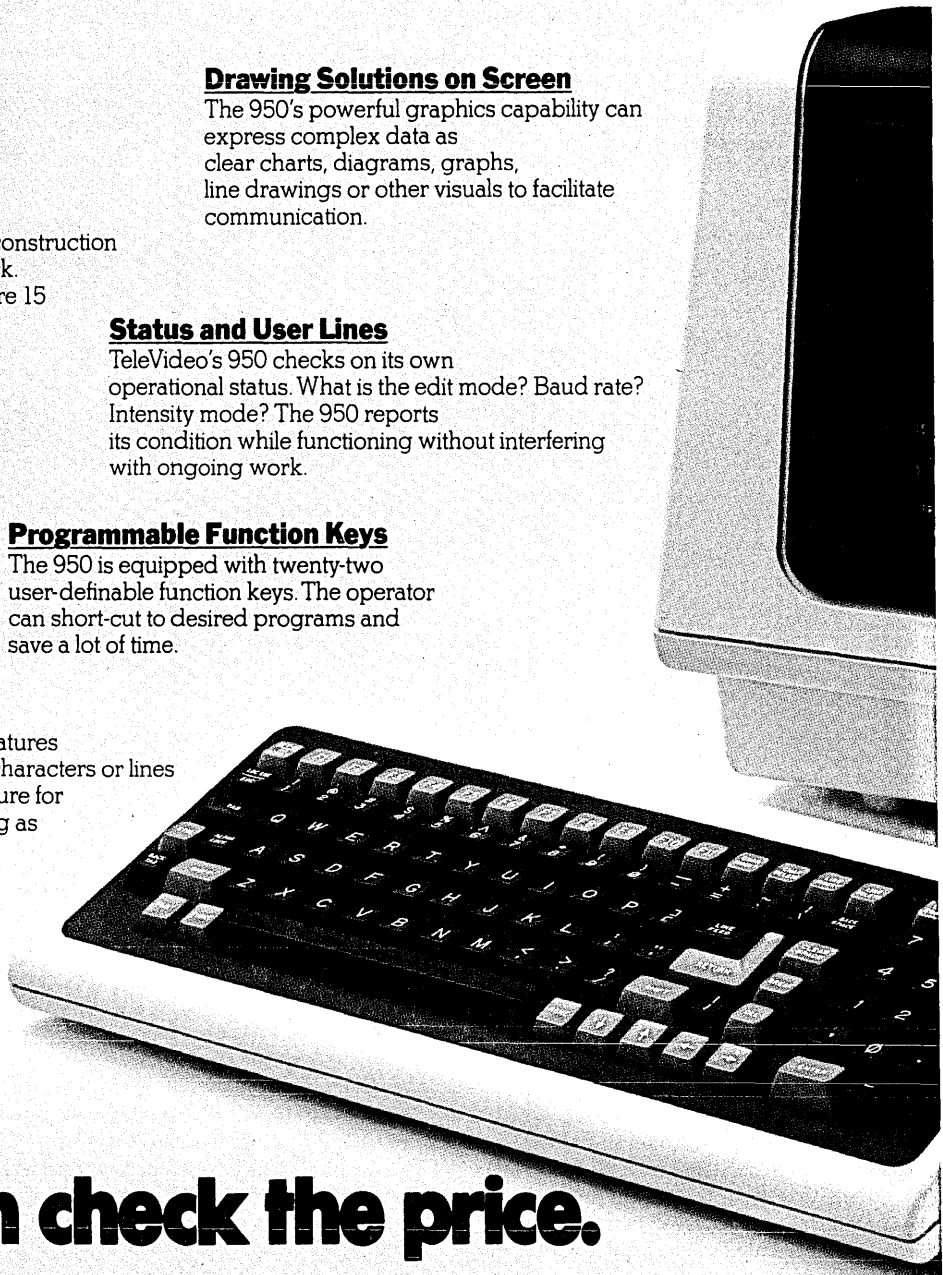
The 950 is equipped with twenty-two user-definable function keys. The operator can short-cut to desired programs and save a lot of time.

Editing

TeleVideo's sophisticated editing features let you insert or delete characters or lines with a wraparound feature for maintaining data as long as you need it on screen.

Ergonomic Keyboard

The 950's detachable keyboard is made for operator comfort. Work close to the screen, or place it on your lap. You decide what is more comfortable and productive.



And then check the price.

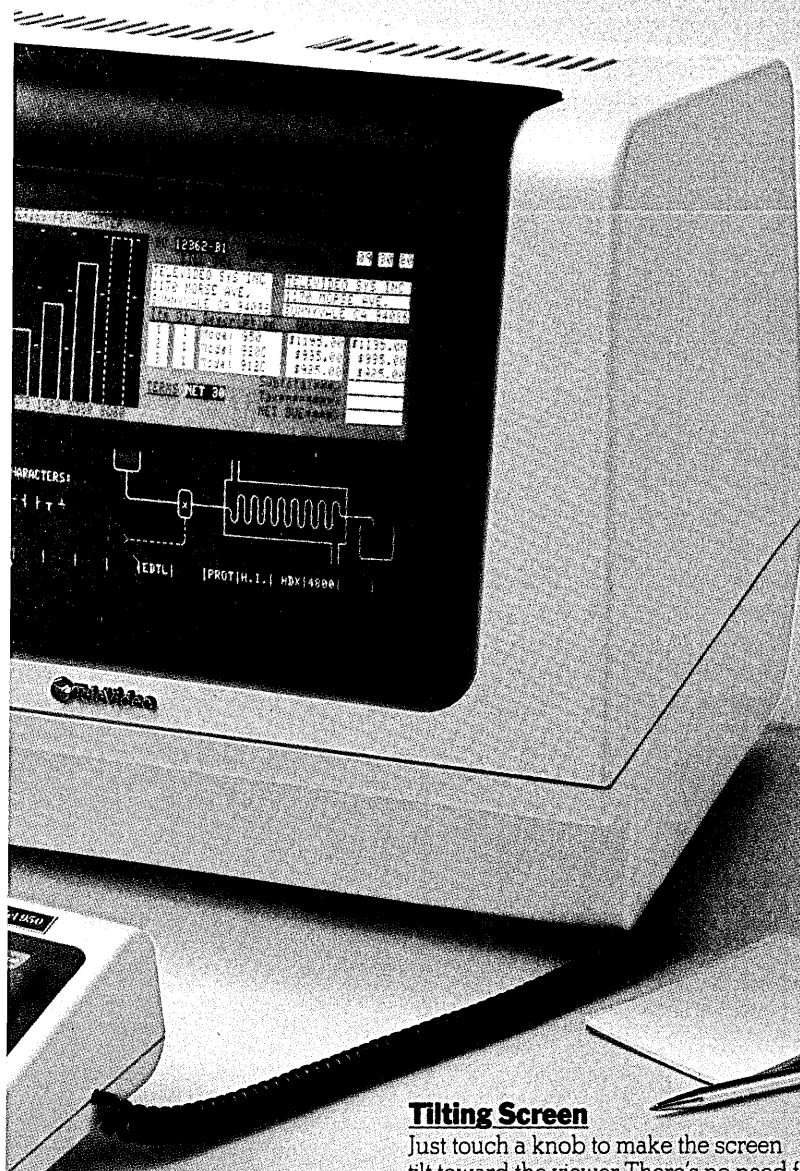
TeleVideo's 950 offers the features you'd expect in terminals costing much more than ours. And most of these features are also offered in our 925, at even a lower price. Both terminals are built with TeleVideo reliability, both engineered for high performance.

Whichever you choose, you can be assured

of the same high quality and reliability, as well as nationwide service by General Electric's Instrumentation and Communication Equipment Centers.

And TeleVideo builds to sales projections, and does not keep you waiting for delivery. That means if you order 200 TeleVideo terminals

Smart terminal, check TeleVideo's 950.



Line Lock

You can frequently reserve data by freezing some facts on screen while changing others. This feature eliminates inadvertent changes of field.

Buffered Print Port

TeleVideo's 950 can be used with printers of various speeds, so you won't lose data during slower peripheral cycles.

Transmission Speed

Our baud range is 50B to 19.2Kb, broad enough to accept data for the great majority of applications.

Smooth Scrolling

The 950, like all TeleVideo terminals, offers easy reading of fast-moving information, without those jerking movements that strain your eyes.

Self-testing

Remote troubleshooting feature determines if a service call is really needed, or if the operator can handle the problem. That saves time and money.

Tilting Screen

Just touch a knob to make the screen tilt toward the viewer. There's no need for neck-craning here. The tilting screen is designed for easy use.

today, we can ship them tomorrow.

To learn more about the 950, the 925 and the other terminals that have made TeleVideo the industry leader, complete this coupon, or call: 800-538-8725 (In California, 408-745-7760)

 **TeleVideo Systems, Inc.**

See us at COMDEX Booth #2444

TeleVideo Systems, Inc.

Attn: Terminal Division
Dept. 210D
1170 Morse Avenue, Sunnyvale, CA 94086

I would like more information about TeleVideo's 950 and 925 terminals

NAME _____

COMPANY _____ TITLE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

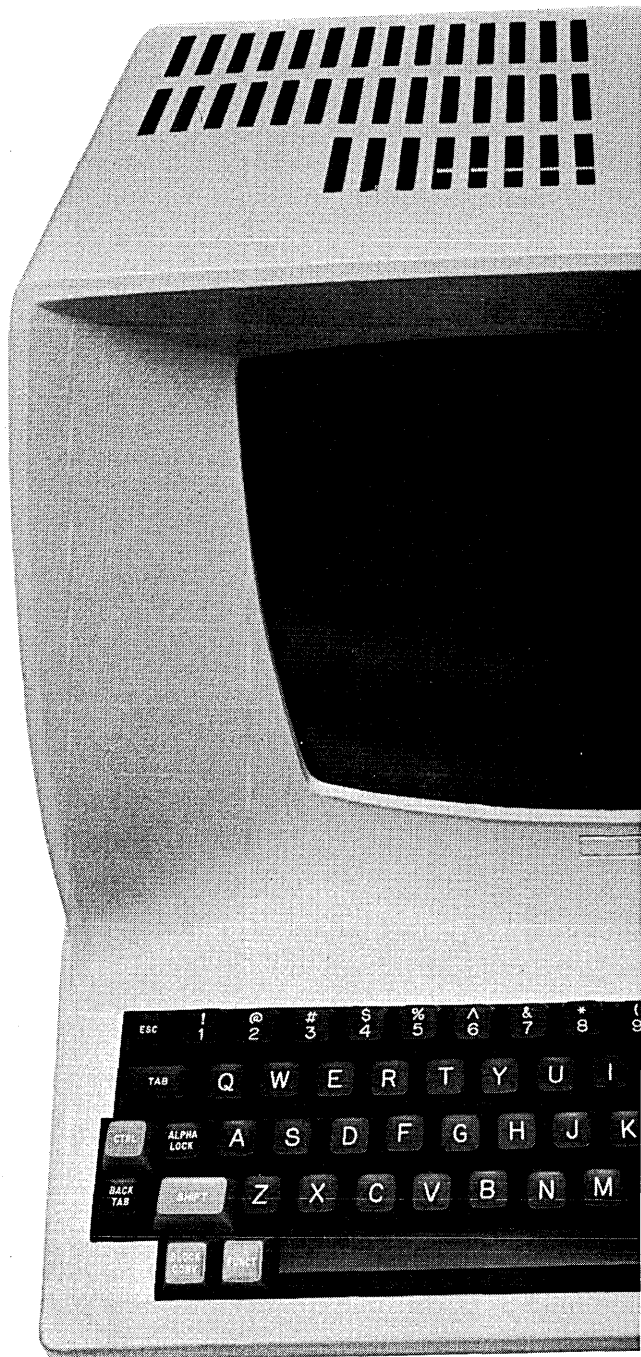
PHONE # _____

Suggested retail price for TeleVideo's 950, \$1135; TeleVideo's 925, \$995, excluding applicable state and local taxes - Continental U.S.A., Alaska and Hawaii

Massachusetts/Boston 617-668-6891; New York/New Jersey 201-267-8805; United Kingdom/Woking, Surrey 44-9905-6464

CIRCLE 11 ON READER CARD

Our EPISODE™ microcomputer is the other 1/2 of a great idea.



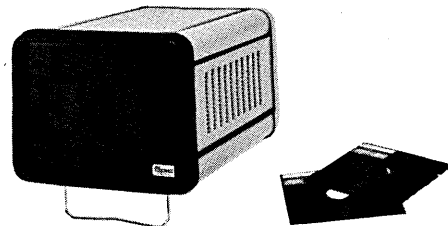
Your dumb terminal is 1/2 the investment in a full capability work station. The other 1/2 is our EPISODE — a compact, transportable, full featured microcomputer you plug right into your terminal for local computing capability including stand alone word processing.

EPISODE gives you a cost-effective means to unburden your mainframe. EPISODE plus your terminal — we interface with more than 45 including our 14C — and a letter quality printer are all the building blocks required for stand alone word processing capability. Add a cut sheet feeder for total automation.

EPISODE's word processing offers more than basic text editing. Features include automatic pagination, scrolls, justification, screen text preview, personalization, and automatic word or phrase revision.

What's more, EPISODE's storage capacity of more than 20 MB easily accommodates financial modeling, electronic spread sheet analysis, forecasting, scheduling, mailing lists, accounting records, expense reporting, statistics and more with the many software solutions Epic has in the works.

EPISODE offers you a choice of two drive options, depending on your specific work station and storage capacity requirements. Dual floppy disk drives provide up to 1.6 MB of disk storage. In the same compact footprint, EPISODE offers a 5.25" Winchester disk drive with more than 20 MB of formatted useable storage. A disk interface includes complete error checking and correcting capability. An 800 KB floppy disk drive serves as a backup.



All this capability is designed into a transportable case measuring 7-1/2" x 9-1/2" x 14-1/2" and weighing less than 20 pounds.

EPISODE utilizes the wide variety of applications packages based on the CP/M® operating system. Now with EPISODE's exclusive SUPERVYZ™, the unique software concept that serves as a translator, teacher and mediator, you can address any CP/M program in plain English. No need for extensive or expensive operator training.

There are thousands of CRT terminals in the marketplace that can be converted quickly, easily to full capability work stations with our EPISODE microcomputer.

That's not only a great idea, but a sound investment. Contact us for information.

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CIRCLE 12 ON READER CARD

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See us at COMDEX '82 Booth #2534

LOOK AHEAD

FROM TOKYO
TO DETROIT

Word is spreading that Burroughs has its eyes on Hitachi -- and on IBM compatibility. Insiders claim that a top Burroughs corporate vp (rumored to be strategic planner Jerome Jacobson) traveled to Tokyo early this year "armed with proposals, including the possibility of a merger." A follow-up visit to Detroit by Hitachi execs is said to have taken place sometime in the second quarter. Burroughs reportedly is close to signing a deal to market Hitachi's fiber optics networking technology, but sources stress that the Detroit mainframer's interests extend to Hitachi's family of IBM-compatible cpus. That's not surprising in light of an internal estimate floating around Burroughs that its own mainframe base has dwindled from 10% or 11% of the worldwide market to about 6% in the past two years alone. That leaves only the IBM-compatibility route as a last resort to an expanded user base, a point which lends credence to the additional rumor that Burroughs wants to buy pcm-maker Magnuson. Both the Hitachi and Magnuson rumors rated an official "no comment" from Burroughs.

THE STAR
DROPS DOWN

It appears high-flying Storage Tech is losing altitude these days, particularly in thin film product development. Analysts speculate that Memorex and Control Data will probably beat STC to market, leaving the company slim pickings for position in the next generation of storage devices..

GONE, BUT NOT
REPLACED

So who needs a director of marketing? Apparently not Cray Research. The company recently lost Peter Appleton-Jones, the exec vp in charge of marketing and software development, who left to head Applitek, a Boston-based startup in the LAN market. Meanwhile, Cray is not scrambling to find a replacement, confirms president John Rollwagen. Instead, international and domestic sales will report directly to Rollwagen, while software development will slip over to Les Davis, an exec vp and director of engineering.

RESEARCH INTO
IBM RESEARCH

While IBM has publicly set about singing the praises of its research staff, it has privately set in motion plans that insiders say will weaken the technical support infrastructure that is the company's lifeblood. Sources point out that IBM's once-renowned Cambridge Scientific Center -- cradle of the VM operating system's development -- is to be reduced to a market support operation. The plan is to house the center along Boston's Charles River with a group selling per-

LOOK AHEAD

sonal computers to universities. In another move IBM plans to transplant its 42nd Street, New York, Systems Research Institute, father of graduate programs in computer science, to the "exurbian" woods of Valhalla, N.Y., thus removing it from the cosmopolitan and cultural stimuli in which it has been nurtured. One source feels that most of IBM's future research moves will be security-driven. "They're building the Great Wall of IBM, driven partly by the FBI sting operation. What IBM will have to realize is walls that keep invaders out often end up preventing intelligence from coming in."

ADA ADRENALINE FLOWING

SofTech Inc., Waltham, Mass., has delivered its Ada compiler to the Army in Fort Monmouth, N.J., and in January the Army will ship the compiler for beta testing at 10 government and commercial sites. Word has it that two groups within the Department of Defense are pushing to get Ada used not only in embedded systems but in commercial dp installations as well. Meanwhile, word from the Ada world is that there are "severe problems" in running Ada on Intel's iAPX 432 micro-mainframe. Sources say it takes as long as 30 milliseconds to run an instruction, meaning there's a bug lurking in the linking instructions.

SOFTWARE THAT SELF-DESTRUCTS

Applications Software Inc., Torrance, Calif., has instituted what it sees as a trend-setting pricing scheme for software -- usage pricing. Customers for ASI/Inquiry, an IMS query language, henceforth will produce their own bills. The company has written into the program an algorithm that determines use and establishes price on a monthly basis. ASI also has changed its licensing arrangement from a site basis to a cpu basis. When ASI/Inquiry is licensed to a specific cpu, that cpu's serial number is coded so as to make the program self-destruct if it is used on any other cpu.

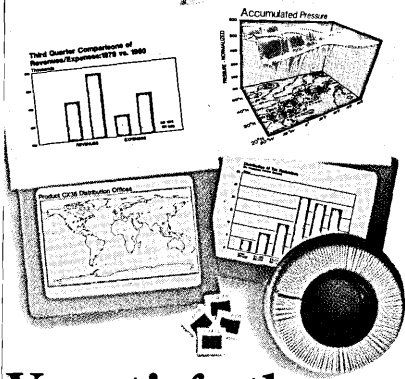
COAST TO COAST

A newly formed, autonomous division of Norway's Tandberg Data A/S has set up business in Orange, Calif., to attack the U.S. market for quarter-inch cartridge tape drives. Tandberg Data Storage Division will offer both 20MB and 40MB drives. Evaluation models are being offered to oems, with delivery scheduled for 30 days.

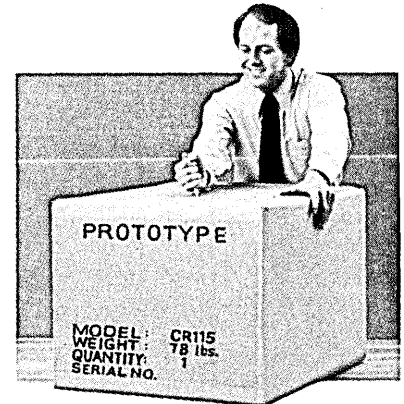
RUMORS AND RAW RANDOM DATA

Sources say ADAPSO is seriously considering slapping a lawsuit on one of the Big Eight accounting firms....IXO had plenty of takers for its giveaway portable executive terminal, but seems to be having trouble selling it.

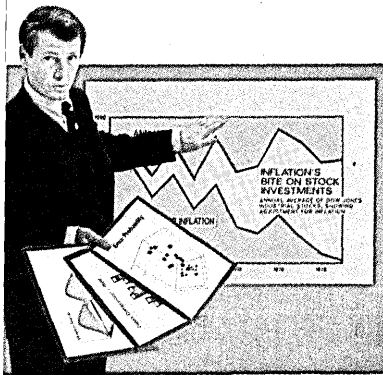
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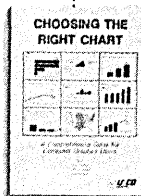
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Send me the book "Choosing the Right Chart." Check or money order for \$8.50 enclosed.
 Please send additional information about ISSCO graphics software. DM-10

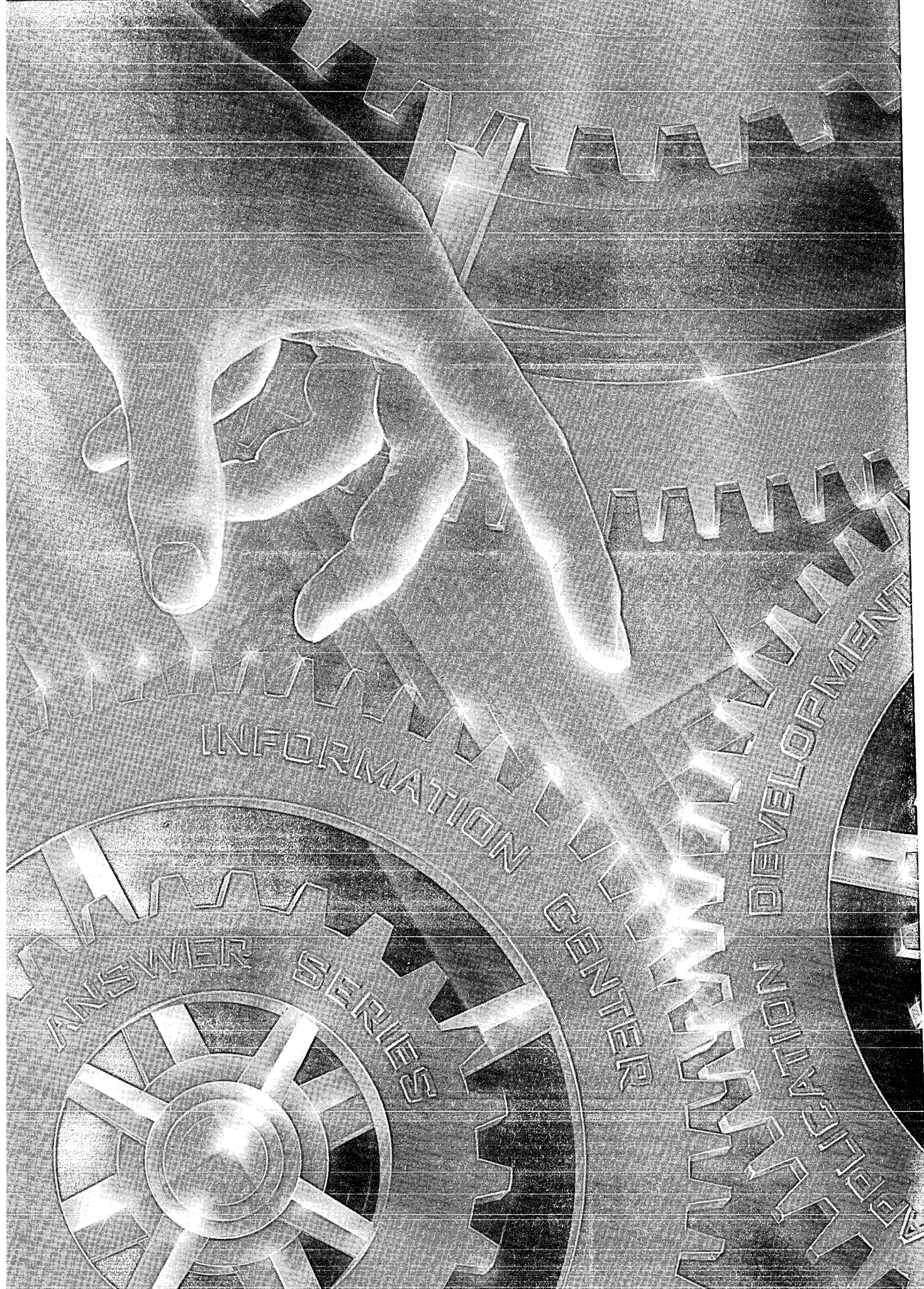


Offer proven documentation and continual enhancements.



The critical path to better understanding.

* ISSCO has over 100,000 individual users in over 1000 installations worldwide, running on a variety of hardware from IBM, DEC, CDC, Cray, Burroughs, Honeywell, Perkin-Elmer and Univac to Prime.



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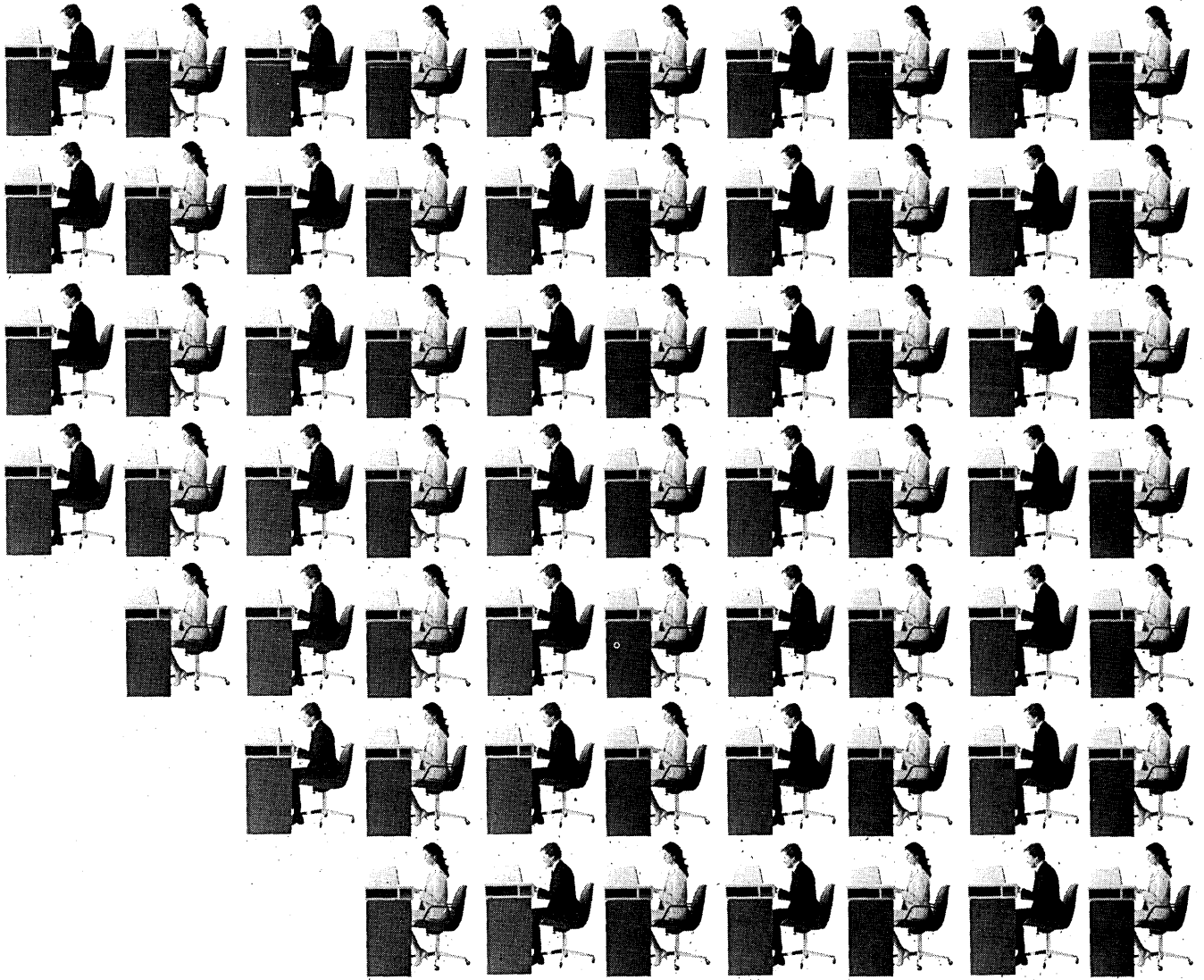
It takes the resources of a company like Informatics to meet the information challenges of the 80s. We will continue to be a dominant force in leading edge IBM installations throughout the world. After all, we've been decreasing backlog, increasing productivity, and engineering great software for over 20 years.

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CIRCLE 14 ON READER CARD



0 to 60 without shifting

Alpha Micro introduces its 68000-based line of systems.

A line that provides a growth path from a one-terminal system to a system that supports over 60 terminals.

And it's growth that doesn't sacrifice your software investment because software developed for our one-user system can run on our 60-user system.

The AM-1000. A 10 MB, multi-user system that fits on a desk.

Alpha Micro's 68000-based product line begins with the AM-1000. A desktop business system that supports two users and a printer, offers 10 MB of storage, and provides 128 KB of memory. And with its 32-bit capability, the AM-1000 offers you the kind of performance not available from 8- and 16-bit systems. In other words, it outperforms most of the currently available small business systems.

The price? Under \$10,000.

From micro to mini to mainframe with one product line.

Alpha Micro 68000-based computers move from the micro through the mini and even the mainframe categories. You can go from a one-user system with 128 KB of memory and 10 MB of disk storage to a 60-user

ALPHA MICRO 68000-BASED SERIES OF SYSTEMS

MODELS	STD	MAX	STD	MAX	STD	MAX	STD	OPT	OPERATING SYSTEM
	DISK STORAGE		MEMORY		SERIAL I/O		SOFTWARE		
1. AM-1000F (dual floppy)	1.6MB	40MB	128KB	256KB	3	3	A	B	AMOS*
2. AM-1000W (winchester; choice of floppy or VCR backup)	10MB	40MB	128KB	256KB	3	3	A	B	AMOS*
3. AM-1042 (winchester)	32MB	2.4GB	512KB	3MB	2	26	A	B	AMOS*
4. AM-1062 (winchester)	60MB	2.4GB	512KB	8MB	2	68	A	B	AMOS*

A AlphaBASIC®, AlphaPASCAL®, AlphaLISP™, AMOS®, Macro-assembler, Word Processing, 150 subroutines, utilities and diagnostics

*Available 4th quarter, 1982.

B Programming languages FORTRAN and COBOL, in addition to over 100 AlphaBASIC® turnkey applications are available from third-party sources.

system with 3 MB of memory and 2.4 gigabytes of disk storage.

A product line that starts so small and grows so large simplifies programming and technical support efforts.

If your business needs a computer, you need Alpha Micro.

The Alpha Micro 68000-based line is the latest, most competitive technology.

- Performance — The Alpha Micro 68000-based product line has the speed and versatility of the very latest and most powerful micro-processor chip.
- Software — The Alpha Micro Operating System... AMOS... is standard throughout the product line. That means software developed for the smallest system can run on the largest system. And AMOS is power-

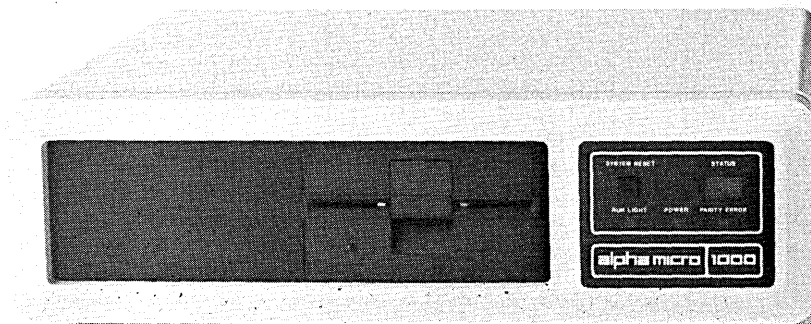
ful. It's multi-user, multi-tasking and timesharing. Its device independence allows virtually any standard terminal or printer to be easily integrated into any Alpha Micro system. You choose the exact configuration that meets your needs and your budget.

- Service — International service and support.
- Cost — For all these reasons and more, Alpha Micro products offer you an outstanding price/performance ratio.

alpha micro

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software.



Find out more about Alpha Micro. T-123

It makes sense to find out more about the 68000-based line from Alpha Micro. Call Alpha Micro at (800) 854-8406. In California, call collect (714) 641-0386. Or fill out and send us the coupon.

- Send the name of my nearest Alpha Micro Dealer.
- I'm interested in becoming an Alpha Micro Dealer.

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CIRCLE 15 ON READER CARD

See us at COMDEX booth #2044

CALENDAR

NOVEMBER

Micrographix '82, November 8-10, Washington, D.C.

This new show evolved from the Government Micrographics Conference and Exposition. Like its predecessor, it will consist of a three-day conference program and a two-day product exposition. Contact Richard Caplan, National Trade Productions, Inc., 9418 Annapolis Rd., Lanham, MD 20706, (201) 459-8383.

COMPSAC '82, November 8-12, Chicago.

Sponsored by the IEEE Computer Society, this year's show is the Society's Sixth International Computer Software and Applications Conference. Contact Carl Martersteck, Bell Telephone Laboratories, Room 1C-307, Naperville, IL 60566, (312) 462-5400.

Comdex / Europe, November 8-11, Amsterdam, The Netherlands.

On its first trip abroad, Comdex will emphasize business, financial, and marketing topics of interest to independent sales organizations (ISOs). Contact The Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

Electronica '82, November 9-13, Munich.

Billed as "the world's largest exhibition of electronic components and subassemblies," the 10th International Trade Fair will feature exhibits of semiconductors, various types of components, connecting elements, and subassemblies. Contact Kallman Associates, 5 Maple Ct., Ridgewood, NJ 07450, (201) 652-7070.

Autofact 4, November 30-December 2, Philadelphia.

The Computer and Automated Systems Association of the Society of Manufacturing Engineers (CASA/SME) sponsors this three-day event, focused on CAD/CAM, computer integrated manufacturing (CIM), and the automated, integrated factory. Contact CASA/SME at One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

DECEMBER

CMG XIII, December 12-16, San Diego.

The 13th International Conference on Computer Performance Evaluation is sponsored each year by the Computer Measurement Group. Contact CMG Headquarters, P.O. Box 26063, Phoenix, AZ 85068, (602) 995-0905.

ESIT/ASIS Conference, December 13-15, Cairo.

The Egyptian Society for Information Technology and the American Society for Information Science are cohosting their first international information conference, titled "Infrastructure of an Information Society." Contact ASIS, 1010 Sixteenth St., N.W., Washington, DC 20036, (202) 659-3644.

2nd Gulf Computer Exhibition, December 13-16, Dubai, United Arab Emirates.

The exhibition is the only show in this region devoted exclusively

to computer technology. It is organized by the Trade Centre Management Co. in association with Middle East Computing, and is supported by the Ministry of Finance and Industry, United Arab Emirates. Contact Trade Centre Management Co., P.O. Box 9292, Dubai, United Arab Emirates, tel. 472200.

JANUARY

PTC '83, January 16-19, Honolulu.

PTC is organized by the Pacific Telecommunications Council. This year's event will focus on communication infrastructures, the "technical, human, and institutional resources that contribute to economic and social development of the Pacific Hemisphere." Contact PTC, 1110 University Ave., Suite 303, Honolulu, HI 96826.

FEBRUARY

Kuwait Info '83, February 1-5, Kuwait.

In addition to last year's equipment demonstrations, the 1983 show will expand to a broader conference and seminar program. For further information, contact Clapp & Poliak International, P.O. Box 70007, Washington, DC 20088, (301) 657-3090.

Caribbean Expo '83, February 4-6, Paradise Island, Bahamas.

This computer and electronics expo will operate under the theme "Computers, The Door to Our Progress." Contact Ormand Vee Co., 1430 Miner Rd., Des Plaines, IL 60016, (312) 397-9572.

OAC '83, February 21-23, Philadelphia.

Theme for the fourth annual Office Automation Conference is "Explorations in Office Automation." For information, contact AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3624.

ISSCC, February 23-25, New York City.

The 30th annual International Solid-State Circuits Conference is touted as a "global forum," covering topics that include the design, performance, fabrication, testing, and application of solid-state circuits, devices, and systems. Contact Lewis Winner, 301 Almeria, Coral Gables, FL 33134, (305) 446-8193.

SECURICOM '83, February 23-25, Cannes, France.

Also known as the Worldwide Congress on Computer Security and Protection, the goal of the congress is to support the exchange of information on technological, economic, and social aspects of computer protection, data security, and privacy. Contact Peter Hazelzet, SEDEP, 8, Rue De La Michodiere, 75002 Paris, France, tel. 073-94-66 or 742-41-00.

MARCH

Compcon Spring '83, March 1-3, San Francisco

Get ready to lose your heart all over again, at the latest Compcon show. For details contact Harry Hayman, IEEE Computer Society, P.O. Box 639, Silver Springs, MD 20901, (301) 589-3386.



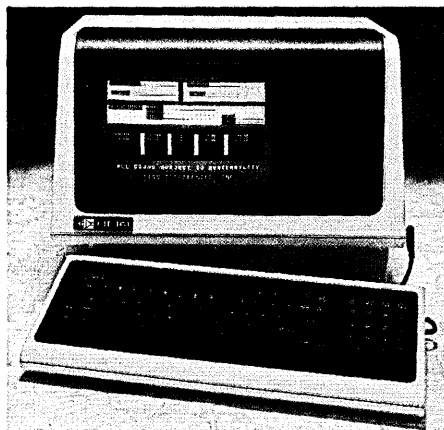
Some interesting things happen when you sit down at our CIT-161 Terminal.

Like any office worker, video terminal operators are bombarded by a tremendous spectrum of visual and audio stimulæ. Add to that their own thought distractions and you begin to see why a single-color display is at a severe disadvantage competing for user attention.

Our CIT-161 Color Alphanumeric Terminal, on the other hand, makes use of some very interesting color phenomena. Which makes a much more efficient terminal... and makes users a lot more productive.

Studies have shown, for instance, that color can improve user response time by 50% — which translates into faster throughput and decreased time to job completion. Data is made more interesting and easy to follow with the use of color, resulting in less error in interpretation.

Color also has broad attention-getting power, affording the added ability to prioritize data by different hues and



create more significant and long-lasting impressions. Not to mention the subliminal conditioned responses we all have to color. (Red, for example, can be used to flag a problem instantly.)

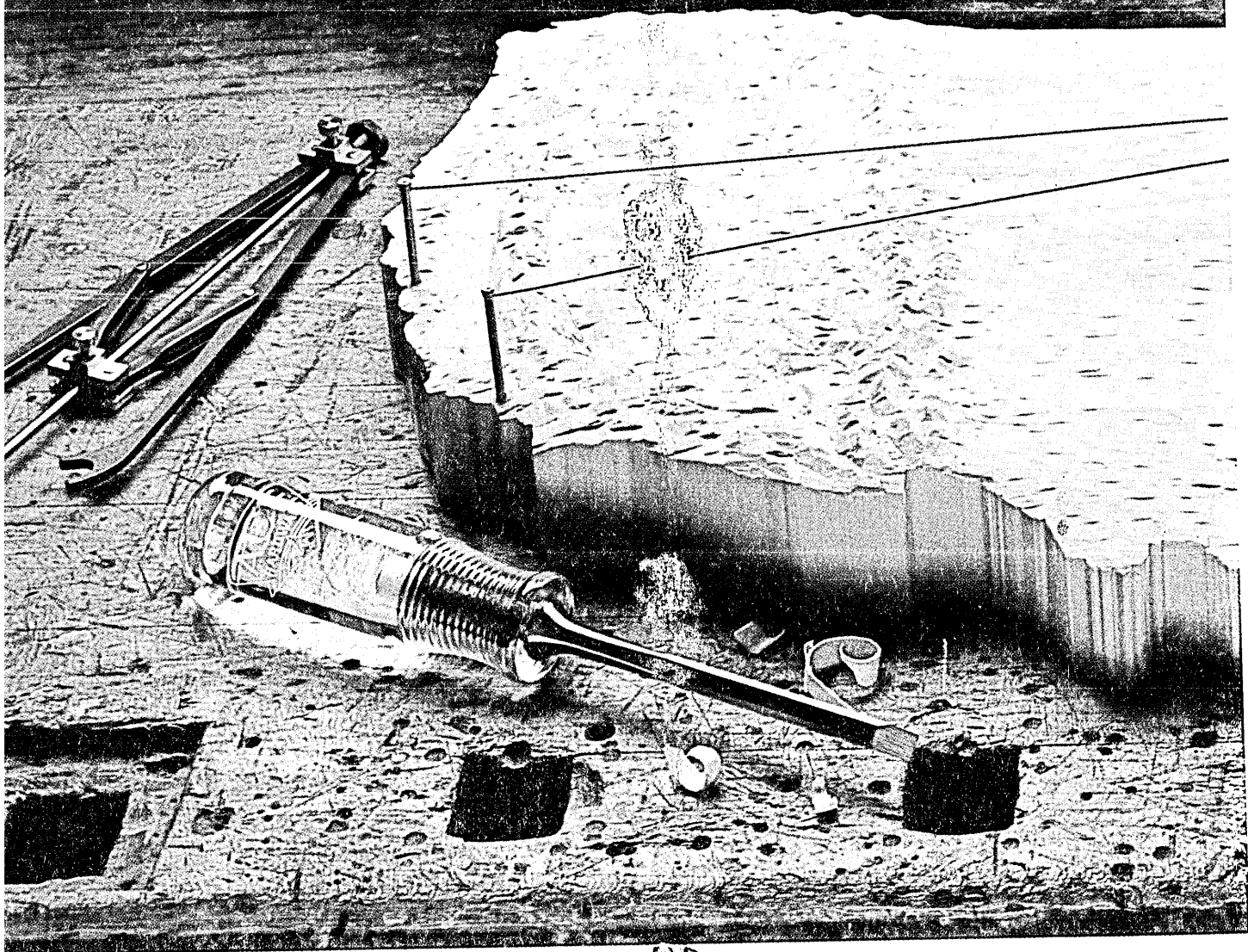
And color dramatically accelerates the learning process. Meaning that training time can be substantially reduced so operators reach full productivity far more quickly.

How will our CIT-161 fit into your system? Perfectly! It's an ANSI-compatible direct replacement for the DEC® VT-100 Series with a full range of advanced video features: 132/80-character column display, single-width or double-width/double-height characters, the unique Window Erase feature, split screen, and more.

Sound interesting? Contact C. Itoh Electronics, Inc. today for more information: 5301 Beethoven Street, Los Angeles, CA 90066, (213) 306-6700. Or call ACRO Corp., exclusive representatives: Irvine, CA (714) 557-5118; Houston, TX (713) 777-1640; Cherry Hill, NJ (609) 667-4114; Chicago, IL (312) 992-2346.

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ELECTRONICS, INC.**

One World of Quality

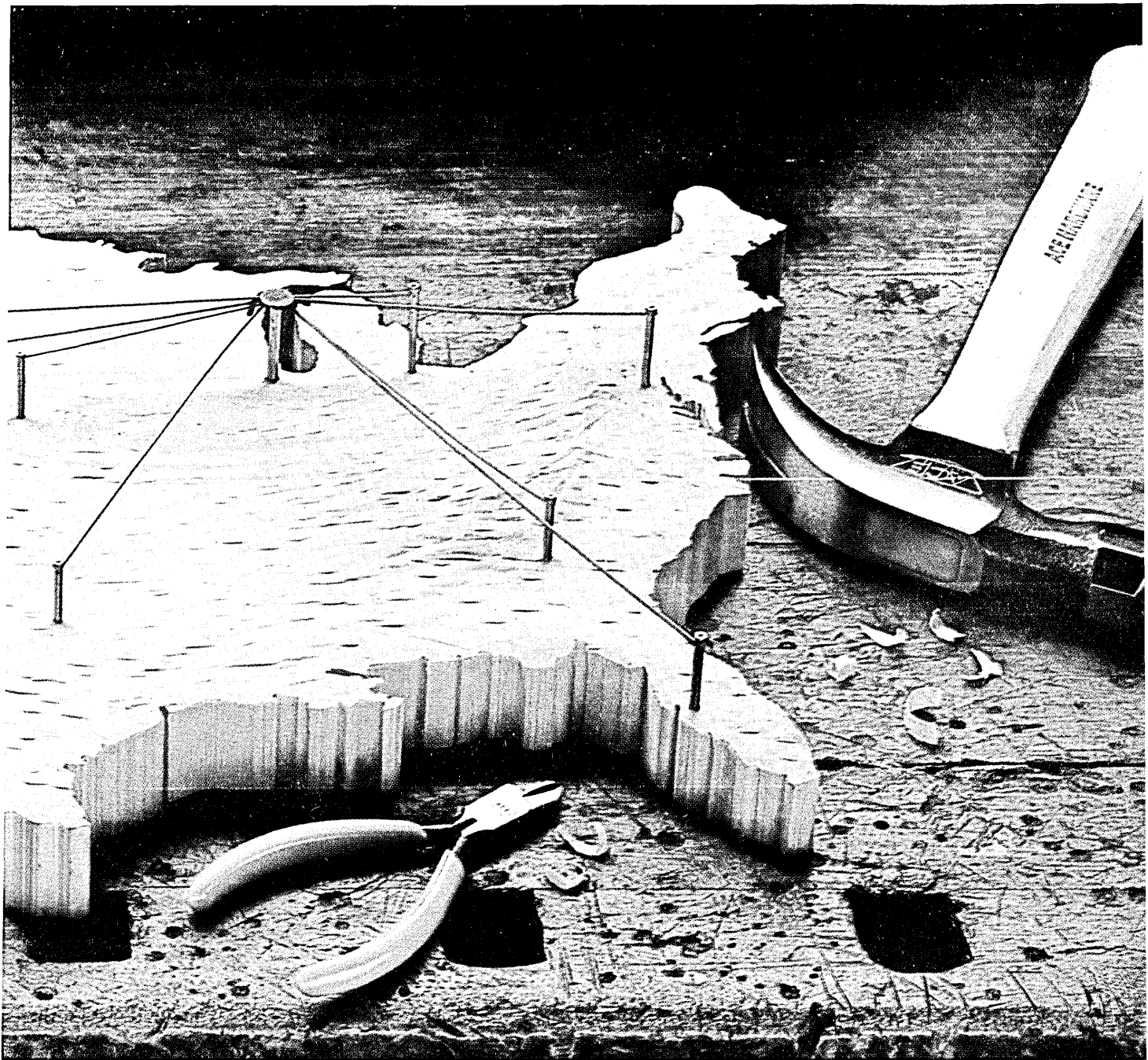


Distributed data processing with a network of IBM small systems

**ACE HARDWARE
SPEEDS UP SOFTWARE
DEVELOPMENT, NAILS
DOWN INFORMATION.**

It takes the right tools to build a distributed data processing system that provides up-to-date information out in the field, while maintaining central-site control. Ace Hardware Corp. found the answer in a network of IBM small systems.

An IBM 8100 Information System in each of Ace's regional distribution centers has compressed the time it takes to process orders, while expanding both warehouse and programmer productivity. The 8100s are tied through phone lines to a host IBM 3033N in Ace headquarters in Oakbrook, Illinois. Ace—the second largest chain of retail hardware stores in the U.S.—is a coopera-



tive acting as a wholesaler to 4,000 independent retailers.

Perfect Fit

"The IBM 8100 fit perfectly into our long-range information strategy," says Jim Van Wert, Director of Information Services for Ace. "We've been committed to a network tightly controlled from the host site, yet at the same time, able to provide support to our end users. Distributed data processing via the 8100 has accomplished all our objectives, and more."

Van Wert points out that Ace wanted a distributed system that would permit central development

of remote application programs, rather than placing DP staff in each warehouse. Ace also wanted to assure the integrity of information at the warehouses through backup at headquarters.

Dramatic Gains

"The 8100 has not only met those requirements," Van Wert reports "it also helped programmer productivity to the point where it took half the expected time to write applications and bring the programs on line.

"We demand the same high degree of service from the companies we deal with as our dealers expect

from us. With IBM, we've always received it, from the excellent people who helped us develop the applications to the service representatives across the country who can get there fast if we need help.

"Distributed data processing was waiting to happen at Ace. The 8100, made it happen."

For details on how a network of IBM small systems could help put distributed processing on your map, write IBM, 1 Cúlver Rd., Dayton, NJ 08810. Or call, toll-free, IBM Direct 1 800 631-5582. Ext. 93.

Alaska and Hawaii,
1 800 526-2484.
Ext. 82.

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PERSONAL COMPUTING AND APPLICATION DEVELOPMENT HAVE NEVER BEEN EASIER.



Ever since Henco Software joined the Prime Solutions Program, personal computing and applications development has become available to people of all skill levels.

For non-DP people, INFO is a truly functional departmental computing tool. Users can access corporate data or set up their own files. And they can enter and update information, query and generate reports, and write simple applications programs. Henco also offers a range of INFO-based interfaces for document management, graphics, modelling and word processing. All can be run on the same departmental machine. And all with a minimum of technical support.

For the DP department, INFO is a fast application development and design tool. Productivity will soar because system development takes just one-fourth to one-tenth the time as COBOL or FORTRAN. So projects scheduled to take a year can be done in a few months. And because INFO is so easy to use, many users maintain their own applications, allowing the DP department to concentrate on major programming projects.

And for DP management, INFO provides all the advantages of a 4th generation language, plus fast and easy integration into existing systems and files.

Even if you start with a small

system, the Prime/INFO combination gives you mainframe performance at a fraction of the cost. And you get Prime's unique full-line compatibility for easy growth, along with state-of-the-art distributed processing capabilities.

All in all, INFO is one of the most versatile and cost-effective software tools available today. In fact, payback can be measured in weeks, not years. Which helps to explain why it's installed at nearly 1000 sites worldwide, from small businesses to giant Fortune 500 companies.

If you'd like to know more about how Prime and Henco are providing solutions for the '80's, write to Prime Computer, Prime Park, MS 15-60, Natick, MA 01760. Or call 1-800-343-2540. In Massachusetts, call 1-800-322-2450.

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CIRCLE 22 ON READER CARD

LETTERS

THE VOICE OF VERBEX

In the Look Ahead sections of both your May and August issues, you have made inaccurate statements about Exxon Enterprises activities in the voice recognition field and in particular about Verbex, a division of Exxon Enterprises.

Contrary to your reports, Exxon Enterprises has not "bailed out" of the voice recognition market, nor is it having "particular problems" with Verbex. We have not "just told . . . Verbex that plans for an upgraded telephone-input product line would have to be shelved."

More than a year and a half ago, Verbex reoriented its efforts toward continuous speech recognition technology, while naturally continuing to provide support services to the model 1800 telephone-input product line. Today, Verbex has a high accuracy, continuous speech, speaker dependent, microphone-input system in active field testing. Exxon Enterprises has continued to finance Verbex's development activity in speech recognition at levels that have increased annually.

ROGER E. CHANDLER
Exxon Enterprises
New York, New York

CALLING CANADA

Would someone please inform Ted "the U.S. is the only country with a privately owned telephone system" Withington (July Special Report) that just 250 miles north of his Cambridge, Mass., office is a country one fifth larger than the U.S. which has privately owned telephone systems? (Old Alexander Graham was Canadian, eh?)

JOHN SEITZ
Informabec, enrg
Quebec, Canada

CANADA CALLING

In reading the DATAMATION Top 100 article in your June issue, I noted with interest that Datacrown was included as the 10th ranking computer processing services company with \$63.1 million in 1981 revenues. And in the write-up on Datacrown, the company is referred to as the largest Canadian time-sharing company.

Canada Systems Group had 1981 revenues of \$101 million (Canadian), and we are the largest Canadian computer ser-

vices company, with projected 1982 revenues of over \$140 million (Canadian). We therefore look forward to being included in the 1983 Top 100 article as a leading Canadian computer services company.

W. W. BEAIRSTO
Canada Systems Group
Mississauga, Ontario, Canada

A STAR IS BORN

In projecting the future place of computer movies ("From FORTRAN to Film," August) your writer Jan Johnson accepts some dubious assumptions: "Think about it: 64 channels at the viewer's beck and call, 24 hours a day. It's a thought that gives cable company managers nervous cramps. Where are they going to find enough talent to fill all that air space?"

To which one could raise a few (naive?) questions:

1. Do we have to fill all the available channels if we can only fill them with junk or plastic?

2. Why should cable companies control this resource anyway? They seem to have the same mind set as their fellow "entertainment technology" providers in the major networks, who in a country of 240 million creative and talented people give us the tv fare we all know and endure so well.

3. What about the idea of cheaper, easier access to the new cable channels for

all kinds of people—music and drama groups, political and community service groups, talented new writers, poets, and artists (including computer graphics people!)? Let the cable companies manage just the technical end; there are enough creative people to provide the talent, if they can get access.

No doubt Digital Productions Inc. and others will do some fascinating things as they strive to create "a computer-based system that will produce scripts, scenes, people, and most intriguing of all, behavior." Will their end product arouse in us the kind of response we give to the depiction of real human drama? Not very likely. But come to think of it, neither does much of our current tv! Perhaps computer-generated equivalents of *Love Boat*, *Three's Company*, etc., would fit right in with what we already get from the major networks.

PETER KENNY
Glenn Dale, Maryland

KUDOS FOR US

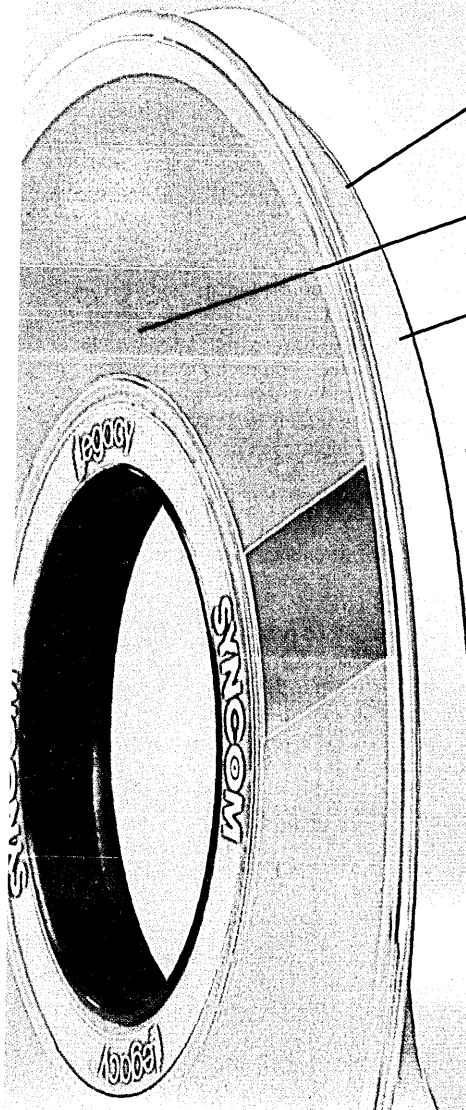
I read with interest and fascination your July Special Report, "IBM/AT&T: The Coming Collision." To my knowledge this is the first time in recent years that a major trade publication has focused on these important issues—issues that will affect the way business communicates in years to come. You should be commended for a job



"We'll be right back with more EKG readings following these important messages."

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How to solve parity problems:



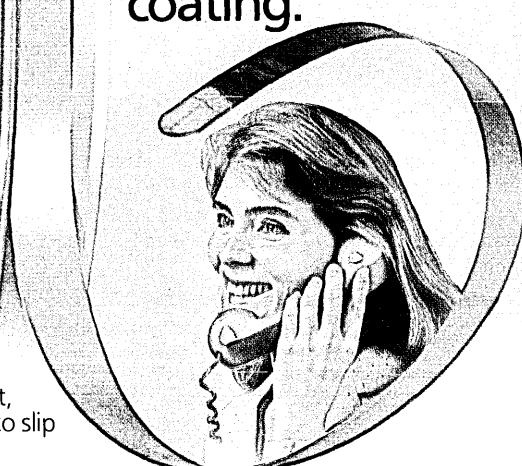
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LETTERS

well done. I hope you are planning updates on a scheduled basis.

PHILIP F. PAGANO

The Comnet Group of Companies
Garden City, New York

CAPTIVE AUDIENCE

Your August issue (In Focus) notes that some dentists are selling computers as well as using them. My own dentist is one. He was lured into the business a few years ago by two programmers who developed a dental accounting system on minis and got him to help sell it. Believe me, you don't know what a captive audience is until you've sat in a dental chair while some guy holds his thumb in your mouth and tells you about the glories of his report formats.

JOE RIGO

SYSDOC Inc.

New York, New York

BEAUTY MORE THAN SKIN DEEP

Regarding Merrill Cherlin's article on Mona Lisa (In Focus, June), you perhaps know that Leonardo was a great anatomist and student of the human body. In the case of Mona, the facts are that Leonardo began by painting a portrait of a human skeleton exhumed from the local churchyard. He then painted the musculature, internal organs, body fat, and finally, the skin. The clothing was no more an afterthought than the skin. But then, Mona Lisa was also not painted from as superficial a viewpoint as her skin. For reference, see *Codex Microfilmus*, Volume 13.

BRUCE HYMAN

Short Hills, New Jersey

DO WHAT?

As a programmer working closely with hardware engineers, I have discovered a method of easily determining whether a person is a programmer or an engineer. I have decided to share this secret with your readers.

Simply ask the person to convert a large number, such as 65,536, to its "K" equivalent. If he divides by 1,024 and says 64K, he's an engineer; if he drops the last three digits and says 65K, he's a programmer.

ROBERT C. FISH

IBM Corp.

Manassas, Virginia

LE FAUX PAS, C'EST MOI!

Even though it has nothing to do with data processing or the General Services Administration, I would have expected someone at DATAMATION to notice the glaring error in your report on GSA's proposed new procurement policy (News In Perspective, August). While it was indeed Louis XIV who declared "L'état, c'est moi," he did so in the 17th century. It was a later Louis, the XVI, who lost his head in the French Revo-

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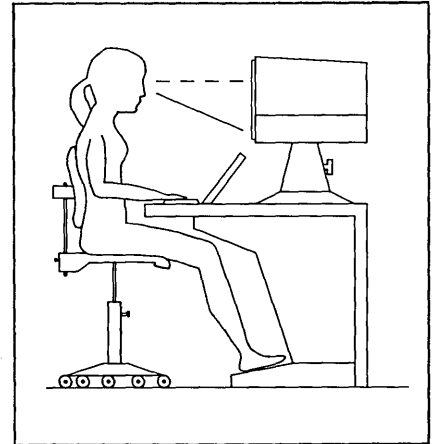
Others talk about ergonomics, TEC can put *true* ergonomics in your office... NOW.

True ergonomics increases job satisfaction, improves office productivity; decreases fatigue induced errors thereby reducing costs where video display terminals are used continuously.

The TEC ET80 includes all internationally known ergonomic standards

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- flickerless positive display (refresh rate well above 60 Hz)
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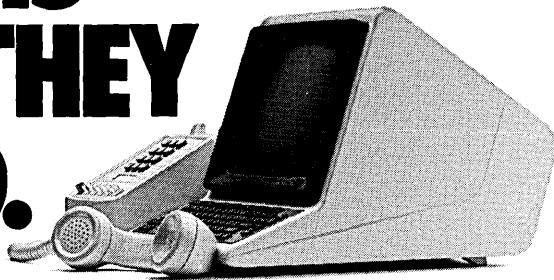


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CIRCLE 251 ON READER CARD

LETTERS

lution. I doubt that the author means to suggest that it will take the industry a century to react to GSA's new policy.

DIANE LEVIN
Atlanta, Georgia

Mr. Willie Schatz's moderately interesting article on GSA policy is seriously marred by historical ignorance. Louis XIV died of old age in 1715. It was Louis XVI who was beheaded, in 1793, primarily by outraged city dwellers, not at the hands of peasants. I can hardly wait to hear Mr. Schatz's version of the correspondence between the famous King George III and Thomas Jefferson.

KATHLEEN M. MOREY
Fullerton, California

Your news article in August started off with a cute reference to Louis XIV. ("You remember Louis . . . L'état, c'est moi?") Actually, some of us do remember Louis XIV, the Sun King, who reigned for 72 years (1643-1715) and was succeeded by his great grandson. It is certainly *not* true that "his listeners handed him his head." Perhaps your reporter permuted his Roman numerals and confused the Sun King with his less illustrious descendant, Louis XVI (1754-93), who lost his kingdom and his head in the French Revolution.

CARLA MARCEAU
NCR Corp.
Ithaca, New York

Willie Schatz's article in the August issue comparing GSA to Louis XIV falters in the face of fact. Louis XIV, the Sun King, died peacefully in bed in 1715, mostly of old age. Louis XVI was the unlucky participant in the close shave party in 1793 [sic]. Oh well, what's one Louis more or less?

EUGENE M. LEWIS
Distribution Sciences, Inc.
Des Plaines, Illinois

Dear Mr. Louis—er, uh, Lewis: Just as your correction suffered from a transposition (i.e., 1973 for 1793), so did our Louis's number (XIV for XVI)—Ed.

WERE YOU WATCHING?

As if transposing the numerals on King Louis weren't enough, we also transposed sections of Eugene I. Lowenthal's article ("Database Systems for Local Nets," August), as was so kindly pointed out by the many mystified readers who called us on it. For those of you who would like to reconstruct the original line of thought, the last sentence on p. 102 ends with the sentence fragment that begins 14 lines down in the third column of p. 104. All of the text in between those two points should have been situated in column 2 on p. 102, before the paragraph that begins "A more profound step forward . . ." Our apologies to Mr. Lowenthal and our readers. —Ed.

McCormack & Dodge can afford any 3270 compatible terminal. Why would they choose the least expensive? Control Concepts.

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 "Regardless of the cost, we have to know our 3270 terminals are going to run every time we plug them in. Because that's how we demonstrate our on-line financial software programs to potential clients. And that's why we prefer to use a Control Concepts terminal. It goes directly to the demonstration site with us, usually in the trunk of a car. We know it will perform."

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 "The integrated modems allow us to get our terminals on-line instantly. That's especially critical to us since our business is selling advanced financial software to discerning clients. Plus, when we need a new terminal from Control Concepts, we know we'll have it within 72 hours."

3
 "At Control Concepts, they build their terminals tough, and then they thoroughly test each one before it ever leaves the factory. On those rare occasions when service is required, we know we can count on Control Concepts to get us back on line immediately. Usually, the problem can be resolved over the telephone."

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 "Reliability. Fast Delivery. Service. We get it all in a Control Concepts 3270 terminal. And best of all, we get it for less money than we'd have to pay for any comparable terminal on the market."
 — Bill Holland,
 Communications Manager
 McCormack & Dodge



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The highest level query language is one you already know...

ENGLISH

I WONDER HOW ACTUAL SALES FOR LAST MONTH
COMPARED TO THE FORECASTS FOR PEOPLE UNDER QUOTA
IN NEW ENGLAND.

NAME	1982 SEPTEMBER SALES	1982 SEPTEMBER ESTIMATED SALES	CHANGE	% CHANGE
SMITH	\$52,570	\$55,064	2,494	4.53
JONES	\$83,596	\$85,360	1,764	2.07
ALEXANDER	\$52,546	\$55,482	2,937	5.29
ADAMS	\$53,837	\$56,357	2,520	4.47
McNEIL	\$95,760	\$96,929	1,169	1.21
McKAY	\$36,448	\$39,694	3,246	8.18
BERGER	\$85,691	\$90,515	4,824	5.33
COLONDER	\$75,762	\$77,448	1,686	2.18

With Intellect™,
all you do is type a simple
question—any way you want

```
PRINT LNAME, 82-SEP-ACT-SALES, 82-SEP-EST-SALES,
      82-SEP-ACT-SALES - 82-SEP-EST-SALES,
      (82-SEP-ACT-SALES - 82-SEP-EST-SALES) / 82-SEP-ACT-SALES
```

```
IF REGION = 'NEW ENGLAND' AND
   82-YTD-ACT-SALES < 82-QUOTA
```

Before Intellect™,
you had to use a complicated
query language like this

Intellect is the only true English language query system. It employs the technology of Artificial Intelligence to understand even the complex pronoun references and incomplete sentences that we all use in conversational English. Executives can access data themselves—more easily than ever before—without learning any jargon or “computerese”. It’s so easy to use it doesn’t even have a training manual!

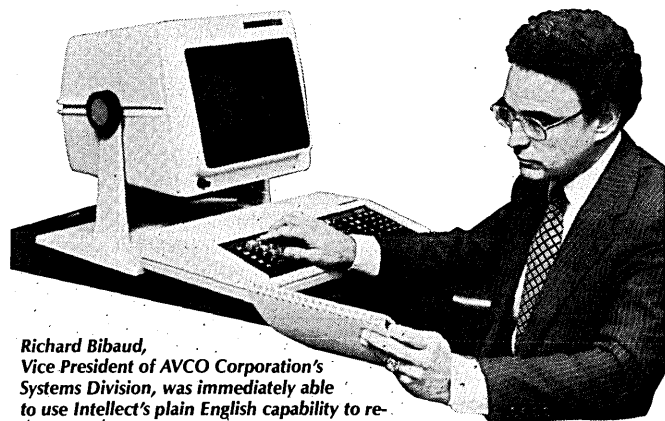
Intellect isn’t just for simple questions. The system can combine information from several files to respond to a query, so that a request doesn’t have to be confined to a single file. Users can compare different sets of data with one question, as when comparing actual sales figures with projections. Managers make better decisions with all this information instantly available at their fingertips.

Eighteen months ago true English-language data retrieval was not even possible in everyday commercial applications. Although Intellect is a recent and dramatic development, it is already hard at work at over 100 installations in major Fortune 500 companies. It has been hailed by publications such as *Business Week* and *Fortune* as the first product to put Artificial Intelligence to practical commercial use. Intellect is used in a wide variety of businesses, such as manufacturing, banking, insurance and retailing—because the system incorporates a lexicon tailored to the way your company does business.

Intellect’s ability to understand English is so unique

that leading software companies have arranged to integrate it into their product lines. Intellect is marketed by Cullinane Database Systems under the name “On-Line English”. Management Decision Systems offers Intellect as “ELI—English Language Interface”. Information Sciences markets Intellect with their human resources package as “GRS Executive”. Intellect also interfaces directly to ADABAS, IDMS and VSAM, as well as dealing with sequential files.

You don’t have to learn a complex formal language to talk to your computer any more. Intellect already speaks your language. We’d be delighted to hear from you.



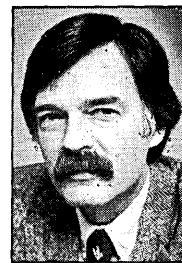
Richard Bibaud,
Vice President of AVCO Corporation's
Systems Division, was immediately able
to use Intellect's plain English capability to re-
trieve information from his company's computer.



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CIRCLE 27 ON READER CARD

EDITOR'S READOUT



MELON AND THE ADDICT

As we walked into the Second Avenue pub we had no trouble spotting the tall, angular figure of our friend Persiflage Melon draped over a stool at the end of the bar.

Melon, a highly successful management consultant and noted amateur ichthyologist, was gazing moodily into his mulled wine.

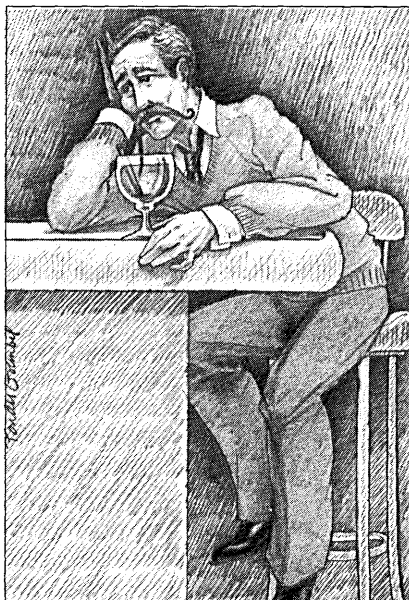
"I'm glad you got here so fast," he said. "It's an emergency."

Melon's enigmatic phone call, hinting of dark disasters, had drawn us out of the office and into the raw, early dark of a late afternoon in November only minutes before.

What's the matter, we asked, ordering a beer and settling down beside him.

"It's Glynnis," said Melon. "She's addicted."

We were shocked. Glynnis and Melon had been together for some time now and we felt that finally he had found his soul mate. Glynnis had grown to maturity in the '60s in Haight-Ashbury. A free spirit, she is given to somewhat eccentric dress (as is Melon), and at any given moment might be studying the *I Ching*, conducting a group session in creativity, planning a trip to the Amazon, or stripping furniture. But we knew that her experience with drugs had been voluntarily limited



to a few LSD trips and an exploratory puff or two of marijuana. And that was 15 years ago.

What is it, we asked? Pills, coke, heroin? Has she become a Valium junkie?

"Oh I wish it were that simple," Melon groaned. "No, no, it's far worse. She's hooked on a TRS-80 and I can't pry her loose from the thing."

"She canceled our Club Med Caribbean cruise because it conflicted with a Dungeons and Dragons convention. She's off looking at modems and checking out database management software. She sits at that damn machine day and night doing spreadsheet analysis and learning Latin roots and prefixes just for kicks. Last night she was talking about running out of memory and adding a Winchester drive. . . . this is my little Glynnis who just two

months ago didn't know an interface from a pterodactyl. I hear that damn matrix printer in my dreams."

He dipped his magnificent mustache into his wine. "I'm losing her to a personal computer," he said glumly.

Our heart went out to him. We had seen this affliction too many times before not to recognize the seriousness of the situation. It's common enough nowadays, often having its roots in a chance visit to an arcade. Sometimes the computer junkie recovers, sometimes not. As we fumbled to form some sort of consoling reply, the door to the pub burst open. In strode Glynnis, looking resplendent in a tam-o'-shanter and a multicolored coat that appeared to have been fashioned from the remnants of a Kurdish tent.

"Melon, my love," she said, "I've been acting like a character out of *Tron*. I've realized that I've let a computer come between us. Some sort of primeval urge to restructure the universe came over me. It's all been a bad dream, but it's over. The Caribbean trip is back on and right now I'm taking you to the Woody Allen film festival."

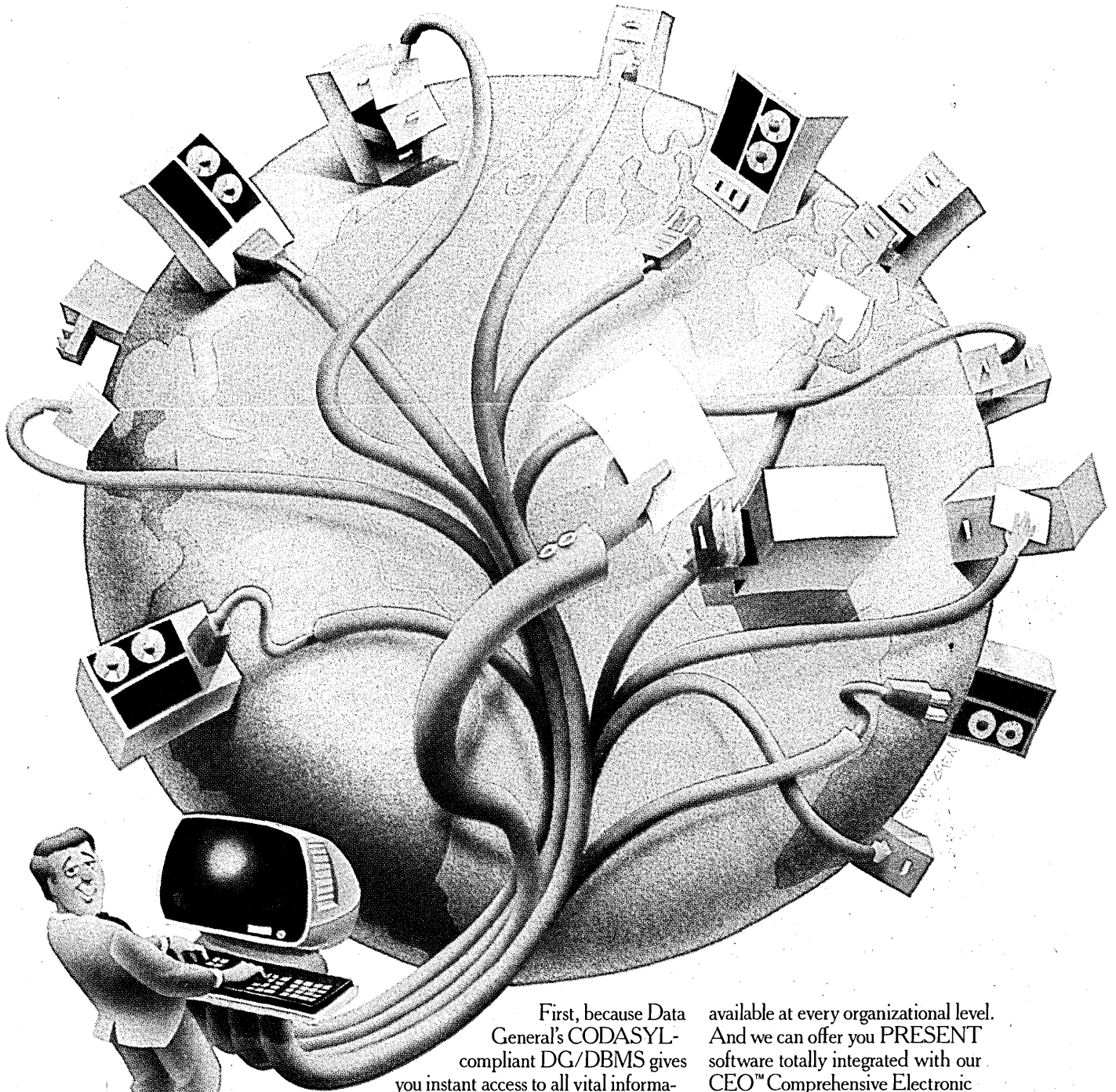
With a sigh of relief we watched the happy couple head for the pub door. It had been a close call.

But as we watched Glynnis gallantly open the door for Melon (he'd been at the pub far longer than we), we heard her say, "Melon, sweetie, you know Christmas is just around the corner, and I saw the cutest little daisy-wheel printer on sale just the other day. . . ."

Some addictions are harder to shake than others, we mused, signaling the bartender for another beer. *

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Computerize new applications faster, and make all information available in an easily accessed database.

And toward both these ends you can search the globe and not find more effective information management software than that engineered by Data General.

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And third, Data General's PRESENT™ software—with its interactive graphics—makes information

available at every organizational level. And we can offer you PRESENT software totally integrated with our CEO™ Comprehensive Electronic Office system. All of which gives your users a powerful desk-top tool for automating their offices, accessing the information base and generating their own reports.

So if you're looking for software that lets you stay on top of your management's demands, instead of their staying on top of you, you're looking in the right place.

For more information write to Data General, Dept. IRM-3, 4400 Computer Drive, Westboro, MA 01580.

Data General
WE ENGINEERED THE ANXIETY
OUT OF COMPUTERS.

1982 MINI-MICRO SURVEY

Mini sales are slowing as the micro comes on strong; networking is increasing in popularity.

by John W. Verity

Like the rest of the industry, the small computer market looks like it has a tough year ahead of it, according to this year's DATAMATION/Cowen & Co. survey of small computer users. The traditional mini will suffer the most as the personal computer and other micro-based systems steal away new installations and erode existing ones.

This year's survey, taken in July, is based on responses received from 6,743 DATAMATION subscribers throughout the U.S., who said they have more than 44,000 small computers, office systems, and intelligent terminals installed. More than 3,300

of the respondents in the survey said they also had already purchased and installed personal computers, which are the subject of increased analysis this year.

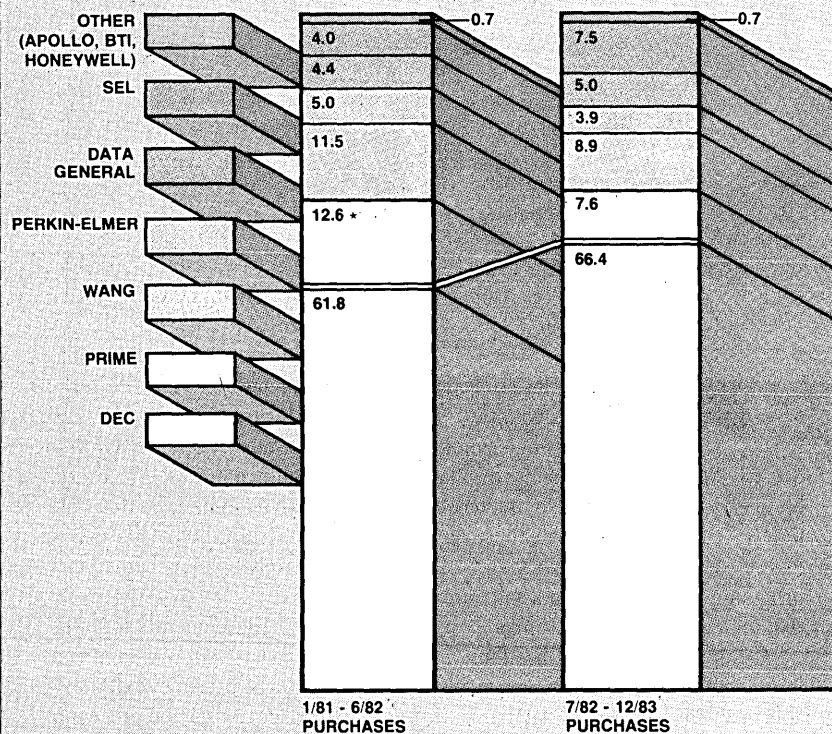
In total, for all applications, 3,278 respondents reported taking delivery of 13,242 minicomputer systems with an estimated purchase value of about \$900 million during the 12 months preceding the survey. For the subsequent 12 months, 2,466 users reported plans to purchase 14,542 systems valued at roughly \$950 million.

Minicomputer industry shipment growth in the area of 12% to 13% is projected for the year ending June 1983, a figure sharply lower than the more than 23% growth forecast in last year's survey. The figures are adjusted to take estimated new users into account.

Those new users remain a significant source of minicomputer industry growth, but the rate of expansion from them continued to slow, a trend that has been evident for several years. This year's figures showed a 7% growth in new users over 1981, compared to 11% last year over 1980. The overall growth rate for the past eight years is 19%.

Over the past five years, the new user compound growth rate for the overall

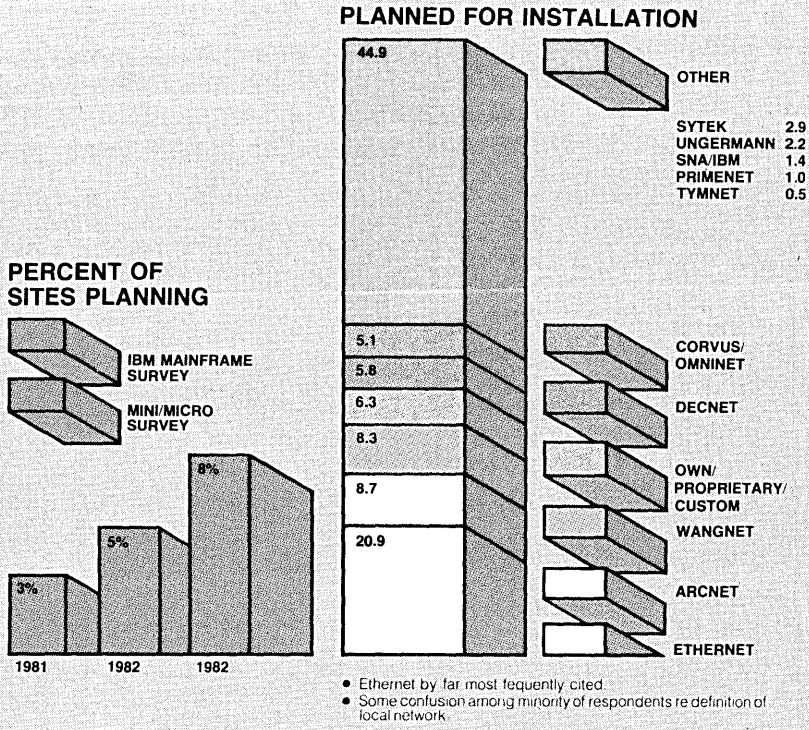
FIG. 1
**DEC SHARE OF 32-BIT MARKET
CONTINUES TO GROW**
PERCENT OF RESPONDENT 32-BIT SYSTEMS PURCHASES



* 4.1% from a single site large end user purchase of 100 Prime 250 systems.
● Significant share increase indicated for SEL also.

FIG. 2
EIGHT PERCENT OF RESPONDENTS PLAN TO IMPLEMENT LOCAL NETWORKS

Query: Will your organization install a non-phone line local area network (such as Ethernet) during 1982/83?



survey base was 16%, but was a more moderate 11% for the oem-only segment of the base. Systems houses showed a 19% growth rate and end users a 16% rate.

The strongest growth in new-to-the-industry minicomputer users was seen in business data processing and office systems applications, which showed growth of 14% and 13% respectively. The lowest such growth was in the education category, where a figure of 7% is thought to reflect inroads being made by the personal computer.

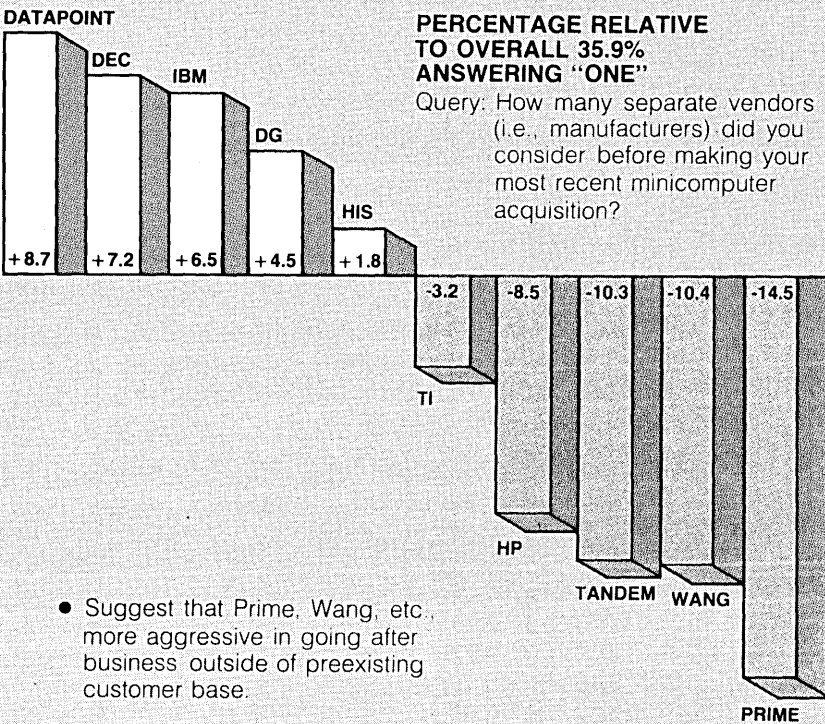
As for applications of minicomputers in general, industrial automation showed a drop as the percentage of the dollar value of shipments compared to the previous year, while medical/biophysical lab, office systems, and business data processing (standalone and distributed) showed gains. Education and training, too, showed a slight drop.

Office systems seems to be an arena Digital Equipment, Prime, and Wang are doing well in; that was the application most often cited for DEC machines planned for installation in 1982 and 1983.

Software and support continue to increase as a percentage of the spending planned by minicomputer users. Previous to last July, respondents said, they spent 18.6% on support while in the following 12 months they will spend 19.5%.

Database management system (DBMS) usage among minicomputer respondents is heaviest in shops where Hewlett-Packard, Microdata, and Tandem are the principal mini suppliers. In the network software category, Tandem is far and away the leader, with 60% of its sites involved. It

FIG. 3
DEC AND IBM ENJOY HIGHER THAN AVERAGE INCIDENCE OF SINGLE-SUPPLIER PROCUREMENTS

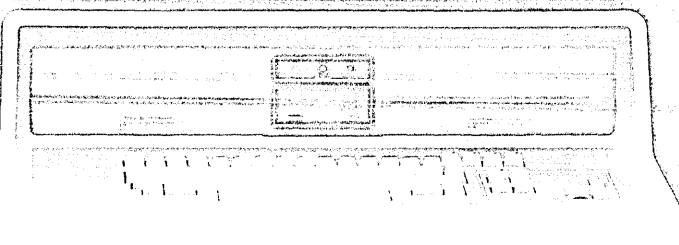
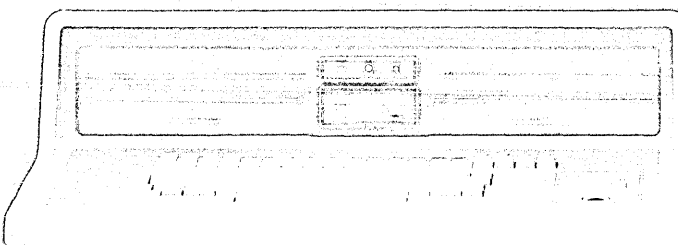
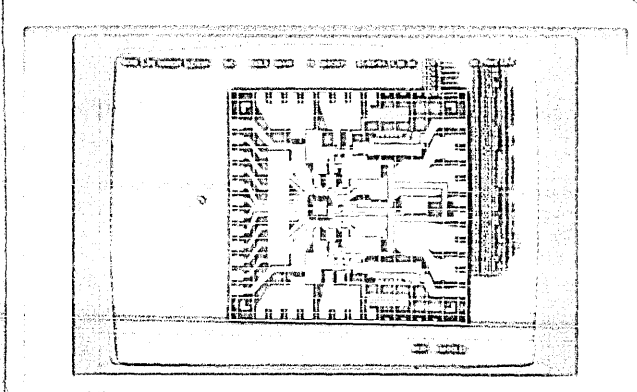
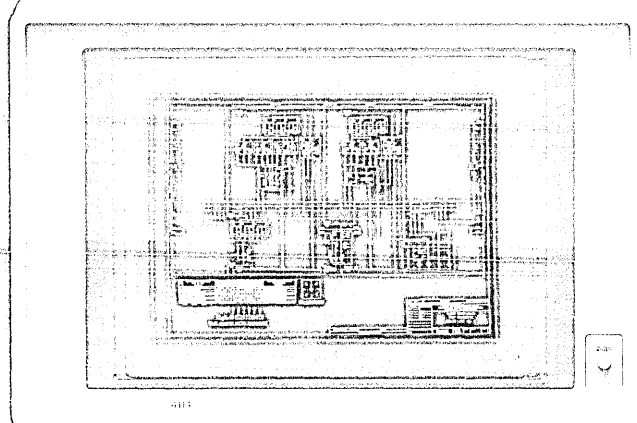
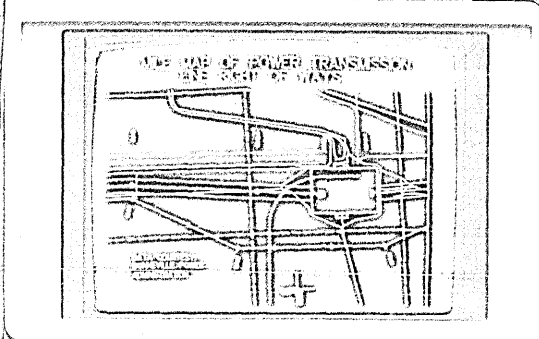
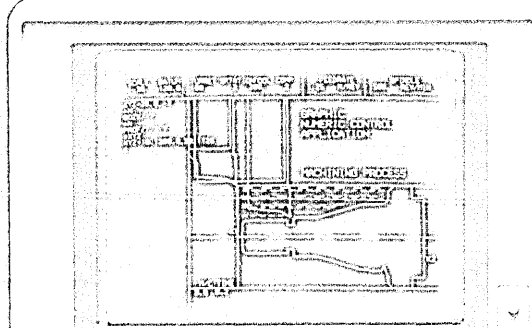
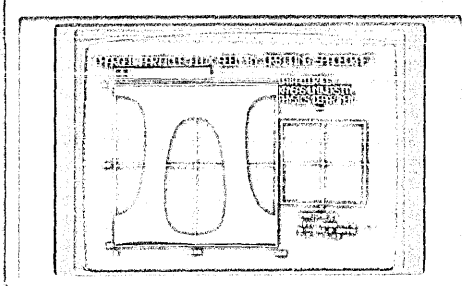
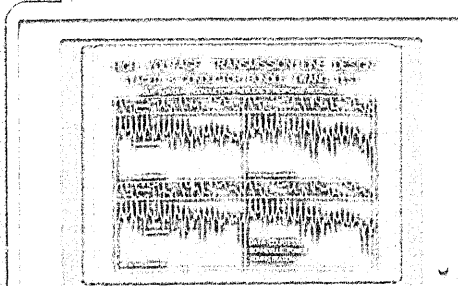
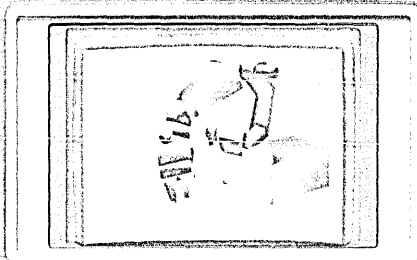
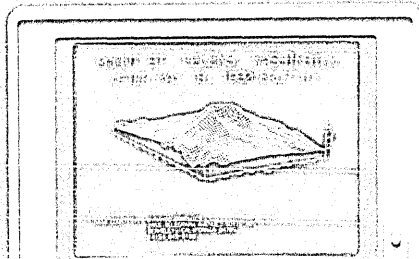


Industry growth of 12% to 13% is projected for the year ending June 1983, a figure sharply lower than the 23% forecast in last year's survey.

is followed by ModComp (which sells primarily into the industrial automation market), Burroughs, Datapoint, and Four-Phase.

DBMS usage is expected to grow 17% compounded over the next two years, while network software is pegged at 35% for the same period. Some 28.3% of the respondents said they were using mini DBMS software and another 10% said they will install it for the first time in the coming year. As for network software, 9.2% of all respondents are using it, with another 7% planning to add it during this year and next.

Some interesting data concerning the field of local networking were revealed by this year's survey. Asked what the primary mode of minicomputer use was, respondents showed a discernible increase in peer networks, or connecting minis to each other without an intervening host. This year's figure of 5.7% of sites using peer



There's a time and place for storage. For raster. And for both.

Strengths of DVST are demonstrated by the bank of displays (left column, top to bottom): 1 & 2. 4096 x 3120 point matrix captures minute variations in data analysis. Manipulate and highlight selected elements with color write-thru option. 3. Numeric control relies on DVST's smooth arcs and diagonals for accurate machine calibration. 4. In PCB design, DVST affords precise display of intersecting points.

Tek color raster answers a different set of needs (right column, top to bottom):

1. Select from thousands of colors to add realism to 3-D graphics.
2. Color shading enhances the eye's interpretative capability.
3. & 4. Use Tek segments to manipulate and highlight color information, from simple maps to PCB layouts.

Only Tektronix offers you a choice of two distinct yet compatible graphics technologies.

So you can begin each new application with one basic question: "What kind of graphics will do the job best?"

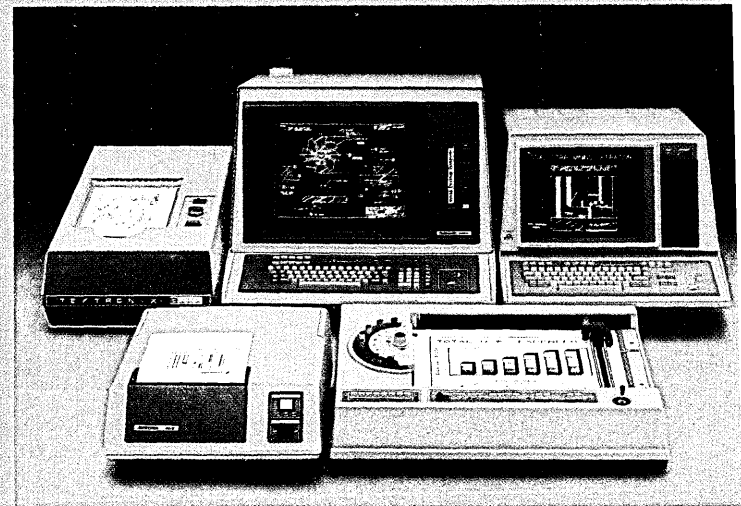
Choices include Tek's exclusive, direct-view storage tube (DVST). Raster. And "write-thru" option, a powerful merger of both.

DVST is vital to the most complex tasks, such as electrical and mechanical design and cartography. Its high edge acuity, image stability, and perfect arcs and diagonals

make DVST essential to environments dealing with precise, extremely dense graphics data.

Raster may be your best value for tasks in which color or easy editing outweighs the need for DVST's exacting detail. Tek 4110 Series raster terminals offer 60 Hz non-interlaced displays for the best in flicker-free viewing. Their unique segments capability offers exceptional interactivity with graphics data.

Tek color raster lets you select from thousands of colors. You can use graphic segments, true zoom and pan, plus patterns and surfaces, for the enhanced data discrimination required by many CAD and analysis environments.



Draw the best of raster and storage from the "write-thru" mode on Tek DVST displays. With write-thru, you can scale, drag and edit selected, high-resolution refresh segments. Optionally, you can show these segments in a contrasting color, to differentiate sections or layers of complex displays.

Many applications benefit by the service of both technologies. So Tek designs immediate compatibility among all its 4110 Series raster and storage terminals. We support them with modular PLOT 10 IGL, the world's most popular SIGGRAPH "core" software.

Assure yourself of the right technology for all times: ask your Tek Sales Engineer for the complete picture. For the

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networking is up from last year's 4.0% and is thought to signify the increasing use of local networking.

Host networking accounted for 12.2% of the sites responding while 65.9% said they ran standalone minis interactively; the remaining sites ran standalone batch systems.

In response to a question of whether they intended to install non-phone line local networks, 8% of the respondents said they would during 1982-83. Of those, 20.9% said they would use the Ethernet scheme promoted by Xerox, Intel, Digital Equipment, and a host of other firms. After that came 8.7% for Datapoint's Arcnet, 8.3% for Wangnet, 5.8% for DECnet, and 5.1% for the Corvus/Omninet designed for Apple computers. Some confusion was seen in the respondents' understanding of the definition of a local network, perhaps because the concept is a relatively new one.

Interestingly, local networking seems to have gained more interest among the mini users in this survey population than

Users continue to be loyal to their mini suppliers; 82.6% said they had no plans to switch.

was seen in a sample of IBM mainframe users surveyed by DATAMATION/Cowen earlier this year (May, p. 34).

Each year the mini-micro survey investigates what factors are important to users in selecting their machines. As has been the case in the last two years, hardware reliability is the main factor, followed by vendor reputation.

Asked if they expected to change principal mini suppliers over the next 12 months, 10.7% of the responding sites said they were seriously considering it, 6.7% said would make a switch, and 82.6% said they had no such plans. The comparable figures from last year's survey were 11.3% considering, 7.2% yes, and 81.5% no.

In terms of the vendors as principal suppliers, Tandem continued to show the highest loyalty among customers, with only 7.5% of its sites saying they were planning or considering a switch. Last year the firm showed a figure of 0.0%. DEC and IBM also fared well at 11% each. The highest risk of defections was seen in figures for Northern Telecom, with its aging base of Data 100 and Sycor equipment; ModComp; Computer Automation; and Univac, which a few years ago took over the Varian Data customer base.

Software support was the most cited reason for considering a switch of vendors, particularly among end users. Oem/systems house respondents cited price and software support as the main factors in considering a change.

Until the end of 1981, customers of DEC had stated to previous surveys that they

FIG. 4

APPLICATIONS SOFTWARE DEVELOPMENT FOR PERSONAL COMPUTERS VS. MINICOMPUTERS

Query: Who primarily develops the applications software for your organizations?

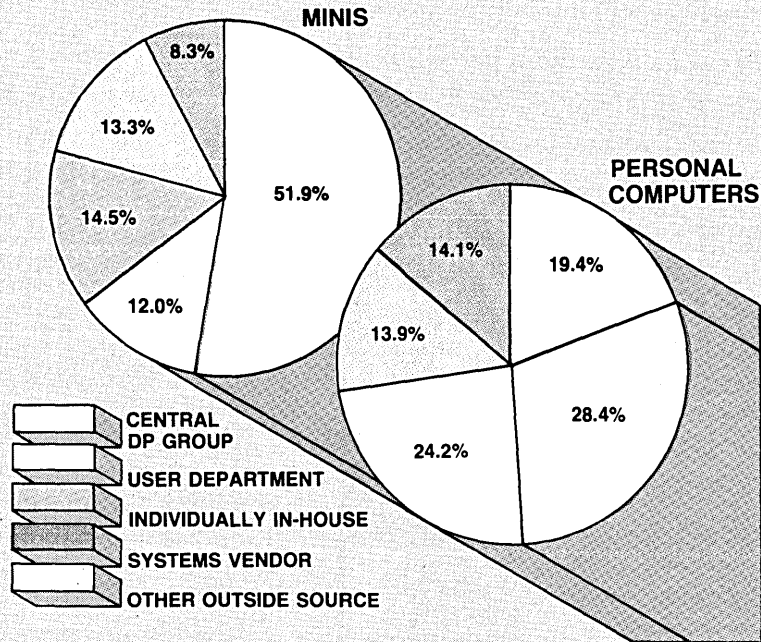
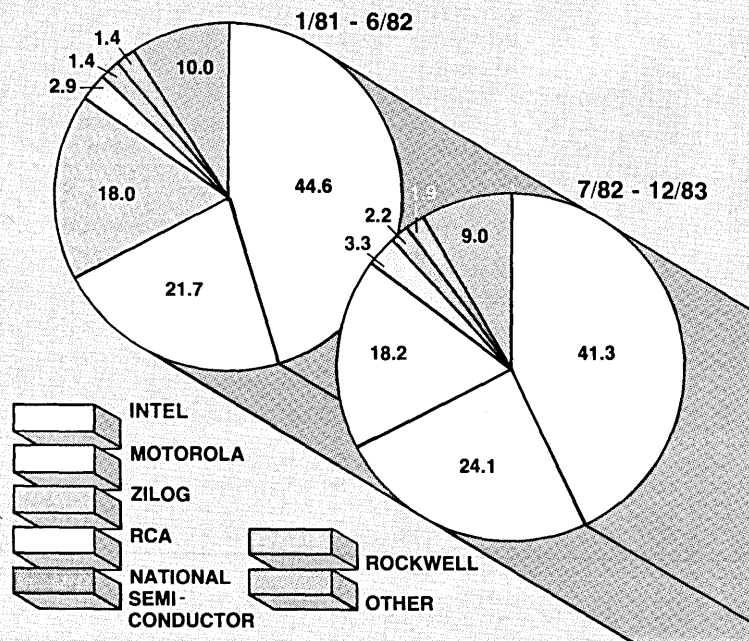


FIG. 5

INTEL STILL THE MOST FREQUENTLY CITED MICROPROCESSOR CHIP SUPPLIER

PERCENT OF SITE MENTIONS



- Lineup among top three unchanged during past five surveys.
- 25% of these sites planning 16-bit microprocessor purchase during 7/82-12/83, up from 13% in 1/81-6/82.

"THE COMMODORE 64 COULD BE THE MICROCOMPUTER INDUSTRY'S OUTSTANDING NEW PRODUCT INTRODUCTION SINCE THE BIRTH OF THIS INDUSTRY."

—SHEARSON/AMERICAN EXPRESS

The Commodore 64™, to judge from the above comment, is generating as much excitement among the people who invest in companies as it is among the people who run them.

The reason for this is that, for the first time, high-level computer power is limited only by the inclination to have it, rather than the means.

HALF THE COST = TWICE THE PRODUCTIVITY.

This simple equation reflects the Commodore 64's most basic—and outstanding—qualifications.

Its standard memory is 64K. Which is unusual enough in a micro at any price.

At \$595, it is astonishing.

Compared, for example, with the Apple II+®, the Commodore 64 offers 33% more power at considerably less than 50% of the price.

Compared with anything else, it's even more impressive.

And if you're a businessman, it can effectively double your computer-equipped work force.

PILE ON THE PERIPHERALS.

Because the basic cost of the Commodore 64 is so low, you can afford more peripherals for it. Like disk drives, printers and a telephone modem.

For about the price of an Apple II+ computer alone, you could equip your company with a Commodore 64, disk drive, printer and modem.

HARD FACTS ABOUT SOFTWARE.

The Commodore 64 will be able to run virtually any program important to business and industry.

Commodore software will include an electronic spreadsheet; business graphics (including printout); a user-definable diary/calendar; word processing; mailing lists; an electronic mail program; and much more.

Even programs that can teach operators how to program.

It is programmable in BASIC.

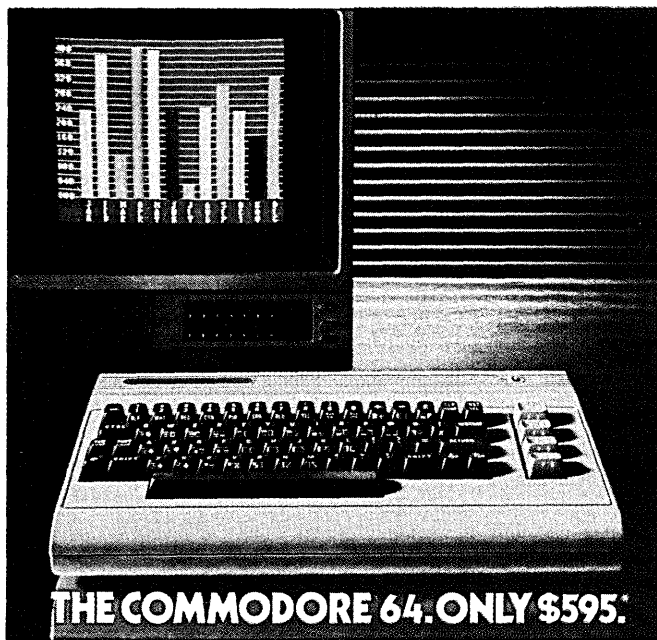
With the added CP/M® option, you can have access to hundreds of existing software packages.

In short, its applications are virtually limitless.

THE FUN SIDE OF POWER.

The Commodore 64 can become very playful at a moment's notice.

You can use it with Commodore's game cartridges or invent your own diversions. All will be enhanced by brilliant video quality and high resolution graphics (320 x 200 pixels, 16 available colors, 3D Sprite graphics), plus its own unique music synthesizer.



THE COMMODORE 64. ONLY \$595.*

NOW'S YOUR CHANCE.

If you've been waiting for the "computer revolution," consider it as having arrived.

Through its 25 years of existence, Commodore has been committed to delivering better products at lower prices.

Today, the company's vertical integration has resulted in the Commodore 64's price performance breakthrough heralded by Shearson/American Express.

So if you run a company, you couldn't make a more cost-efficient capital investment.

For more information, contact your local Commodore dealer, or send in this coupon.

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P.O. Box 500, Conshohocken, Pennsylvania 19428

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COMPUTER

D-11

CP/M® is a registered trademark of Digital Research, Inc. *Manufacturer's suggested retail price: July 1, 1982. Disk drives, printers and monitors are not included in price. The 64's price may change without notice.

CIRCLE 30 ON READER CARD

IN FOCUS

were upset with the company's inability to deliver equipment fast enough, but that log-jam has since been cleared up. Among those sites considering a switch of main vendors, only 5.8% of those with DEC as that vendor were considering a switch because of delivery schedules. Last year the figure was 19.3% and the year before,

The trend toward single-supplier procurements of all types of mini-based systems—small business machines, traditional minis, intelligent terminals, and office systems—continues. In those categories 32%, 37%, 31%, and 28% of all sites, respectively, said they were considering a single source. In general, the data suggest a continuing process of consolidation favoring already established suppliers.

DEC and IBM, according to the survey, enjoy a higher-than-average incidence of single-supplier procurements. In contrast, it appears that Wang and Prime are more aggressive in going after business outside their existing customer bases. Also, the

The strongest peripherals shipment growth this year will be in small hard-disk drives and graphics terminals.

data show that Hewlett-Packard is the most frequent competitor of DEC while IBM is the most frequent competitor at HP sites.

In addition to investigating central processors, the survey questioned users about their buying plans for peripherals to attach to those systems. On average, 63% of the responding sites said they specify the cpu supplier for peripherals as well. The vendor that gains the most peripherals sales from its processor users is HP, with an 81% share. It is followed by Wang, IBM, Data-point, Tandem, and Honeywell, which are all above average. Below average, in order, come DEC, Data General, Perkin-Elmer, and Prime.

The strongest peripherals shipment growth this year will be in small hard-disk drives and graphics terminals. Disks under 50 megabytes are enjoying a shipment growth rate of about 103% compared to last year, while the terminals show a rate of 76.7%. The leading disk suppliers are International Memories Inc., Seagate Technology, and IBM, while the terminals suppliers named most by respondents were DEC, HP, and Data General.

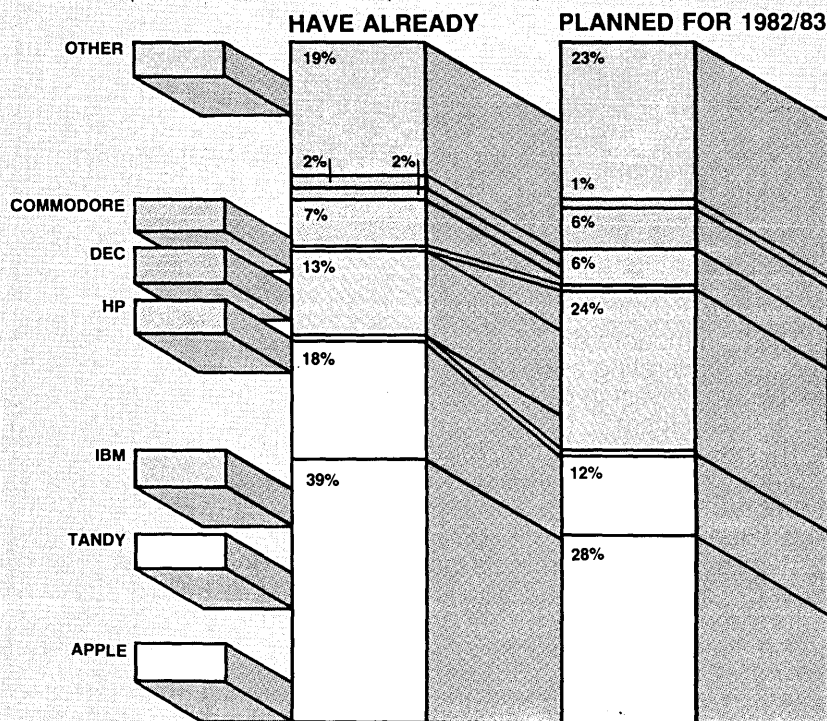
DEC is the leading peripherals supplier to the survey's population, selling the largest share of hard disks over 50 megabytes, graphics crts, and add-on memories. Shugart gained the top slot in supplying floppy disk drives over Micropolis, according to survey data.

The amount of disk storage being attached to minicomputers is on the rise again after the plateau seen in last year's survey. The average amount of disk storage on systems this year was 262 megabytes,

FIG. 6

PERSONAL COMPUTER PURCHASES

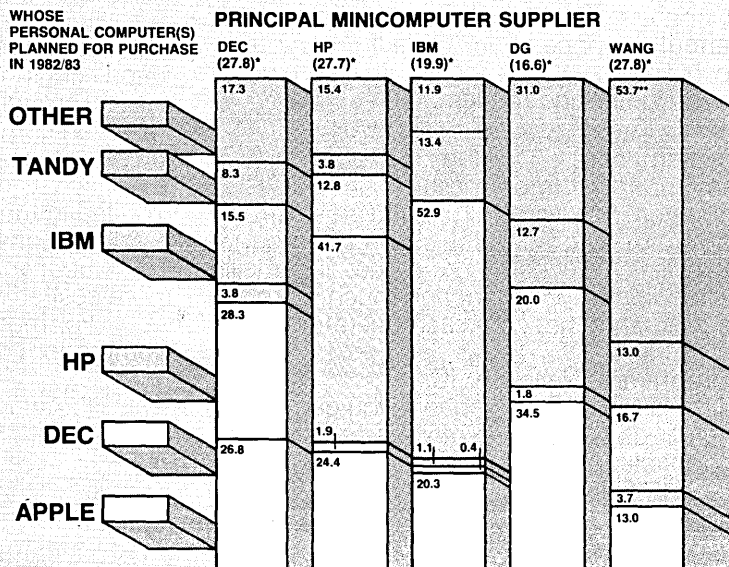
Query: Have you or your organization purchased or are you planning to purchase micro-based personal computers?



- IBM share of prospective installations twice that of previous installations.
- Three times for DEC off much smaller base.
- HP percentage relatively steady.

FIG. 7

EFFECT OF MINICOMPUTER SUPPLIER ON PERSONAL COMPUTER CHOICE



* Figures in parentheses represent percent of sites planning personal computer purchase during 1982/83. ** 38.9% Wang.

- Still-broad penetration of DEC minicomputer user base and of IBM base by Apple, notwithstanding subsequent PC introductions by these mini systems suppliers themselves.

NCR makes Interactive Programming easier from start to finish

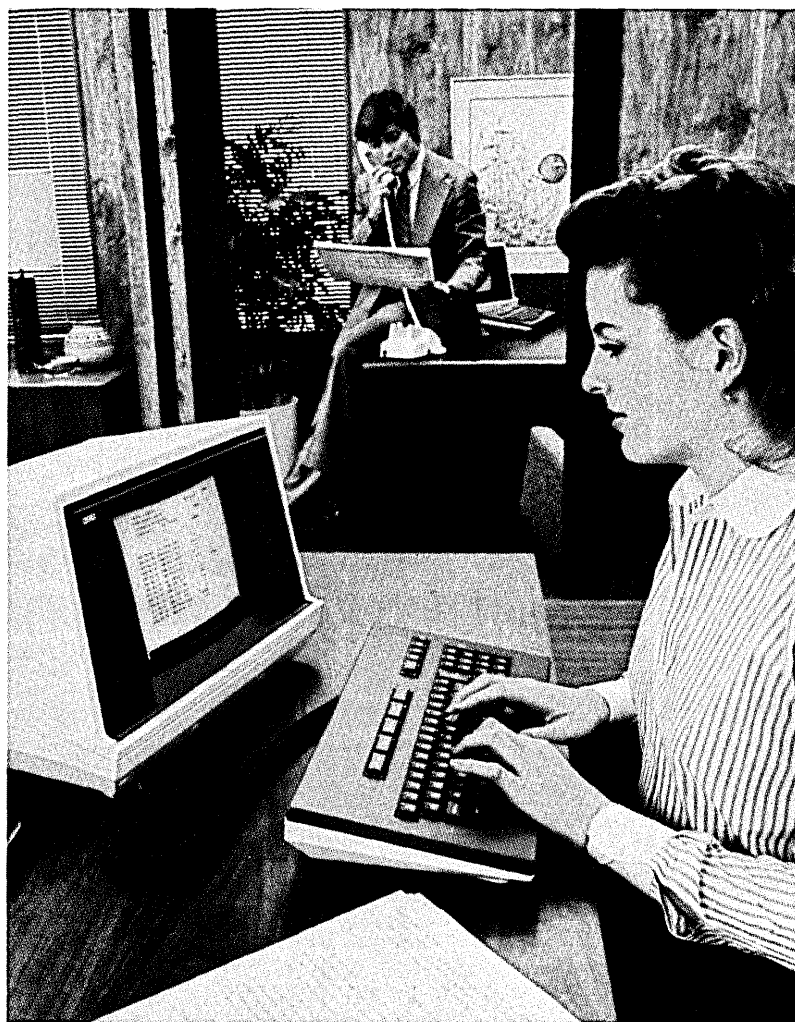
NCR's new Interactive Virtual System software now leaps the formidable gap between batch system files and workstations where transactions occur. It introduces greater facility into programming to make your hard pressed programmers more productive than ever before.

Common Syntax

It's convenient. With IVS, you use the same syntax to address the system in both the interactive and batch modes. The System Command Language features and options provide access to the VRX operating software either way. A batch job may even be initiated from an interactive terminal.

Interactive Programming and Debugging

IVS provides powerful tools to increase programming productivity. Three of the eight modules help the programmer to write, rework and debug programs directly, through an



interactive terminal. One can work through a complete program development cycle, from initiation to debugging, in a single session — interactive from start to finish.

Security

IVS cooperates only with prequalified people using a designated terminal at the right time of day. It gives them access to specified commands and peripherals for up to a given length of time. And it may require a delay between sign-on attempts. All based on management discretion.

Get the Whole Story

For more information on the Interactive Virtual System and the V-8500-II Data Processing Systems that make it work, just phone 1-800-CALL-NCR. (From Ohio, call 1-800-543-4470).

Or write to Interactive Virtual Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

NCR

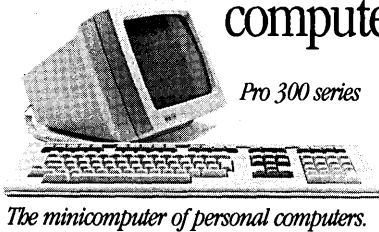
98 Years Experience
in Business Systems

CIRCLE 31 ON READER CARD



**THE
THREE PERSONAL
COMPUTERS
EXPERTS SAY
"BLOW EVERYTHING
ELSE OUT OF
THE MARKET!"**

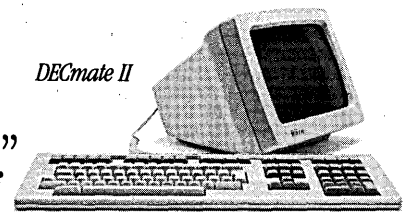
Once in a great while, personal computers come along that drive the normally staid computer press to extremes of praise. The personal



The minicomputer of personal computers.

computers made by Digital Equipment Corporation are such an example. These are the personal computers about which industry analysts such as The Yankee Group have said: "... comparing other currently available personal computers to (Digital's) Professional series is like comparing a sub-compact car to a Porsche."

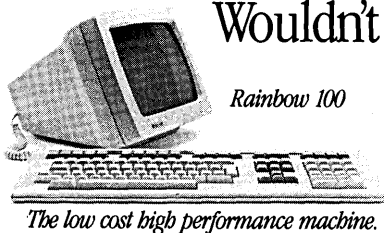
And further: "The trio of personal computers will blow everything else out of the market."



The fully supported small business system.

The Yankee Group was not alone. From the Rosen Electronics Letter: "Digital offers more storage, more memory, more expansion, more columns, and a higher performance central processor." And from The Gartner Group: "...the hardware specifications, design, and future upgrade planning appear superb."

What could inspire such remarks? Perhaps it was a feature like Digital's bit-map graphics—a graphics capability that makes yesterday's graphics look like yesterday's news. Or maybe it was the overall idea of a personal computer that could do more than one thing at a time. Or storage. Or memory. Or the idea of using two central processors instead of one.



The low cost high performance machine.

Wouldn't you like to find out a little more about Digital's personal computers? Call 800-DIGITAL and we'll send you our free brochure. Or write: Digital Equipment Corporation,

129 Parker Street, Maynard, MA 01754.

And if our words aren't good enough? Ask anybody else.

digital
MORE PERSONAL.
MORE COMPUTER.

IN FOCUS

compared to last year's figure of 143 megs and the year before's figure of 149 megs. (The numbers relate to disks attached to the last system purchased.) It is thought that the data reflect a greater strength in high-end systems such as DEC's VAX. Tandem led the pack in average disk size, with 502 megabytes attached to its average system. At the other end of the scale was Datapoint with 64 megabytes and Northern Telecom with 28 megs.

Average main memory size of minicomputers also continued to rise, this year reaching 551,000 bytes. Last year's comparable figure was 383,000 bytes. The increase was seen in equipment from almost every vendor. A more dramatic growth in main memory was seen in microcomputers, where the average size this year was 95,000 bytes compared to 55,000 bytes last year. This clearly bodes favorably for memory chip suppliers, who can expect to sell very large unit volumes.

In terms of peripherals purchases for personal computers, 79% of users running such machines said they bought printers, 74% bought monitors, 79% bought floppy disks, and 31% bought rigid disks.

The survey this year revealed a shifting pattern of distribution in the minicomputer system market. The oem/systems house and dealer/distributor categories each showed a slight increase as the channel by which respondents received their machines. Shipments directly from manufacturers fell slightly from last year's survey, while retail stores did not change at all. A small increase in sales through used equipment dealers was seen, possibly indicating an increasing maturation of the traditional mini market.

Pricing and discounts as competitive tools were seen as particularly important to Prime, Perkin-Elmer, and Texas In-

Average main memory size of minis has continued to rise, this this year reaching 551,000 bytes.

struments. As expected, IBM was at the low end of the list of discounters.

Outright purchase remains the predominant mode of acquiring minicomputer equipment. In terms of dollar value, Data General, DEC, and TI machines were leased (largely via third parties) least often, Datapoint and IBM most frequently.

The survey data show DEC increasing its total market share, largely as a result of projected VAX and PDP-11/23 shipments. In the past 18 months, DEC held a 34.5% share of the dollar value of minicomputer shipments, but in the coming 18 months respondents indicated they would spend 39.5% of their minicomputer money with DEC. Close behind was IBM, which had comparable figures of 14.2% for the past 18 months and 13.7% for future spending.

TABLE I

TOP 10 MINICOMPUTER SYSTEMS 1982/83

A. Based on number of respondents acquiring systems (7/82-12/83)

MANUFACTURER	SYSTEM	HOW MANY SITES	AVG. UNITS/SITE
		ACQUIRING	SITE
DEC	VAX-11/780	147	2.1
DEC	VAX-11/750	102	1.4
IBM	System/38	92	1.1
HP	3000 Unspec.	92	2.2
IBM	System/34	82	1.4
DEC	PDP-11/44	81	1.5
IBM	Series/1	75	7.1
DEC	VAX Unspec.	78	1.5
DEC	PDP-11/23	69	12.4
DEC	VAX-11/730	61	1.6

B. Based on number of units being acquired (7/82-12/83)

MANUFACTURER	SYSTEM	HOW MANY UNITS BEING ACQUIRED	EST. VALUE (\$ MILLIONS)
DEC	PDP-11/23	857	\$23.0
IBM	Series/1	533	21.4
DG	Nova Unspec.	341	4.5
DEC	VAX-11/780	311	103.7
DG	Nova 4	287	3.2
TI	990 Unspec.	274	12.9
IBM	8100	208	20.6
HP	3000 Unspec.	200	36.1
DEC	VAX-11/750	144	25.5
Datapoint	8600	132	2.4

• In total, 2,466 respondents (37%) reported plans to purchase 14,542 systems valued at roughly \$950 million between 7/82 and 7/83.

Next was HP with 9.8% past and 9.0% future spending.

In the small business systems market, IBM led with a 30.0% share of past 18 months' purchase value and a projected 24.2% for future spending. DEC followed with 14.7% past and 14.9% future. It was shown that HP, Tandem, and Wang are picking up share in the small business systems segment, as is newcomer Convergent Technologies. The drop in projected IBM shipment values was attributed to the aging System/34 product cycle. Sizable declines were also seen for Data General (dropping to 6.3% from 4.8%), Honeywell, and Burroughs.

In the traditional minicomputer market, DEC was far ahead of the pack in terms of percentage of 18-month-past and future purchase values. The firm showed a 44.1% rating for the past 18 months and a 47.1% share for future purchases. Next was IBM, with 9.4% past and 11.0% future, indicating perhaps that its Series/1 product is still gaining in this market. IBM has garnered a strong second place in the minicomputer market a mere six years after entering it with the Series/1.

Prospective shipment trends look weakest in the traditional minicomputer segment of the market, according to the survey data. But in sharp contrast, the personal computer segment is expected to experience a 99% increase in unit volume and a 114% increase in dollar volume with about half of the growth projected to come from new users. Roughly 60% of previous users are planning to purchase personal machines in the current year as well. The average number of units will be six or seven and the average price per unit will be \$4,600, according to the survey.

Thus it appears that the personal computer market will be a significant source of incremental growth for those minicomputer manufacturers who can effectively participate in it.

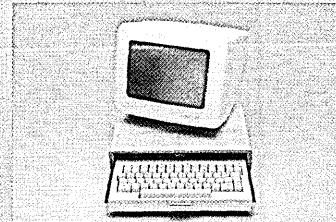
Growth in the traditional mini market is coming more and more from the 32-bit arena, where unit and dollar volumes are ahead of the overall market's growth. In terms of units, planned purchases of 32-bit machines for the year ending June 1983 will make up 11.8% of overall minicomputer unit shipments. In terms of dollars, however, those machines will make up 36% of

New designs for IBM users.

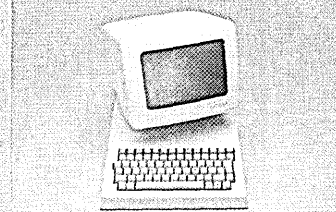
These are Informer's small 370 terminals. They are IBM 3270 compatible.
Use them as stand alone displays or with our 374 controller for multiple display stations.



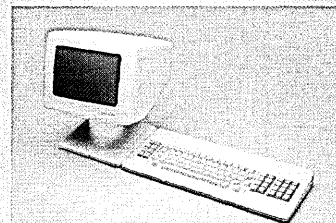
Model 203



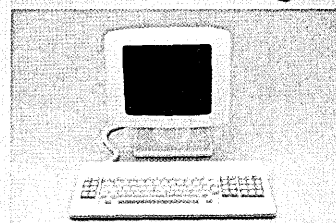
Model 201



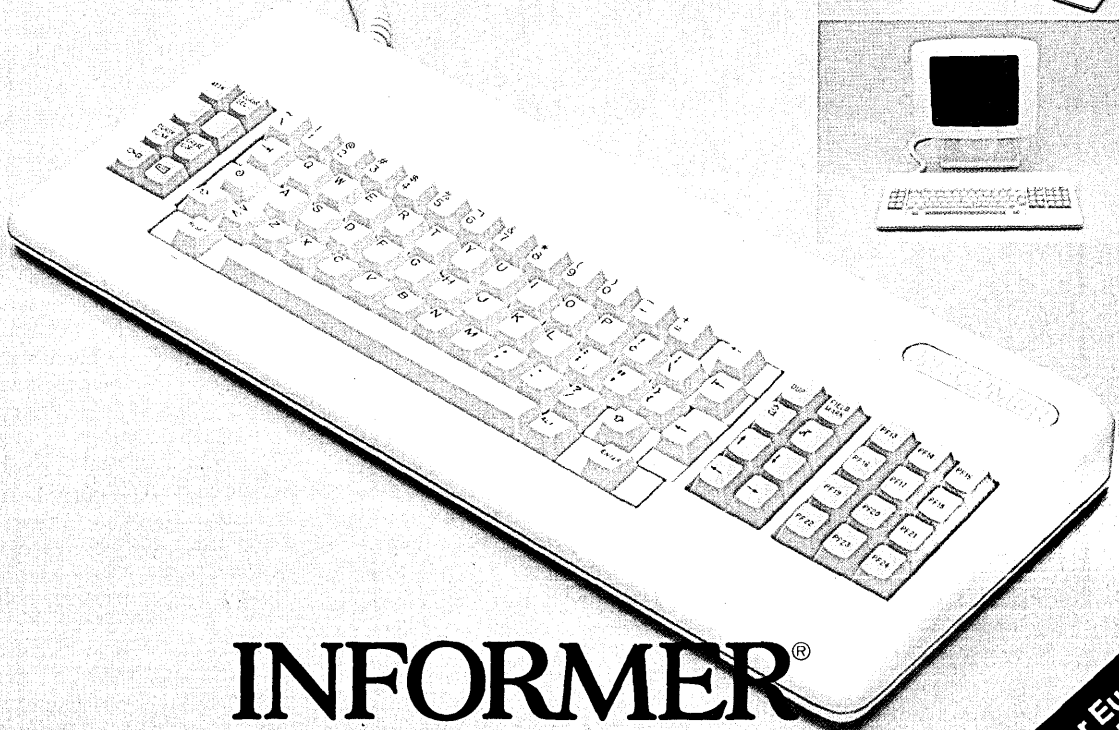
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IN FOCUS

TABLE II

PERCENT OF SITES PLANNING/CONSIDERING VENDOR SWITCH

MANUFACTURER	1980 SURVEY	1981 SURVEY	1982 SURVEY
Basic Four	16.9	32.7	26.5
Burroughs Computer	29.6	27.0	29.5
Automation	23.1	31.8	46.2
Data General	18.2	22.0	25.0
Datapoint	9.4	15.2	22.4
DEC	12.8	13.2	11.0
Four Phase General	20.0	19.6	29.2
Automation	53.8	60.0	25.0
Harris	24.6	30.0	25.0
Hewlett-Packard	10.6	10.7	14.3
Honeywell	17.9	21.4	15.7
IBM	11.9	12.8	11.1
Microdata	20.3	16.2	25.0
Modcomp	17.9	23.3	36.4
NCR	19.8	15.5	22.4
Northern Telecom (Sycor)	41.7	30.0	52.6
Perkin-Elmer	19.8	26.2	18.0
Prime	8.3	8.2	14.1
SEL	11.1	16.7	13.6
Tandem	6.9	0.0	7.5
Texas Instruments	14.5	18.3	16.8
Univac/Varian	22.6/23.3	26.7/38.5	32.6
Wang	15.6	19.3	16.1
Total Sites	17.2	18.6	17.4

- Tandem continues to enjoy highest degree of customer loyalty.
- Consistently high also for IBM and DEC.
- But some deterioration in this year's data for HP and Prime, albeit to still better than aggregate percentages.
- Negative trend of past two years for Datapoint and Data General persisted in 1982 survey.

purchase value during the same period. This is occurring despite a modest drop in the 32-bit system unit price, generally attributed to a changing mix of systems at DEC, the 32-bit leader, to newer, smaller VAX systems.

In fact, DEC's share of the 32-bit market is even greater than its share of the total market and it is growing. Survey respondents indicated that 66.4% of their 32-bit system purchases will be from DEC during the 18-month period ending in December 1983. Following DEC are Wang, with an 8.9% share; Prime at 7.6%; SEL at 7.5%; and Data General at 5.0%. Perkin-Elmer's share will drop from 5.0% of purchases made in the previous 18 months to 3.9% in the next 18-month period.

Interest in personal computers was found to be proportional to the organization's size. For companies under \$50 million in annual revenues, only 21.5% said they would emphasize personal computers for future small system applications while

in the over-\$500 million category, 30.4% of respondents said they would do so.

Potential incursion of the personal computer into minicomputer markets seems strongest in the office systems segment. The machines will be used most, the survey indicates, by organizations involved in education, insurance, and business services and least by communications suppliers, utilities, and wholesale/retail operators.

Fueled by IBM's entry into the personal computer market, the year-to-year expansion of personal/desktop computers was even more rapid in 1982 than a year ago. The latest three-year compound growth rate for such machines was 109% for all sites, 87% for personal use, and 113% for organizational use. The figures from last year's survey are 106%, 94%, and 107%, showing that organizational use of the machines is growing faster than personal use. Indeed, 86.7% of the machines purchased by respondents will be for organizational use.

IBM's entry into the market has

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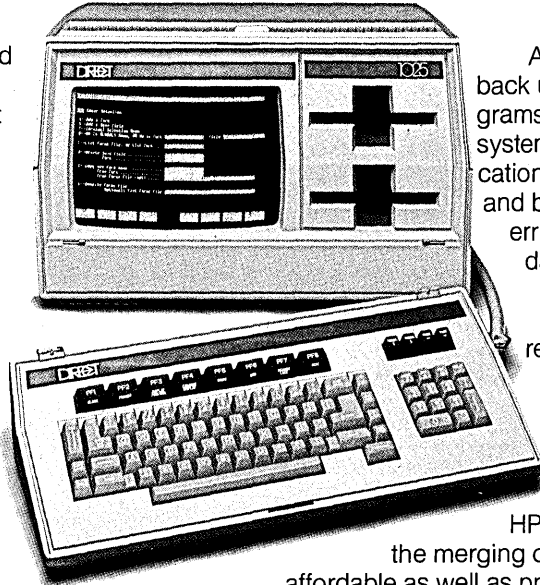
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IN FOCUS

TABLE III

REASONS FOR PLANNING/CONSIDERING VENDOR SWITCH

CURRENT PRINCIPAL VENDOR	PERCENT OF "SWITCHING SITES" DISSATISFIED WITH:					
	DELIV- ERY SCHED- ULES	PRICE	HARD- WARE RELI- ABILITY	SOFT- WARE SUP- PORT	SALES/ SERV ORG.	OTHER
Basic Four	11.1	22.2	11.1	50.0	27.8	22.2
Burroughs Computer	3.0	15.2	33.3	57.6	21.2	21.2
Automation*	16.7	16.7	—	66.7	50.0	33.3
Data General	4.9	20.7	30.5	35.4	28.0	23.2
Datapoint	21.1	18.4	13.2	26.3	26.3	31.6
DEC	5.8	23.1	22.4	34.0	24.4	25.6
Four Phase General	7.1	3.6	21.4	50.0	17.9	21.4
Automation*	—	25.0	25.0	75.0	—	50.0
Harris	—	9.1	27.3	72.7	9.1	9.1
Hewlett-Packard	2.5	22.8	16.5	30.4	24.1	36.7
Honeywell	—	4.8	33.3	66.7	9.5	19.0
IBM	6.8	31.5	15.1	38.4	21.9	24.7
Microdata	—	—	23.5	41.2	35.3	35.3
ModComp	—	16.7	25.0	41.7	8.3	25.0
NCR	—	20.0	20.0	40.0	33.3	20.0
Northern Telecom (Sycor)	—	20.0	60.0	20.0	20.0	30.0
Perkin-Elmer*	—	—	22.2	66.7	33.3	11.1
Prime	3.4	31.0	31.0	37.9	17.2	27.6
SEL*	—	—	—	100.0	—	66.7
Tandem*	—	—	33.3	33.3	—	33.3
Texas Instruments	5.6	38.9	11.1	11.1	44.4	22.2
Univac	—	7.1	50.0	71.4	14.3	21.4
Wang	6.5	16.1	19.4	22.6	38.7	29.0
Total Sites	5.0	20.5	22.6	39.5	22.2	27.8

* Less than 10 sites

helped accelerate this trend. Also, IBM personal computers appear to be purchased more centrally than other brands.

The most important selection criterion for PCs is software, followed by price, product reputation, and compatibility with installed machines. Compatibility seems to be especially important to those buying DEC, Wang, and Zenith PCs.

It looks as if packaged software for personal computers will sell slightly better, in terms of future growth, than hardware. For the 12 months following the survey date, respondents said they would spend 87.7% of their personal computing budget on hardware and 12.3% on software. Visi-Calc, and its look-alikes, is by far the most used software package, representing about 56% of all packaged software mentions by respondents. Word processing was the next most popular software purchase with about 25% of the mentions.

As for distribution of personal machines, the independent store was the most

frequently cited channel. For IBM, only 7% of its personal computers were being bought through IBM-owned stores.

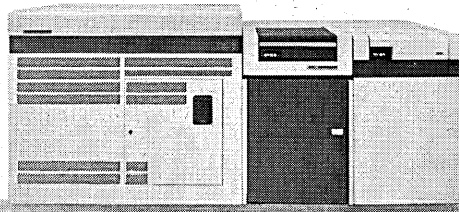
Unlike the IBM personal computer, DEC's and HP's small machines have apparently made little impact outside their base of minicomputer users. However, Apple has maintained a strong penetration into IBM and DEC minicomputer user sites.

In terms of future shipments, 2,359 responding sites said they would purchase 35,667 personal machines during the 18-month period ending in December 1983. During the previous 18 months, 3,360 respondents purchased 22,410 units. Of the planned purchases, 31.3% will be Apples, 18% IBM, 10% Tandy, and 7.3% DEC (vs. 40.7%, 15.1%, 9.6%, and 1.4%, respectively, of machines installed during the previous 18 months).

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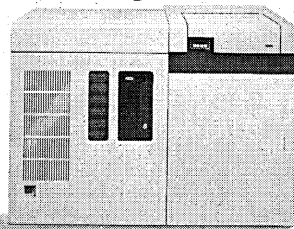
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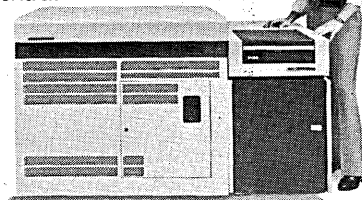
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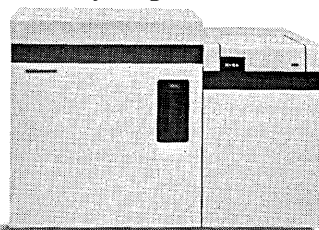
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NEWS

IN PERSPECTIVE

RESEARCH

CHARITY BEGINS AT HOME

Money, big money, may be on the way to help supercomputer makers beat the Japanese to their own "fifth generation."

It was a year ago that the Japanese government and computer industry told the world they planned to spend \$500 million over the next 10 years in pursuit of a futuristic computer system. The so-called "fifth generation" machine would leapfrog current computers, the Japanese said, by its ability to process "knowledge," not just data. The ambitious project might not succeed in all its goals, but the spin-offs from all that coordinated effort would likely give Japan a technological edge in the world computer market.

Many in the U.S. reacted skeptically to such claims. Japan's plans were obviously bold but needed to be taken with a grain of salt. After all, except for high-volume manufacturing techniques, the copycat Japanese had contributed little in the way of original research to the field of computer science. Amidst the glitter of glossy brochures, detailed diagrams comparing brain and computer, and a roster of international computer experts invited to launch the fifth generation project, some critics saw more than a little snake-oil salesmanship.

In certain circles, however, such skepticism is less than unanimous. DATAMATION has learned that the Defense Department's Advanced Research Projects Agency (ARPA) has eyed the Japanese effort with alarm and will seek a large boost in its computer research budget starting next year. The three areas of supercomputing, artificial intelligence, and semiconductor technologies are high on the list of priorities at the agency. In a series of meetings with universities and manufacturers this year, ARPA has cited concern for "national security" and the challenge of the fifth generation project in Japan, according to sources who have attended such meetings. Potential funding in the range of "hundreds of millions of dollars" stretched over the next decade has been discussed at the meetings, sources said.

Reportedly even ARPA chief Robert Cooper has made computing a high-priority item in planning upcoming budgets, the sources said. While Cooper did not return phone calls made to his Arlington, Va., office, another ARPA official was willing to discuss the matter.

"There's no definite plan yet, but we have proposed that we do something," confirmed Robert Kahn, director of ARPA's computer research efforts. "My hope is that something will materialize by the beginning of next year in time for the President's budget submission to Congress. The ultimate decision has to be made by the White House and Congress."

Kahn in early October said the agency would probably complete its proposal for increased computer research funding by mid-November, after which the plans would have to be incorporated into the Defense Department's fiscal 1984 budget request. No details were available about the amount ARPA might request, Kahn stated, claiming, "We're still in the discussion stages."

"I think the challenge is for the United States to become very competitive with the Japanese and beat them at their own game," the ARPA official stated. "The real problem we'll face is one of high-productivity and high-quality components coming out of Japan. Those components will range from microelectronics to full computers."

"We've never had a big enough program to do crash projects," Kahn continued. "We've only been able to handle small-scale explorations into certain technologies. Sometimes it never leaves the paper and pencil stage. What we want to do now is follow some of these projects through into the production stage and make them available to the industry."

Much of ARPA's computer funding now goes to universities where small teams of researchers pursue short-term projects. ARPA's hope is that enough money will be available to plan R&D on a time scale comparable to the 10-year plan Japan has adopted for its fifth generation machine.

Apparently motivated by concern over the Japanese research plan, ARPA earlier this year called a meeting in New York

"My hope is that something will materialize by the beginning of next year."

between supercomputing specialists at Lawrence Livermore and Los Alamos national laboratories and a dozen or so of the most active parallel computer architects. It was concluded that the only way to gain more than an order of magnitude in system performance over current machines is to opt for "massive parallelism," as one participant puts it. (The "strategic importance" of such machines was also discussed, according to the source, who asked to remain anonymous.)

Already ARPA has identified several parallel computing architectures as worth pursuing, particularly in conjunction with some of the VLSI (very large scale integration) research it has undertaken. Parallel

architectures entail many processors working together to solve a problem as opposed to the single-processor, or von Neumann, design used in traditional machines. It is generally thought that parallel machines will provide far greater future improvements in computer performance than can be gained from improved semiconductor technology.

Parallel systems are expected to be necessary to handle the so-called artificial intelligence functions that it is hoped future machines will perform. Japan's proposed fifth generation machine, in fact, is to include such subsystems as a "knowledge base management system," "inference engine," and "inferotemporal cortex ma-

"We've never had a big enough program to do crash projects. We've only been able to scratch the surface."

chine," according to literature presented at the Tokyo conference last year. Theoretically, at least, the fifth generation machine and others of its ilk would process knowledge, not just numerical data.

One of the parallel systems already being funded by ARPA is the Non-Von (for non-von Neumann), whose principal designer is Dr. David Elliot Shaw, a professor at Columbia University in New York. Construction of a Non-Von prototype will be helped by a two-year, \$2.5 million ARPA contract. Although its development is in the early stages, the Non-Von project provides a good picture of the kind of cooperative resources ARPA could bring into play should a national computer research effort get under way.

Non-Von is to be composed of as many as a million microprocessors arranged in a binary tree (each element in the tree is connected to two elements below it) and will handle traditional commercial data processing tasks as well as the numerical processing usually reserved for supercomputers, according to Shaw.

"We're using tiny microprocessors which are actually quite slow individually," the professor explained. "Each one is much smaller than an [Intel] 8080. I'd say that one instruction on a conventional 16-bit microprocessor would be the equivalent of four or five instructions on the micros we're going to use."

The micros Shaw plans to use are being custom designed at Columbia and will most likely be manufactured by a West Coast semiconductor maker, he said. Their packaging will be different from most microprocessors in that several (perhaps a few dozen) micros will be packaged with accompanying RAM memory on a single silicon substrate.

This method reduces manufacturing costs, increases performance, and helps keep down maintenance efforts on the fin-

ished machine.

The custom chips are being logically defined on a color CAD/CAM system, said Shaw, noting that once the definitions are finished they will be sent electronically to the West Coast for fabrication. The means of transport, of course, is the ARPANET, which connects many advanced computing research labs in the country. In Marina Del Rey, Calif., the Information Sciences Institute will process Columbia's definitions and produce standard mask tapes with which a semiconductor maker can finally produce the chips, which will be sent to Shaw's group on Manhattan's Upper West Side.

In addition to helping buy chips, the ARPA grant will aid Shaw in recruiting a small team of "extraordinarily gifted engineers and computer scientists," who will join the two dozen or so workers already involved. Although "only a handful" of such individuals exist, Dr. Shaw said he believes that "the kind of superstar we're looking for will be unable to resist the temptation to help build the world's most powerful computer."

Two corporations, IBM and Digital Equipment, are also aiding, and presumably keeping an eye on, the Non-Von project. IBM's "very generous" \$600,000 funding came with an open invitation to "talk shop" at the firm's Yorktown Heights, N.Y., research facility. DEC has

A parallel computer architecture is being worked on by a dozen or so ARPA-backed researchers at Columbia University.

been kind enough to discount some VAX gear quite heavily and is also developing a working relationship with the Columbia researchers, according to Shaw. "We're very interested in contact with manufacturers," he said. "What we're doing now is in the public domain. We're pushing the frontiers of science."

Non-Von and other microprocessor-intensive systems are just the type of machines ARPA would like to investigate, according to Robert Kahn. "Non-Von and New York University's Ultra machine are examples of the kind of projects that could be accelerated," he commented. "We had once funded the dataflow machine at MIT, but then the Energy Department took over."

The next job for Kahn and his boss Cooper, it would seem, is to sell their idea to budget writers at the Department of Defense and then to Congress itself. With the Japanese industrial specter looming as large as it does in the general press, in Detroit unemployment lines, and in Silicon Valley, ARPA's idea may be one whose time has come.

—John W. Verity

FAULT TOLERANCE

FAIL-SAFE VENDORS EMERGE

About a dozen makers of fault-tolerant computers can be identified in a market that Tandem for eight years called its own.

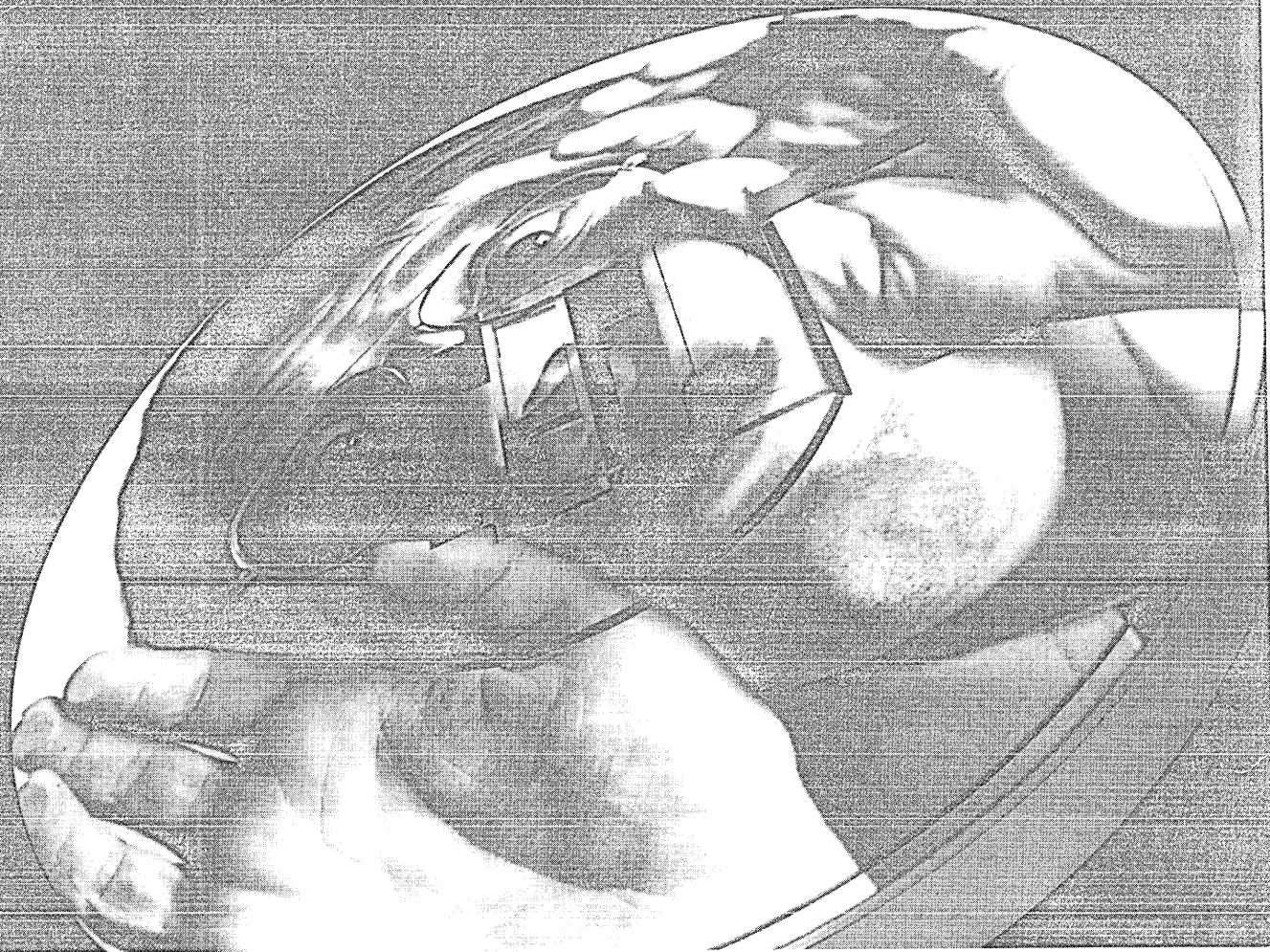
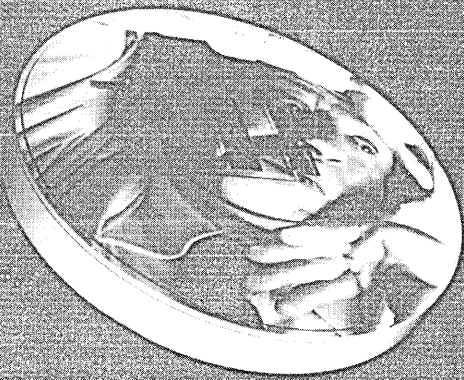
As if by prearranged signal, it suddenly has become evident that a flotilla of fault-tolerant computer makers has emerged, mucking up waters that had previously been the exclusive province of Tandem Computers. Tandem, founded in 1974 and shipping hardware since May 1976, has prospered in its own little pond, closing its latest fiscal year in September with revenues of more than \$300 million. But by one estimate, there are a dozen or so companies already in or preparing to enter the fray.

Not to worry, says consultant David Gold of San Jose, Calif. "I think there's a big enough market out there for them and Tandem and probably lots of others without any of them feeling the pain from competitors."

By one count, fault-tolerant computers have applications in process control and industrial automation in general, in certain shared-logic word processing systems, in microcomputer networks that allow for the sharing of resources, and in on-line transaction processing. When all those applications are included, the market in 1986 will come to almost \$22 billion, says Omri Serlin of Los Altos, Calif. The consultant, who just completed a study of this market and its participants, says the current vendors and those planning first product introductions by the end of '83 will be able to realize only some 15% of that demand. That leaves the rest of the market to be satisfied by conventional minicomputer and mainframe approaches.

Into this market has come a ton of companies with systems built around the ubiquitous microprocessor chip. The vast majority of them are going after the on-line transaction processing market, which Tandem also serves. Serlin estimates that these startup companies have been funded by venture capitalists to the tune of more than \$50 million, and the transaction processing market they are entering has a potential of almost \$17 billion by '86. He sees Tandem taking \$2.5 billion of that total, the upstarts being able to grab much less, and the majority of it not realized by the current crop of systems makers.

The transaction processing market can trace its genesis back to the 1960s,



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CIRCLE 41 ON READER CARD

NEWS IN PERSPECTIVE

TABLE I

FAULT-TOLERANT SYSTEMS MARKETS IN 1986 (BILLIONS OF 1981 DOLLARS)

SEGMENT	POTENTIAL	REALIZABLE	% PENETRATION
On-line transaction processing	\$17.0	\$3.3	19
Data acquisition, process control	3.6	0.24	7
Microcomputer networks	0.6	0.02	3
Word processing	0.9	0.05	5

Source: ITOM International Co.

Present and future vendors of fault-tolerant systems are expected to capture only a fraction of the enormous markets that will potentially exist in 1986. By '86 Tandem is expected to be a \$2.5 billion company.

when business transactions were initially recorded with paper and pencil, the data then being keypunched at night and run against files stored in the computer. In the 1970s, with the development of database management systems, on-line inquiries to a database became economically feasible, but updates were generally made at night in the batch mode. It is thought that in the '80s the new vendors will make it possible for transactions in real-time to occur against a database, much like the airline reservations systems and automatic bank teller machine transactions.

"Microprocessors are giving these newcomers new technological ways to approach the fault-tolerant operation," Serlin says, and those design approaches are significantly different from Tandem's. The environment today, he adds, is similar to what existed when Tandem started in '74. At that time, Tandem was able to take advantage of a mature minicomputer technology, harnessing the small processors to offer attractive price-performance levels in competition with mainframers like IBM and Univac.

"You have the same situation now," he explains, "except now it's working against Tandem." Today people are able to harness the power of very powerful 16-bit microprocessors that cost a mere \$40 or \$50 each, showing how such processing power can be plugged in to satisfy redundancy requirements and to provide ever more processing power upgrades.

Indeed it is not certain that Tandem's NonStop systems sell so well because of their fault-tolerant features. "The fault-tolerant capability is the sizzle," says Dave Gold, "but I think in fact a lot of people buy Tandem because it's incrementally upgradable, and they have a nice database system and networking and so on."

Similar sentiments are expressed by the head of a software company that has developed an integrated, interactive, manufacturing software system that runs on the Tandem system. The fault-tolerant feature,

says Redwood Software president C. Stephen Johnson, "wasn't the first thing that attracted us to do something on a Tandem." Rather, he says, it was the graceful growth capability and the networking facilities.

With this networking capability and the ability to plug in more processors as they're needed, Tandem's users can grow their system as their needs grow, and without rewriting their applications programs—which are completely insulated from the configuration details. The user need not know how many processors there are or what particular peripherals are connected to what specific processor.

(Up to 16 processors will fit into a Tandem cabinet, but more can go into an

"There's a big enough market out there for Tandem and lots of others without any of them feeling the pain from competitors."

adjoining box. The company's networking software allows up to 255 of them to work together. The largest user is Tandem itself, with more than 140 systems, something like 400 processors worldwide. And there are paying customers who have hundreds. To date, the company has shipped more than 4,000 processors.)

The idea of merely adding another processor whenever the workload demands it is very appealing to the user. It is perhaps in recognition of this appeal that a number of startups have entered this business. Serlin names a dozen in the U.S. and the U.K.

One such company is Synapse Computer Corp., Milpitas, Calif., which was founded in August 1980 and is already funded to the tune of almost \$14 million by a number of investors. The firm uses Motorola 68000 microprocessors both as dedicated processors to run applications programs and as dedicated I/O processors. The distinguishing feature of Synapse's product is the absence of local memory at the processors that execute user programs, which

instead share a central memory in a tightly coupled fashion. In a design called N + 1, it provides as many applications processors as are required by the workload, plus one more for redundancy. The performance range is said to be from the equivalent of a VAX 780-class machine, or an IBM 4341, up to an IBM 3081.

"Computers are becoming a part of everyday life," explains Synapse president Mark Leslie. "People are getting used to seeing terminals, dealing with automatic teller machines." With the cost of disk storage declining twice as rapidly as the cost of silicon, he says, "people are putting more and more [data] on-line and want more users to have access to it."

That is an observation made also by consultant Serlin. He notes that Tandem has been in the on-line environment, where users simultaneously are making inquiries to a database. This means the system experiences very short bursts of activities—and you don't need a very powerful cpu for that. You need instead very powerful access to peripherals, disks in particular.

"The cpu requirements are not very high," he says. "That was one of the major reasons Tandem succeeded—recognizing that characteristic." The founders saw that they could attack this market more effectively with multiple minicomputers, whereas people at that time were applying large mainframes to such systems tasks.

In some applications, of course, a small processor will run out of steam, and the Tandem processors are no exception. Redwood Software's Johnson says he sometimes wishes he had the use of a bigger computer than Tandem's mini, which runs out of horsepower on jobs that run in the batch mode, such as modeling.

Is he happy with Tandem's 16-bit architecture? "Well, I would like them to go to a 32- or a 64-bit design," Johnson says, "and they probably will some day. But [the 16-bit architecture] is not a tremendous limitation right now." The original NonStop is, of course, limited to the direct addressing of 128K bytes, which prompted the development of the NonStop II and its 32-bit addressing scheme and the use of an address translation box. Now, when Johnson's software is made to run on the NonStop II, it would be possible for programs to build larger date arrays. And the programs wouldn't have to go out to disk as often.

"I think some of the new architectures that are coming out have a lot of advantages over Tandem," Johnson adds, advantages that stem from the use of more recent technology. But he cites Tandem's networking capabilities, its database system, and various software tools and says, "Tandem has a lot of advantages over most of the newer computers coming out."

The technology issue has to do with more than the addressing space, even though the Motorola 68000 processor can

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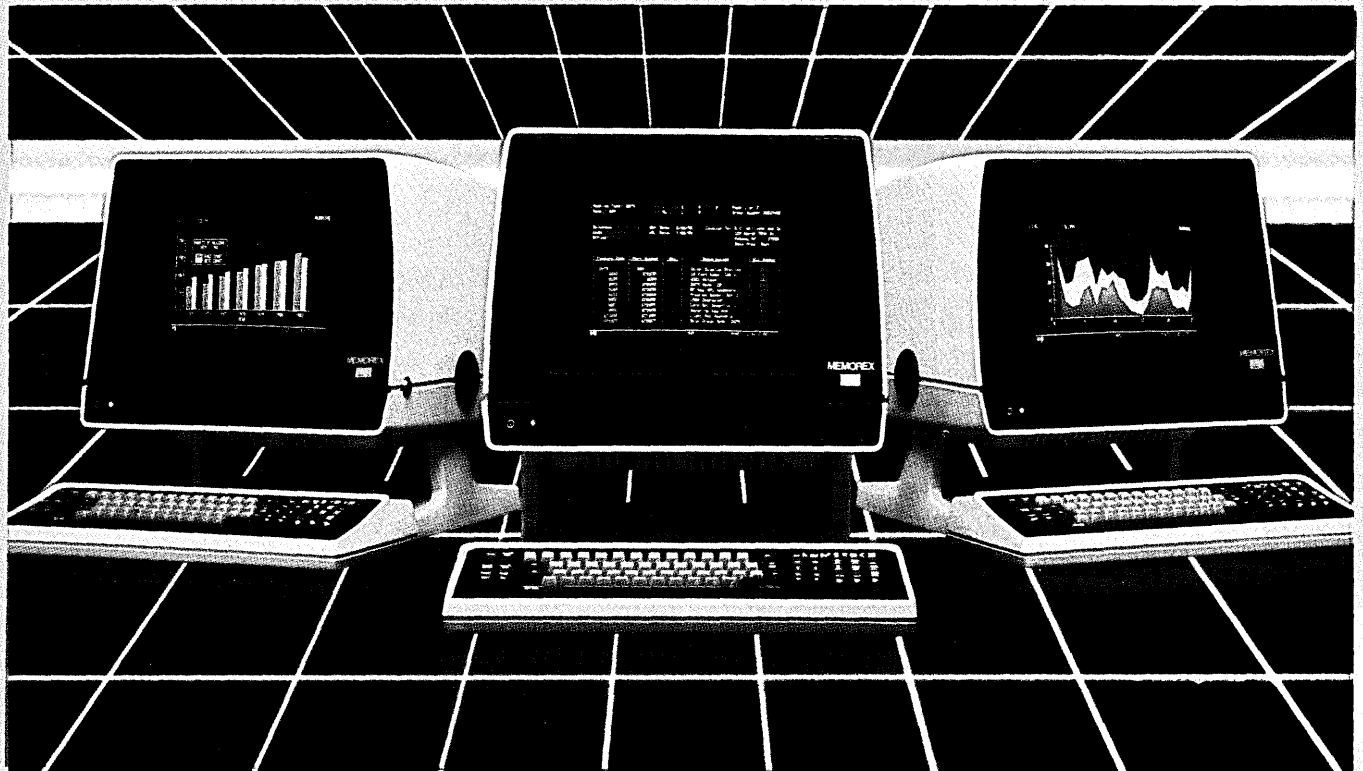
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REG 2	181,376	7,747	7.82	2	28,722
REG 3	47,273	2,294	4.86	3	218,231
REG 4	51,431	2,738	5.32	4	3,428
REG 5	21,891	1,000	4.57	5	31,222
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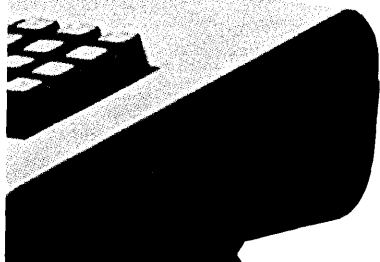
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NEWS IN PERSPECTIVE

FAULT TOLERANCE, TO A DEGREE

As with most other things, there are degrees of fault tolerance. At one end of the scale is the conventional system—the everyday computer—that offers fault tolerance, self-checking, or hardware redundancy. At the opposite extreme is the continuous, nonstop processor that never crashes, offers total hardware redundancy, and checks itself constantly.

Moving toward this ideal is the Tandem NonStop configuration, whose phenomenal success now has spawned a whole new industry. With the Tandem setup, two central processors handle separate data processing loads and constantly check each other's operation. Either can take over both jobs if one should fail. The failed cpu must then be brought back through software and programmer intervention.

Digital Equipment Corp. is expected to continue this approach next year, when it's targeted to make a dual VAX 11/80 configuration available. (An earlier attempt with PDP-11/70s failed.) IBM is another company that is expected to offer a special purpose dual configuration using 4300s. Like Tandem, both these companies will rely on scarce and much needed programming resources in the event one processor fails, experts point out.

Like most new ventures, Synapse Computers, Milpitas, Calif., has the option of a more technologically current approach to nonstop than Tandem did when its systems debuted in 1976. The availability of step-function semiconductor technology, coupled with a powerful new operating system, offers Synapse the chance to bring a processor back using hardware alone, but before this can happen the system has to crash for a brief time.

In contrast, Natick, Mass.-based Stratus Computer Corp., currently Tandem's only major competitor, seems to have produced a crash-proof, totally redundant system. Both its design team and architecture have been highly praised. Stratus president Bill Foster and his team developed a Noah's Ark system wherein all main controller boards—cpu, memory, disk, communications, and tape controllers—

“go in two by two” and constantly check each other.

Foster says that a failure in any one of the components does not affect the system in any way, and the broken component can be replaced while the system is running. The Stratus exec also claims that he can offer a self-checking system for just 3% more than the cost of his own conventional computer. “The additional cost for self-checking is only a very small part of the total system cost, since peripherals, software, and service—together making 80% of the total—remain unchanged,” he says. This potent fact is the key to the tremendous success Stratus is currently enjoying.

“Everywhere you turn, people costs are rising, and with them the costs of down time, systems and applications software, and service,” Foster explains. “In stark contrast, the primary elements in our approach—electronics and peripherals—are getting less expensive by the minute. This means that what is an advantage today will become an even bigger advantage in the future.”

Currently Foster does have one nagging problem—when, and by how much, to increase his sales force. His current team of 15 should triple by year-end, and his installation count should double from 20 to 40. The company will become profitable next year and could touch sales of \$200 million by 1986, Foster told a recent DATAMATION/Cowen & Co. conference.

Stratus will be joined next year by at least three other East Coast fault-tolerant contenders: Parallel Computers, Englewood Cliffs, N.J.; Sequoia Systems, Natick, Mass.; and Computer Consoles, Rochester, N.Y. Companies claiming fault tolerance in other market segments, such as data acquisition and process monitoring and control, shared disk word processing, and local area network-based micros sharing a word processor, include August Systems, Salem, Ore.; Syntrex, Eatontown, N.J.; and DOSC, Albertson, N.Y.

But for all these fault-tolerant suppliers, it will be a question of degree.

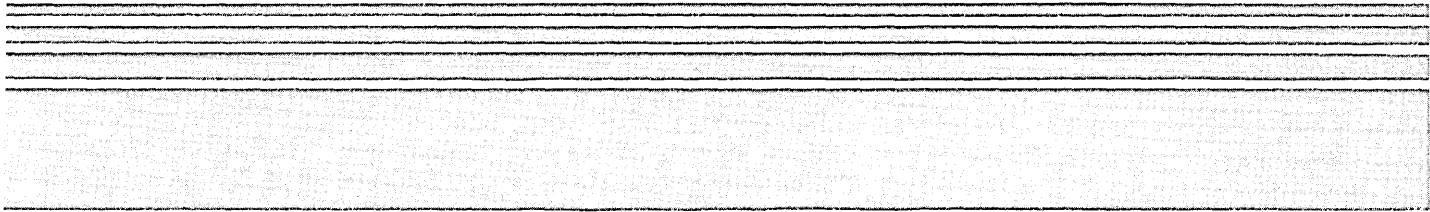
—R. E.

address up to 16MB. “The key issue between all the new competitors and Tandem is the use of microprocessors,” says Serlin. He avers that what Tandem can't afford to do is provide the kind of redundancy that, for example, another new vendor, Stratus, provides. This Natick, Mass., startup has two processors working together, checking each other's work. If there is disagreement between them, they declare themselves bad and another duplicated unit, which has been working alongside the first pair, takes over. “You could not possibly do this economically with the minicomputer approach,” he adds.

With Tandem, an application is

loaded into processor A, which automatically stores a duplicate in processor B, which is running a different job. By passing messages, the status of the original processor and the program it is running is communicated to the other processor. When the original processor goes down, thereby failing to send a message, the work is picked up by the second processor. But in this setup, there is no idle processor that merely serves as a backup or standby, waiting for another processor to fail.

In such a setup, there is no central repository of data about what the system is doing. The processors are linked to a high-speed bus by which they keep up-to-date on



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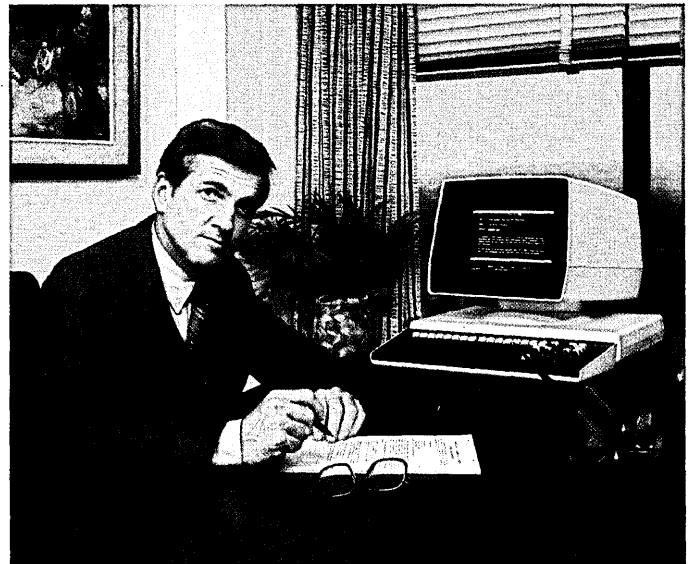
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NEWS IN PERSPECTIVE

what is going on. Each processor has its own copy of the operating system.

By contrast, the Synapse system uses a shared memory with data about what's happening in the system. All processors, except the I/O processors, run off this main memory. It raises questions about the bandwidth of that memory and when it might run out of capacity. Additionally there's the concern about a single point of failure existing, especially in a fault-tolerant system. If one portion of main memory fails, one or more processors could also be forced to go down.

But all that may be academic. Processor failures have become so rare that the concern might be more with disk failures. Or, as Omri Serlin notes, "It's errors on the part of the users in creating those transactions that are causing most of the problems in the database." He thinks the issue of fault tolerance is difficult to prove, that customers just take the word of the manufacturer. Others, too, say that fault tolerance can be achieved by the hardware design, by the operating system design, and the way applications programs are written—using checkpointing, for example. And they observe that users tend to rely only on the first two factors, both provided by the system vendor, for their safety. Besides, there may be other reasons people have been buying the Tandem NonStops. And those other reasons are just as important as, if not more important than, fault tolerance.

—Edward K. Yasaki

REGULATIONS

BOTHERED BY EMI?

Electromagnetic interference from PCs is a problem for vendors, users, and the Federal Communications Commission.

Computer users will little note nor long remember Federal Communications Commission Docket 20780. The FCC is doing its utmost to ensure that manufacturers and vendors will never forget it.

The document is not that difficult to commit to memory. It sets forth FCC rules for computing devices. The rules are an attempt to limit radio emissions from computers and associated devices using digital circuitry in order to minimize the potential for interference to television and radio communications. You might not think your lovable personal computer is capable of snowing out your neighbor's television, but it is. As Casey Stengel so often said, you could look it up.

In the course of its investigations

into products being offered for sale to the masses in retail stores, it has come to the FCC's attention that some manufacturers don't want to play by the rules. To try and ensure that everyone can join the game—let us not forget that this is a participatory democracy—the commission has begun hitting violators where it hurts. Three fines have been issued, with guarantees of more to come. The price is \$2,000 per offense, with the total not to exceed \$5,000.

"Of the products we found offered for sale in stores, 31.9% were not authorized by the rules," said Paul Harris of the FCC's Field Operations Bureau. "We looked at computers, FM radios, and cordless telephones. That's a significant non-compliance rate. It's three times what it should be. We hope for perfection, but we sure don't expect it. A 10% noncompliance rate would be acceptable.

"Of the products we found offered for sale in stores, 31.9% were not authorized by the rules."

"I don't know if they just don't want to comply or they're not following the rules out of ignorance. But we're going to fine people. We'll fine the manufacturers before the retailers. We'll give the retailers a citation, then fine them if we catch them again. We feel justified in doing it. This is a potentially serious problem that we'd like to end before it becomes unsolvable."

"This is a cause for great concern in the industry," admitted a source at a major computer manufacturer. "The rules have created a production and cost impact on the industry, although I don't think companies are as upset now as a few years ago. Over the long run the cost impact is not that great. Now most companies are aware of the rules and are struggling to comply. There is some basis for these rules. The FCC isn't being unreasonable."

Here's the way the whole thing started. Silly, but it's true. As computers were fruitful and multiplied, so did complaints to the FCC of interference to tv and radio reception where the source of the bad vibes was identified as some form of computer. Exhibit A: purchasers of a popular computer marketed to the general public complained the machine totally destroyed tv reception in their own and neighbors' homes. Exhibit B: one of the leading personal computer manufacturers (reportedly IBM) has discovered that occasionally, while running the vendor's financial spreadsheet programs, the user finds simple arithmetic beyond the scope of the machine.

The FCC's first attempt to cope came in April 1976, when it instituted a rule-making proceeding—the aforementioned Docket 20780—to clarify the rules governing restricted radiation devices (including

computers) and to provide more realistic limits at VHF and UHF frequencies.

Enter the Computer and Business Equipment Manufacturers Association. It requested in January 1979 that the rules be adopted specifically for computing equipment. The petition requested more liberal limits than those established in the 1976 notice in Docket 20780. The commission heeded that plea in its order of October 1979, but established an equipment authorization procedure to become effective July 1, 1980.

Deciding that life is too short for that much of a hassle, the industry prevailed upon the FCC to relax the compliance schedule and make a number of minor modifications to the computer rules. The rules were further revised in 1981. Final measurement rules for computing equipment were released in March 1981. None of these permutations altered the thrust of the FCC's First Commandment: thou shalt comply.

The commandment binds both halves of the computer universe. Class A computing devices are those marketed for use in a business/commercial/industrial area. Class B devices are those marketed for use in a residential (home) environment. Using such a computer in a business does not change the classification. A personal computer is a subclass of the Class B solar system.

The FCC has also decreed two equipment authorization procedures that "are not

"This really is the first example of the government regulating computers."

optional for the manufacturer," as it notes in Bulletin OST (Office of Science and Technology) 54. Before either of the computer types can find its way to market, it must be either verified or certified. Class A devices need only be verified. Under that procedure a manufacturer tests the device to determine if it complies with the applicable FCC standard. As soon as he is satisfied that the answer is yes and labels the device as required, he may begin marketing it.

Life is much harsher in the Class B world. Not only must those devices submit to stricter emission standards, they cannot be legally sold without being certified. Under that system the applicant, normally the manufacturer, files an application with the FCC. The application must include: 1) a detailed report of measurements, 2) a block diagram of the computing device, 3) a narrative statement describing how the device operates, 4) the instruction manual furnished to the purchaser, 5) photographs showing the general appearance and component layout of the equipment, and 6) an engineering drawing or photo of the proposed equipment identification nameplate.

The FCC also reserves the right to request the equipment for a pregrant sam-

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NEWS IN PERSPECTIVE

pling test. If both the creator and the created survive this ordeal, a Grant of Equipment Authorization will be issued. Then, and only then, can marketing be initiated.

"This really is the first example of the government regulating computers," said Tom Rosenkranz of Optical Coating Laboratories Inc. (OCLI), Santa Rosa, Calif. "It's also the first time regulations have been developed depending on where the computer is marketed. A lot of people don't know that."

More and more are finding out. As they do, they turn to businesses such as OCLI, which makes plastic shields designed to help computers comply with the FCC rules. Such shields, usually glued to the faceplate of the crt, reflect the potentially offending radiation back into the machine itself. The shields do not affect readability of the crt.

Time has not been on the manufacturers' side. A computing device subject to certification—PCs and associated peripherals and specified electronic games—manufactured after Jan. 1, 1981 is required to be certificated as a prerequisite to legal mar-

"Compliance has added at least 5% to the cost of a device."

keting. A device subject to verification manufactured after Jan. 1, 1981 must bear a temporary warning label stating it has not been tested for compliance, and it must retain that label until it has been tested, verified, and then accordingly relabeled.

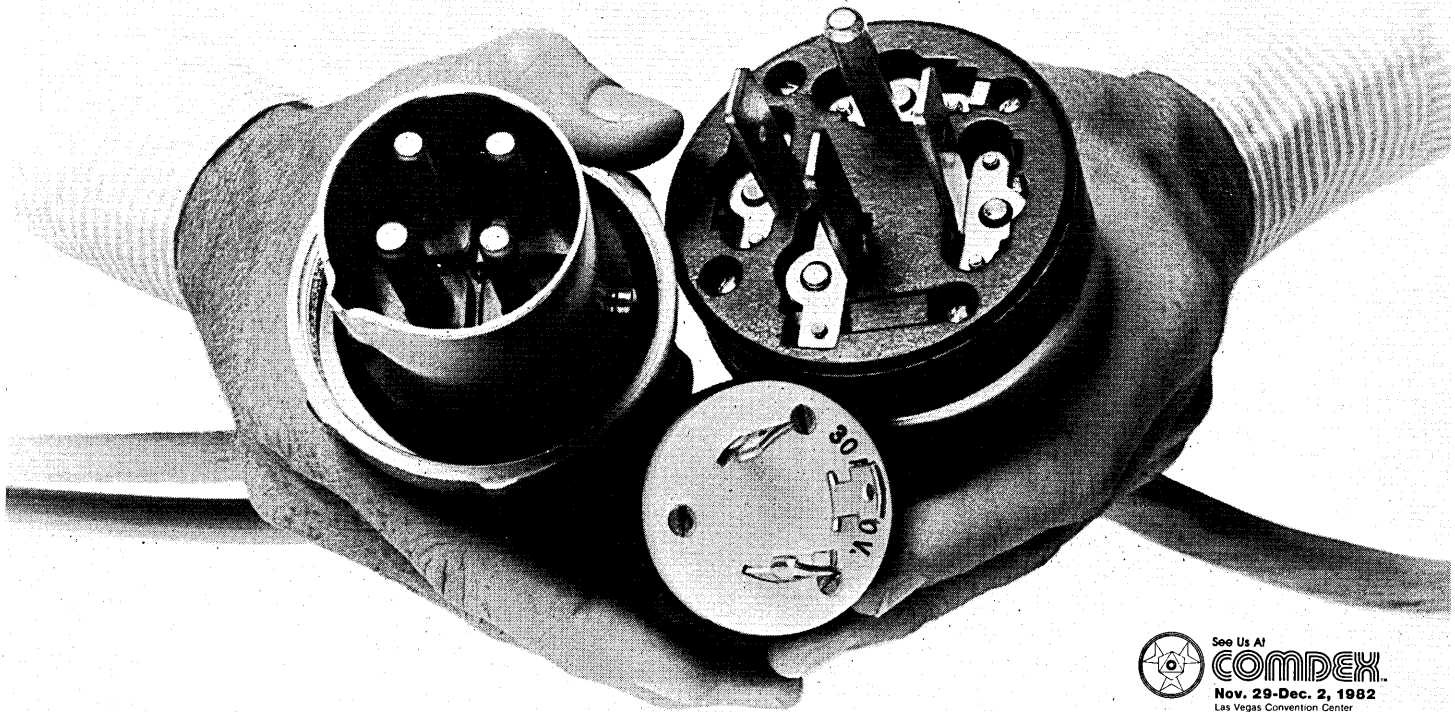
Devices subject to verification first placed in production after Oct. 1, 1981 must be verified as a prerequisite for legal marketing. Last, but hardly least, devices subject to verification which are to be manufactured after Oct. 1, 1983, regardless of the date of first production, must be verified not later than Oct. 1, 1983 as a prerequisite for legal marketing.

So if you want to play fair, the FCC owns the game. Personal computers, business computers, and peripherals. Nothing personal, you understand. Strictly business. If you don't want to play by the rules, hope that the FCC's budget cuts have so devastated its enforcement staff that it can't find you.

"I think the industry went from concern to near panic," said Norm Violetta, a Vienna, Va., consultant specializing in FCC compliance. "Things have settled down, so there's no panic now. But there's no question it has been costly. The consumer has had to pay for it. Compliance has added at least 5% to the cost of a device. And the more complicated the device, the more is added on. The ones hit worst are the personal computer people. The PC limits are much stricter."

"The rules have added some cost to our production, but not anything signifi-

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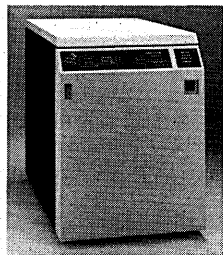


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NEWS IN PERSPECTIVE

cant," said an IBM spokesperson. "There's been no significant cost to the consumer. That's been planned for all along. Compliance has had an effect on the timing of our product announcements, particularly in the personal computer. It hasn't allowed us to announce our products as soon as we'd like. But there's been no effect on our manufacturing process."

If so, Big Blue is one of the few not affected. Though the issue has cooled from white-hot to lukewarm, numerous segments of the industry seem to be proceeding on the theory that if ignored, the timetable

and rules will become another bureaucratic bungle. But though the law recognizes many defenses, ignorance is not among them. And the compliance onus, originally

"The ones hit worst are the personal computer people. The PC limits are much stricter."

on the user, is shifting even more rapidly toward the manufacturer.

"There's a gray area now between the low price Class A and high price Class B computers," an industry source said. "The

Class A devices are meeting less stringent limits, and more people are taking them home. The FCC now presumes that if the manufacturer has any inkling that the device will be taken home, it had better be labeled accordingly."

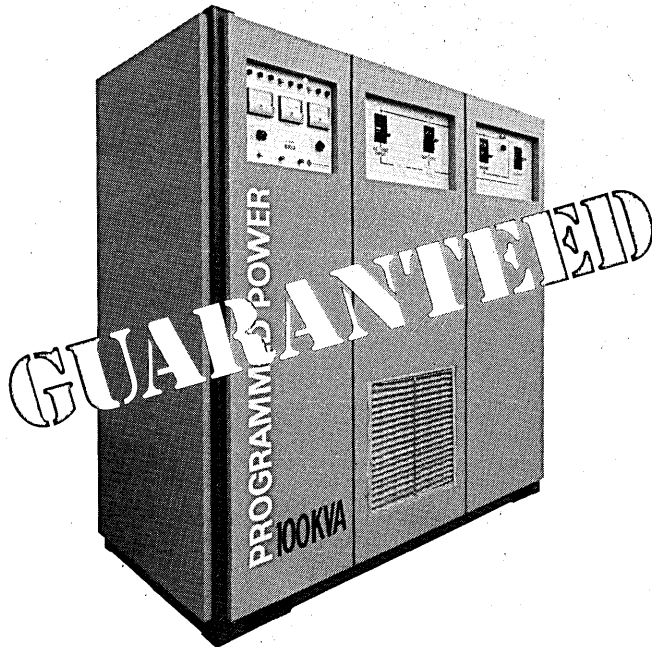
"Everyone knows about the rules, but it hasn't been an inexpensive proposition," contended Larry Movshin, a Washington attorney for several terminal vendors. "Part of the problem has been that until recently the FCC gave no indication of substantial enforcement, so lack of visible enforcement led to laxity by vendors. Now those who have their ducks in a row and have spent money will feel the pressure of competing against those who have not yet complied. Competitive pressure will force the FCC's hand. More people will know about it as their competitors turn them in."

"I'd say the situation is very important, but not a crisis."

"I'd say that if you're an engineer who knows something about electromagnetic interference and compatibility, you've got job security for the next 10 years," said OCLI's Rosenkranz.

—Willie Schatz

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CIRCLE 48 ON READER CARD

SMALL SYSTEMS

PORTABLE COMPUTING TO GROW

The use of ROM-based software makes the HP-75 "as easy to a computer illiterate as plugging in an Atari game cartridge."

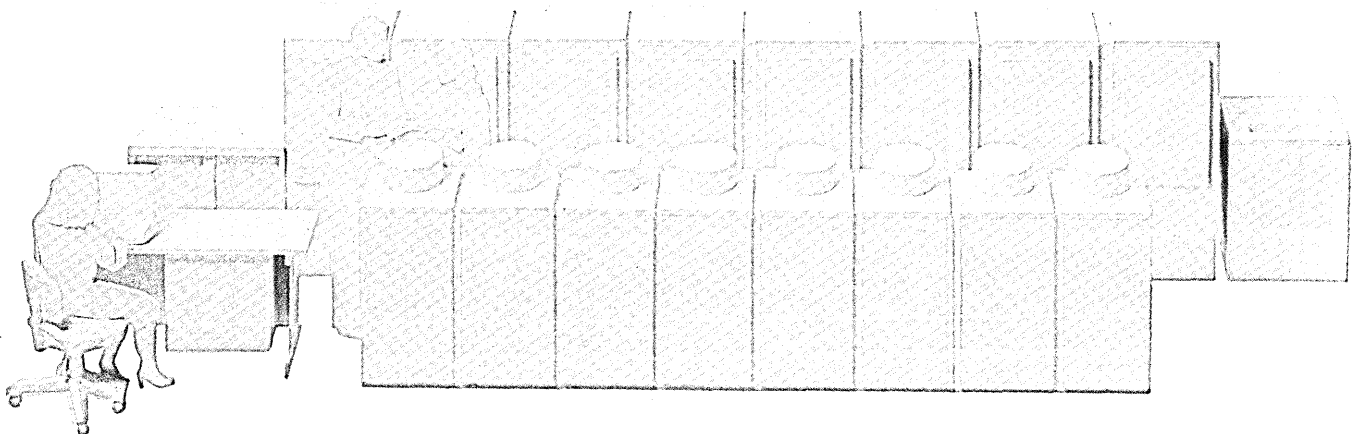
The company that showed the world how powerful a handheld calculator could be when it introduced the HP-35 in 1972 has begun to shine also in the field of portable computers. Hewlett-Packard Co. is not the first to produce a small, lightweight, programmable computer. But the HP-75C at only \$995, introduced in August, is indicative of a welcome trend in computing toward portability (it weighs only 26 ounces), in power (it uses plug-in ROM-based applications and control programs), and ease of use (after inserting a ROM package, the user need only press one key to begin getting prompts from the device).

"It's as easy to a computer illiterate as plugging in an Atari game cartridge," says Jim Fremont of HP's Corvallis Division. He sees the use of plug-in software as the most powerful aspect of the 75's design. By inserting a ROM, he explains, "the machine can be completely customized to whatever application the user wants."

CIRCLE 49 ON READER CARD

When you need
enormous volumes of information,
from hundreds of sources,
in a variety of formats,
from anywhere in the world,
there are only a
handful of computer systems
that can do the job.

When you
need it without fail,
there is only one.



The Tandem NonStop™ Network

Components fail. But that doesn't necessarily have to mean downtime. With a NonStop network from Tandem, you're assured of completely reliable system operation—right through a component failure that would shut other systems down. The result is that you get the right information to the right people at the right time. Across the street or around the world. Without fail.

The network is based on the continuous processing capabilities of Tandem NonStop computer systems—a fault-tolerant environment in which a malfunction or component failure will not inhibit or interrupt system operation.

With a Tandem system, you can access information from anywhere in the network, in different formats (text, data and images), integrate all the information in a form that meets your specific requirements, and distribute the finished product at the appropriate times to any number of recipients at any number of locations. Those receiving the communication can 1) interactively add or delete information; 2) forward it to other individuals or send it back to the originator; 3) print it out; or 4) store it for future reference. Or any combination.

And in a Tandem network, all the advantages of NonStop system availability become NonStop network availability. If a line failure occurs, our advanced networking software transmits the message over the optimum alternative path—transparently to the user, of course.

But the result is always the same: your information gets through. Without fail.

DEVELOPING THE INFORMATION

As the nature of doing business on a large scale becomes ever more complex, so does the nature of the information behind it. Not only is this information in many different formats, it is typically widely dispersed throughout an organization. With most systems, that means throughput problems for those users in remote locations who need only occasional access to it.

Not so with Tandem.

The wonders of a distributed, relational database.

Unlike other approaches to distributed processing in which each location functions as an independent database, Tandem treats the network as one single database with multiple files distributed geographically. Programs will run with files from anywhere in the system, whether you have a single two-processor system or a 255-

system network. And with no user intervention or special programming required.

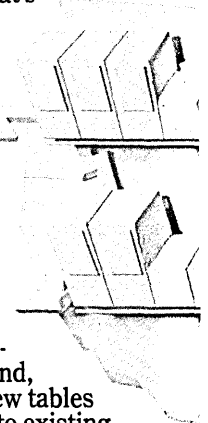
The key is the relational organization of the database—an extremely flexible design concept that's also extremely

easy to work with. Setting up files merely involves creating or

filling in tables with pertinent data. So you save time and money right from the start on program develop-

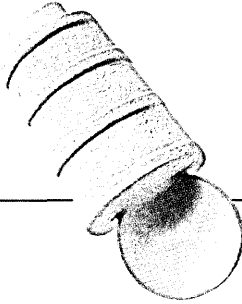
ment and maintenance. And to expand, you merely add new tables or add more rows to existing ones—without rewriting or modifying your applications programs.

This lets you concentrate on the application at hand, not on system organization.



MOVING THE INFORMATION

Most business information systems are configured for the purpose of automating the tasks normally associated with office work: writing, printing, filing and distributing information within a local area.



higher dependability. Tandem supplies all other ground components, including controllers, RF modems and complete computer/communication interface modules, all of which were designed with solid state technology for outstanding reliability. And, since Tandem maintains the entire system, you always have only one number to call for the answer to any question.

Putting it all together.

With a full range of communications capabilities and the enormous capacities of a global system, the Tandem NonStop™ network is uniquely suited to the complete information requirements of multi-divisional, multi-national corporations. And most especially for any business or institution that needs to get the right information to the right people at the right time. Without fail.

THE TANDEM EVOLUTION

- A single system.
- A single hardware architecture.
- A single operating system.
- A single database.
- A single operating environment.
- A single network architecture.
- A single application environment.

The Tandem Evolution—our original design concept, still big enough to contain the past, handle the present and include the future.

The Tandem Evolution—an evolution in products and strategy that integrates information and communications in a single virtual NonStop system. A system with the flexibility to adapt as time, markets or economic considerations change. A reliable network that links people, equipment and data independent of location, application, form

of data, method of transmission, number of users or types of equipment. An evolution that from beginning to end protects your investment in information resources.

The Tandem Evolution—a consistency in philosophy that's designed to give users the optimum in computer performance right now. While providing a continuing, flexible framework for enhanced performance tomorrow.

Tandem provides local sales and service support in the major computer markets throughout the free world. Plus fourteen software education centers in the U.S., Canada and Europe offering professional technical training courses for your programmers and analysts. With this kind of support behind each new capability, applications can be implemented on-line quickly, easily and economically.

If you'd like more information, call your local Tandem sales office listed on the back cover. Or contact Tandem Computers Incorporated, 19333 Vallco Parkway, Cupertino, California 95014. Toll Free 800-538-3114 or (408) 725-6000 in California.



The system shown is a sixteen processor system. It can function independently or as the local node of a 255-system network, more than 4,000 processors, providing direct and immediate access to information sources anywhere in the world.

When you need it without fail, there is only one.

TANDEM

But communicating this information in a timely, reliable manner outside that area is another problem entirely. If you don't know beforehand precisely which locations are to be included in your network, you'll pay a stiff penalty in reprogramming and restructuring costs when you want to add nodes or change them around.

That's where the Tandem difference is so important.

Rings. Strings. Stars. Or any combination.

The Tandem system was designed from the start to be a single, flexible network. No matter what the configuration. Or how many times you change it. A simple two-processor system at one physical location may be thought of as a

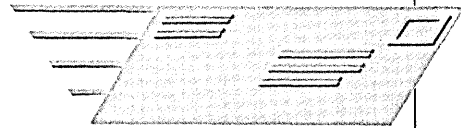
network, just as a 255-system configuration spread across the globe is a network. The very same network, at that. This concept of a *total* information/communications system results in significant time- and cost-saving benefits for the system designer. And ultimately, for the user.

Plenty of room to grow.

System expansion is easy and economical. Thanks to the network's modular construction, moving up to larger configurations is simply a matter of adding hardware, piece by piece, as requirements dictate. You start only with what you need, and add processors, peripherals and communications facilities in low-cost increments. And without having to rewrite a single line of software. That means your original investment in equipment and programs is always protected.

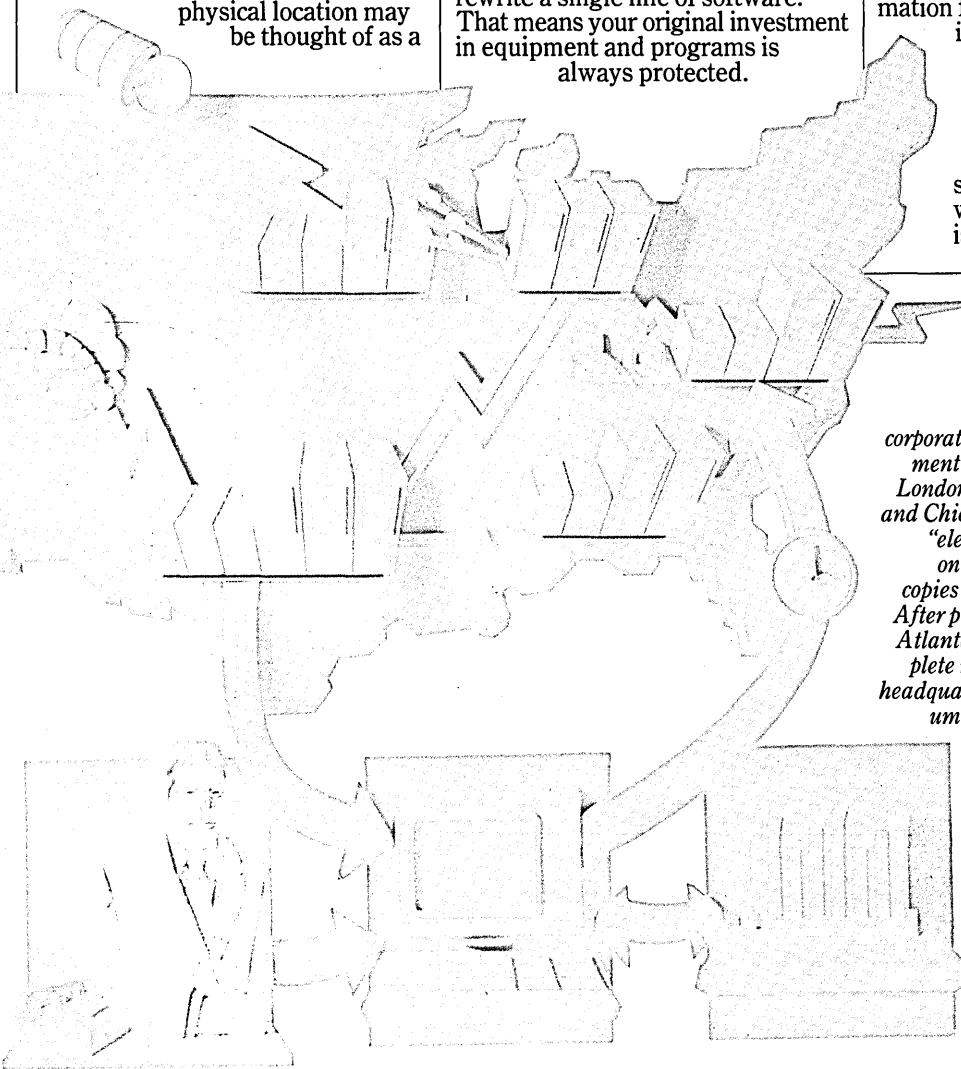
The right information to the right people at the right time.

The Tandem NonStop network integrates all devices into a single virtual system. This provides a framework for information handling that is independent of both content and



time. Each user can send, query, receive, store, secure, forward and distribute information at his or her own terminal. Including information from the database and images from a facsimile machine, and the user's own ad hoc memos. The system assures that the information will reach its destination at the user-specified time. And that's what effective communication is all about.

On a Tandem network terminal in the Dallas office, a sales representative accesses the corporate database to draft a quote document for presentation to a customer in London. Meanwhile, the San Francisco and Chicago offices respond to a separate "electronic memo" by sending charts on the customer's sales activity and copies of faxed news stories and photos. After product inventory figures from the Atlanta warehouse are added, the complete report is transmitted to corporate headquarters in New York, where the document is reviewed and a cover letter drafted. Finally, with a few simple keystrokes, the entire package is sent in seconds to the London sales office, with copies to New York and Dallas for storage on file. Thus, the full resources of the system are put to work for effective corporate information management.



For information on any of Tandem's computer products, contact the sales office nearest you.

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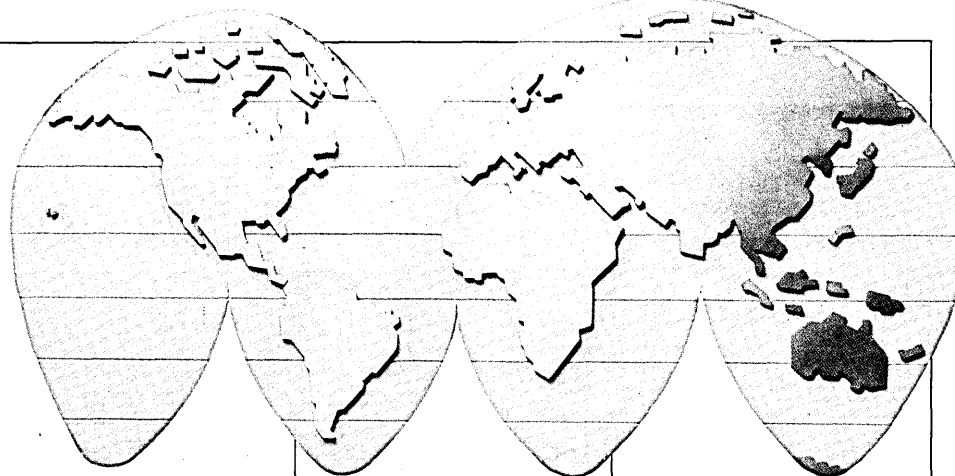
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TANDEM



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THIS NETWORK WORKS

Tandem processors complement each other, working together to increase power, performance and throughput for a lower total cost per transaction. Adding NonStop fault-tolerant operation to advanced networking capabilities, the Tandem system virtually eliminates the risk of network failure. At the same time, it protects the database from damage caused by electronic malfunctions. And when a component does fail, the system can be serviced — parts removed and replaced — while continuing to process transactions. So your message

ucts protects your investment in other mainframe, mini, and peripheral products. The Tandem system supports BISYNC, ASYNC, SDLC and HDLC basic communications protocols. There are also a variety of software packages that allow a network of Tandem systems to be linked to other mainframes or networks (including SNA) for the support of interactive processing and remote batch processing.

In addition, the Tandem system can be interfaced to a wide range of terminal products such as text processors, ATMs, cash registers, badge readers, optical scanners and shop floor terminals.

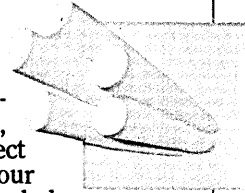
Words and images.

Tandem's special facsimile software lets you store and forward facsimile reproduction of charts, graphs and diagrams to accompany text from various data files. And, you can access this information

The speed of light.

Using state-of-the-art optical technology, our high-speed fiber optics extension provides the means to link Tandem processors up to a distance of 1000 meters between individual systems.

In effect, you can link up to 224 processors within your headquarters or plant, giving you an extremely fast and efficient system that provides enormous processing capability. And of course, you can interconnect this system into your network for expanded information-sharing capabilities.



The sky's the limit.

The lower costs and higher reliability of transmitting data over long distances via satellite is an economical and practical alternative for any corporation with geographically dispersed locations.

That's why Tandem has joined with American Satellite Company (ASC®) in a unique marketing agreement to provide the only completely fault-tolerant satellite communications network on the market today. So you can be assured of total NonStop system reliability, from operating system to orbiting satellite.

Following the NonStop system strategy, earth stations transmit and receive data over two parallel paths—if one is down, the other is still operational.

Also, ASC provides two different transponders on the satellite itself. Again, should one be inoperative, the second transponder and data path continue to function.

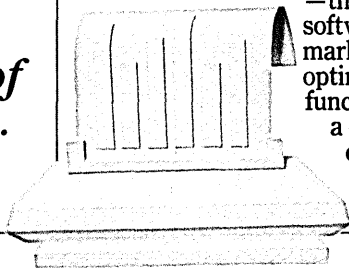
ASC provides the earth stations, including a special antenna that is small and light enough for mounting on a rooftop or in a parking lot. This can be directly connected to the computer system, without need of leased lines, for lower costs and

is guaranteed to get through. On time, every time. And over the widest range of communications circuits, too: X.25 packet-switching networks, terrestrial circuits, fiber optics, even satellite links.

The ins and outs of transmitting data.

Tandem's comprehensive set of communications prod-

from any telephone with a facsimile machine. What's more, this ability to transmit graphic elements also greatly enhances our unique Query/Report Writer capability — the only such software on the market that optimizes both functions over a distributed database.



ii
am

NEWS IN PERSPECTIVE

There's no booting up required and no peripheral devices to plug in. And with the use of ROM packages, the user still has the entire RAM space for his data.

Recent product announcements by HP show a strong commitment to the personal computer market, such devices now coming out of something like 10 different divisions. These products, which the company is shipping at an annualized rate of from \$400 million to \$500 million, include advanced handheld calculators and computers, portable computers, and personal computers for both the technical/scientific community and for the office professional, in addition to printers, plotters, storage devices, and related peripherals and supplies.

The introduction this month of the Series 200 Model 16 is an example of the stress being placed on this marketplace.

Still in its infancy, the portable computing market is expected to reach more than \$5 billion by 1986.

Powered by the Motorola 68000 microprocessor, it is the company's first 16-bit personal computer, one designed for the technical community.

It's possible that at a later date the CPM operating system will be made available for the Model 16, as well as an HP version of Unix, which will run not only on the 16 but also on the 26 and 36 desktops, formerly the 9826 and 9836. The company also announced a new personal office computer, the HP-120, which is available with software for communications, databasing, text editing, and financial modeling.

But it's the market for portable computing devices, still in its infancy, that is about to take off. In the five-year period from 1981 to 1986, shipments are expected to grow at a compound annual rate of 60%, revenues at 66%, reaching some \$5.3 billion in '86, according to Creative Strategies International. The market, it finds, is comprised of four types of devices—programmable calculator, handheld computer (weighs less than a pound), portable keyboard console (weighs less than two pounds and has a standard-sized keyboard), and the portable computer (weighs less than 30 pounds). The largest growth is predicted for the portable keyboard console, shipments and revenues of which are expected



THE HP-75 weighs only 26 ounces and costs only \$995.

to grow by more than 100% a year through '86.

Bonnie Digrius, author of the study, isn't sure whether the HP-75 should be classed as a keyboard console or handheld computer. But she finds no problem in understanding HP's involvement in both those segments of the market. "Their products are really geared toward that [engineering] market," she says. "They're not geared toward consumers." It's only natural that HP would want to cover all the bases, offering products in each of the four categories. "If someone might need something just to go out and do some remote data entry and some processing," she explains, "then they would have something small enough to shove in their briefcases and carry out."

The HP-75 was designed for just such a person on the go, a peripatetic individual who needs a desktop computer, "except that this is the kind of individual who prefers not to leave all his information on his desk when he leaves the office" to go home at night or when he travels, explains HP's Fremont. The portable device has the capabilities of a desktop but is optimized with a smaller keyboard, smaller display, and batter power. A salesman, for example, could have information on his accounts readily available on the road but also enter orders and perhaps transmit them to the company computer. Conversely, he could inquire into a database back at the office and get order status information. Service or maintenance people could expedite parts ordering while at a client site; access warranty records, or update maintenance files.

There's an obvious appeal in something small enough to drop into an attaché case atop piles of paper and alongside a good book. One could take it along on a trip, return without having used it, and still not mind the small inconvenience it might have created. That's to be contrasted with the effort involved in taking along a 30-

There's an obvious appeal in something small enough to drop into an attaché case atop piles of paper and alongside a good book.

pound computer, even if it does fit under an airline seat.

HP, which obviously thinks small is beautiful, has gone beyond the design of small computers. This month's announcement also includes its adoption of Sony's 3½-inch flexible disks, the so-called micro-floppy. "The 3½-inch technology provides smaller, faster, and less expensive mass storage," says the firm's Srinu Nageshwar, "and is expected to give the mass storage industry a new price curve." The micro-floppy, running on a Sony drive with HP electronics, has a capacity of 270K bytes, recording on only one side.

—Edward K. Yasaki

SOFTWARE

SOFTWARE SUPPLIERS SHAPE UP

Buyers are wiser, money is tighter, and competition is stiffer. That calls for changes from the vendors.

On the surface, the software industry appears to be the picture of health. Some software houses, particularly those serving the electronic games and micro market, boast off-the-chart percentage growth rates in the 100s or better and show little signs of slowing. Meanwhile, on the traditional mainframe and minicomputer side of the software world, many suppliers still sport growth rates of 50% to 80%. But despite the impressive numbers, life isn't as easy as it used to be. The market is growing up and the rules of the game are changing. Software suppliers that are slow to adapt may be left standing at the gate.

Tight money, smart buyers, and stiff competition are weeding out the sound from the shaky, those that are in it for the long term and those in it for the quick turn. There are certain things a software buyer can look for in a company that may indicate whether that vendor will be around several years from now. New product development is one place to begin.

"Software companies are great at idea generation, but poor at internal screening of ideas that won't work, testing a new product, and tracking the market reaction to that product," said Robert Blattberg, a marketing consultant and professor of marketing at the University of Chicago. What it boils down to, according to Blattberg, is that companies that take a marketing-oriented rather than a product-oriented approach to their business are more likely to succeed over the long term. Among the types of questions these companies should be asking during their product development cycles are, what is crucial to the customer? what do customers want from the product? what are their real problems?

Advanced technology alone does not a successful product make. It has to have some "real benefit" to users, observes Blattberg, and that is a concept not well understood by many software vendors. Blattberg tells a story about an East Coast software house that tried to get into the decision support market. "The designers of the product sold another company on the nuances and sophistication of the technology in the product. That company didn't research how customers would perceive the

Guelph: High tech potential, low cost turn-key to a Profit Centre

It's the rich Southern Ontario \$180 billion market segment. It's high tech potential is proven with the space shuttle RMS arm. And Guelph will situate you right in this Profit Centre with secure energy supply, total transportation system to international markets, raw materials, abundant water supply and technical personnel potential from universities, colleges and vocational schools. Fully serviced Industrial Parks and acreage for sale or full turn-key operation.

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MAPMAN

decreases your programming time.

Try it FREE for 30 days!

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The new Map-Manager program by Deva Systems Software, Inc. will greatly increase your CICS mapwriting productivity. MAPMAN is an on-line aid that allows CICS programmers to design and format screens interactively. The program automatically produces the BMS macros necessary to define the screen for CICS. This means that even inexperienced programmers can generate new maps almost immediately. What's more, MAPMAN allows programmers to easily modify existing CICS maps interactively, and regenerate a new map; all without the extensive coding effort usually required.

No modifications necessary.

Because Deva makes it a policy to produce products which require no modifications to IBM or user software, MAPMAN is ready when you are. Since both the construction of, and maintenance of, all maps is performed in an interactive, menu-driven mode, functional maps can be maintained with minimal effort. Further, immediate hard-copy output of any map is available as a documentation aid.

Satisfaction guaranteed.

It's simple: MAPMAN is guaranteed to perform. This guarantee is backed by a policy of free maintenance, and distribution of any enhancements made, for a period of one year. Deva also offers its clients direct contact with the authors of its software should the need arise.

Get to know MAPMAN.

For information on how MAPMAN can help alleviate your productivity problems and enhance CICS map design capabilities, complete and mail this form. To order MAPMAN, call toll-free, 1-800-531-1002. In Texas, call collect, (512) 736-4281.

MAPMAN, Map-Manager software by Deva Systems Software, Inc.

Price: \$3,000

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DEVA

DEVA SYSTEMS SOFTWARE, INC. 1-800-531-1002
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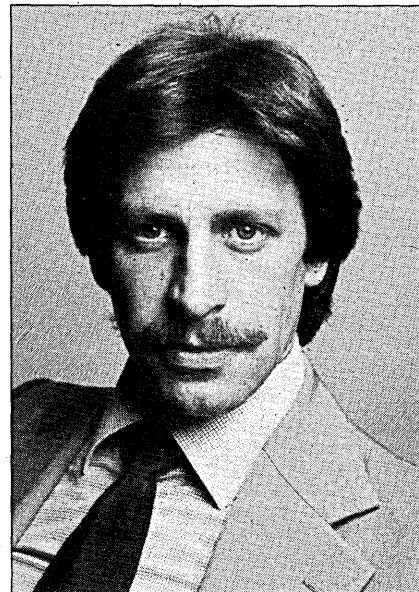
NEWS IN PERSPECTIVE

product," he said. Instead, they acquired it, pumped about \$1 million into it, threw it out into the marketplace, and "very quickly found that people couldn't care less about that product's nuances and clever technology. There was no real benefit to the customer," Blattberg explained.

At this point, Blattberg was called in, and he tried to explain the "sunk cost facility" to the bewildered company. "They kept thinking if they put another \$500,000 into the product they could recoup their investment. The sunk cost facility says you don't put another penny into a bad product. The biggest problem managers face is knowing when to bite the bullet and tell shareholders they've made a mistake." Today, this same company is doing reasonably well, Blattberg conceded, but the incident changed its direction.

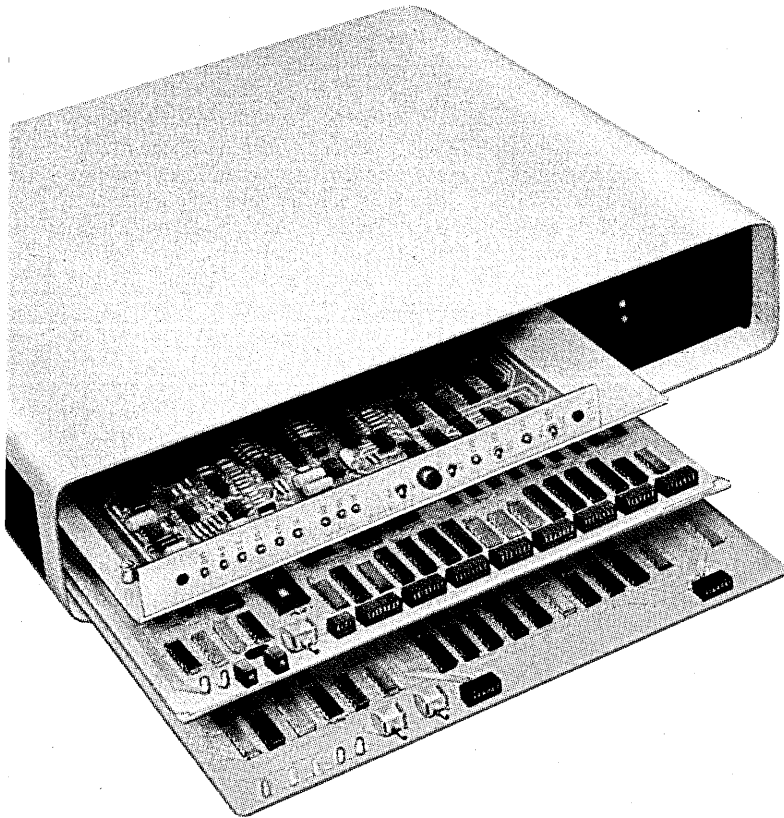
For a smooth, efficient product development cycle, Blattberg believes that a well-run company should have a structure that puts R&D and marketing in constant contact with each other. In addition, product introduction should be backed by well thought out plans and/or market research that help the company position the new product in a market niche. There should also be provisions for monitoring customer response once the product is on the street.

Another area where Blattberg sees software companies falling painfully short is in establishing and using feedback loops. It's just been within the past two years that several software houses have set up user groups. "But users are only part of the picture," reminds Blattberg. "What about those not yet using the product?" He suggests that companies that will prosper are those that talk to nonusers as well as users, those that do some market research, and those that think about and plan for expand-



ROBERT C. BLATTBERG: "The 'sunk cost facility' says you don't put another penny into a bad product."

Minicomputer users:

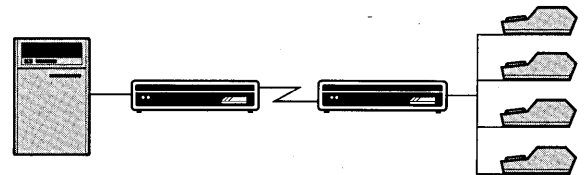


Timeplex offers a one-stop system solution for communicating with multiple remote terminals. Economically.

Asynchronous statistical multiplexer

Synchronous statistical multiplexer

High speed modem



The Timeplex E/SERIES is a complete data concentrator system designed to economically link clusters of remote terminals to your minicomputer.

E/SERIES: Cuts communications costs. Suddenly, saving communications costs by linking several terminals to one shared telephone line becomes easy.

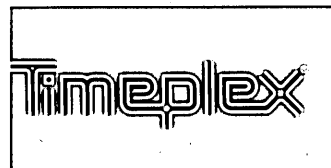
Unlike the competition, the Timeplex E/SERIES simplifies the challenge of point-to-point communications by incorporating three functions in a single compact unit. One system offers you a statistical multiplexer supporting 4 to 16 asynchronous channels, *plus* an optional statistical multiplexer for an additional synchronous channel, *plus* an optional integral high speed modem.

E/SERIES: Puts it all together. Putting three functionally distinct modules in one enclosure eliminates external communications units and bulky, expensive cables. And, a minicomputer interface option further reduces costs. The result: System planning and installation is extremely simple. Reliability is enhanced. Costs are dramatically reduced.

Free step-by-step Guide. This easy-to-understand booklet contains all the facts on how to remote your terminals, simply *and* economically. Just write or call Timeplex for your free copy.

For the name of the E/SERIES stocking distributor nearest you, call 201-368-0736.

Timeplex, Inc./One Communications Plaza/
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The technology leader
in data communications

CIRCLE 52 ON READER CARD

NEWS IN PERSPECTIVE

ing their marketing reach. Another key element in a good product development cycle is determining where hardware vendors are moving and how this will affect software product development plans.

Admits Jim Rabjohn, director of marketing for SPSS, "Like many software companies we were a technology-driven

Companies that take a marketing-oriented rather than a product-oriented approach to their business are more likely to succeed over the long term.

concern with no marketing. There was a lot of order taking that passed as selling." SPSS, a Chicago-area maker of a data analysis package, is moving away from its product orientation, and as a result of this approach, the company has begun to redefine the market for its package. Instead of just selling to research groups oriented toward the social sciences, the company believes its product has a lot to offer corporate human resource departments.

Another company that expanded its market reach by rethinking its market niche is Computeristics Inc. of Hamden, Conn. "Instead of trying to compete feature to feature against other order entry or accounts receivable packages, we approached the market with the idea of providing customer

service software. We defined our market more broadly than most," recalled Computeristics president Jim Chambers.

In defense of why the software industry doesn't do more marketing, he reasons it's because its product is less tangible than, say, a consumer product. "There you can build a prototype and let people test it," said consultant Blattberg. "In the software business it's more difficult. It's also difficult to get customers' evaluations. Sometimes you are on the leading edge and yet you don't like to go to customers with prototypes because your product plans might get back to your competitors. That's a problem, but it's not insurmountable. A lot of companies are using that as a crutch."

Meanwhile, there have been some changes taking place on the user's side of the fence, too. Buyers are wiser and less eager to part with their money, thanks to the recession. A blessing as well as a curse, the recession has stimulated business for software houses. In the wake of staff cuts, departments and data processing centers are turning more often to packaged software to help pick up the slack. "Dp doesn't have the capacity to react quickly enough to all the cuts," said William Donohue, credit manager, Johnson & Johnson Products Inc., New Brunswick, N.J.

"There aren't enough people in MIS to handle all the requirements, so produc-

tivity tools and packages are looked to," says Frank Sparcia, director, management information systems for Revlon of Edison, N.J. "We are not able to develop everything in-house. Part of the problem is money; part of it's pressure from users. So we are going outside because it's more economical to go outside with the kinds of systems that are available."

Nonetheless, dollars don't flow as fast and loose as they used to from user to vendor. Today's software shoppers are kicking tires, looking under the hood, asking about the manufacturer, and pulling out checklists. What qualities come up most often on the checklist? Compatibility with the current way of doing business is a prime consideration, followed by the acid test of matching a package's features and func-

Advanced technology alone does not a successful product make.

tions against the user's list of requirements. "Buyers are doing more preparation up front before starting to look for a package," said Walter Riedel, manager, credit and administration services for Johnson & Johnson Baby Products Co., Skillman, N.J.

No longer can vendors get by with shoddy documentation. The quality of both user documentation and technical docu-

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May 1, 1982

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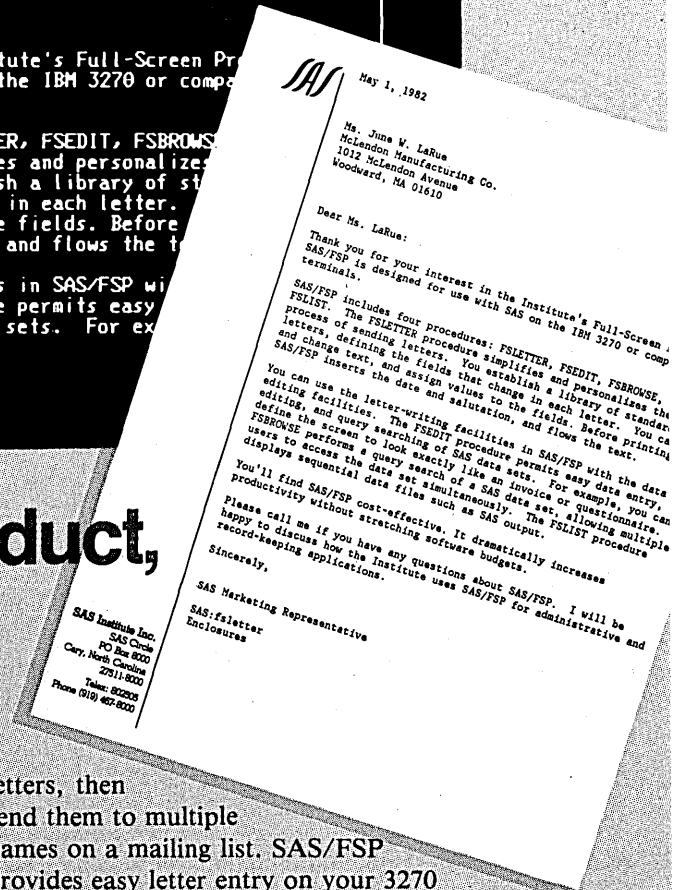
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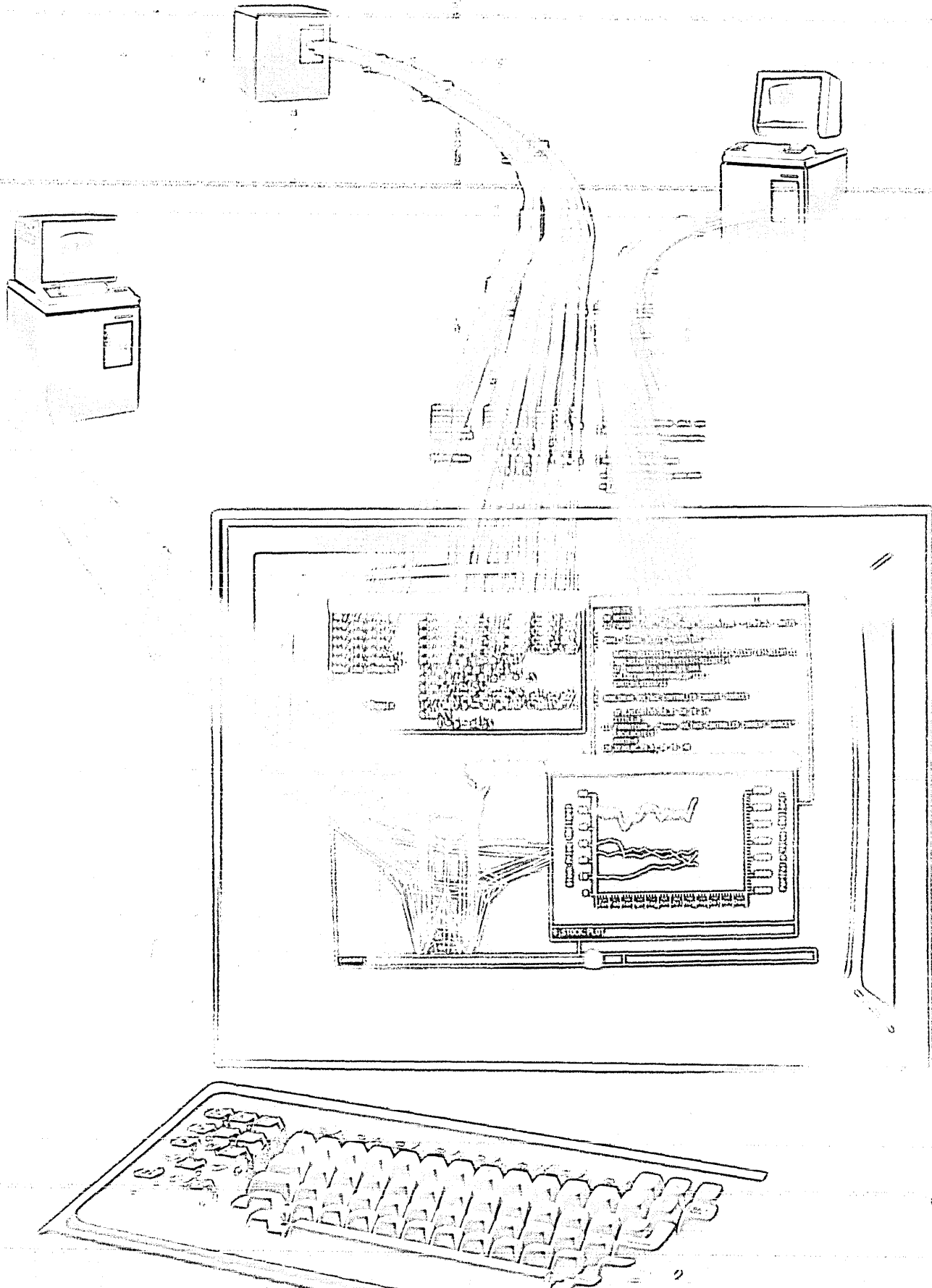
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now available in 16 million colors.

APOLLO'S NEW DN600 HIGH PERFORMANCE, FULL COLOR GRAPHICS COMPUTATIONAL NODE PUTS UNPRECEDENTED POWER ON YOUR DESKTOP.

The DN600, latest in Apollo's rapidly growing family of nodes for engineering, scientific, and CAD/CAM users, provides performance and flexibility unavailable in any other computer graphics system. The DN600 uniquely integrates a high performance superminicomputer with a full color graphics system, eliminating the performance bottlenecks associated with traditional processors and stand-alone graphics terminals.

Like all Apollo nodes, the DN600 has a 32-bit central processor, 16 million bytes of virtual address space and support for up to 3.5 million bytes of main memory. In addition, the new color node has up to 2 million bytes of dedicated display memory, more than the total capacity of many other computer systems. Display memory can be used to store fonts, graphic templates, parts of oversized images, or the next image in an animated sequence. The DN600 provides 320 million bit per second area fills, so the entire screen can be changed in about 1/30 of a second.

The DN600's 19-inch, high resolution display offers a selection of more than 16 million colors and lets users select from seven interactive and imaging modes. Users can choose from a combination of 1024 x 1024 and 512 x 512 pixel resolution and 4, 8, or 24 planes for different levels of color selection.

The Concept of Domain Processing

The Apollo Domain distributed processing system is unique in its ability to combine a powerful, mainframe-like architecture, high resolution bit map graphics, and a high performance local area network. The Domain processing system consists of a collection of low-cost 32-bit workstations, each capable of running very large and complex applications. All workstations share a common network-wide virtual memory operating system that allows users to share resources—data, programs, files, and peripherals—transparently, across the network.

The DN600 is ideal for applications such as computer-aided design, where high resolution and fast response times are essential; and for solids modeling and imaging, where users build high quality graphics with many colors and subtle shading.

The DN600 is fully software compatible with Apollo's monochromatic DN400 or DN420 nodes, and can be added to any existing Domain network.

And the new DN600 node costs under \$60,000, far less than the price of any other 32-bit computer with comparable color graphics capability.

NEW DISTRIBUTED DATA MANAGEMENT SYSTEM TAILORED TO THE NEEDS OF TECHNICAL PROFESSIONALS.

Apollo's new Domain Distributed Data Management System (D3M) is the first truly distributed database management system available from any computer manufacturer. It combines the efficiency and performance of a CODASYL-compliant DBMS with the flexibility of a relational interface. Its applications range from a personal electronic file cabinet to a full mainframe-level, shared database.

D3M works exactly the way engineering and scientific users work, allowing members of a design team to create and update a database to store their own information. And with D3M, users can access each other's databases or combine

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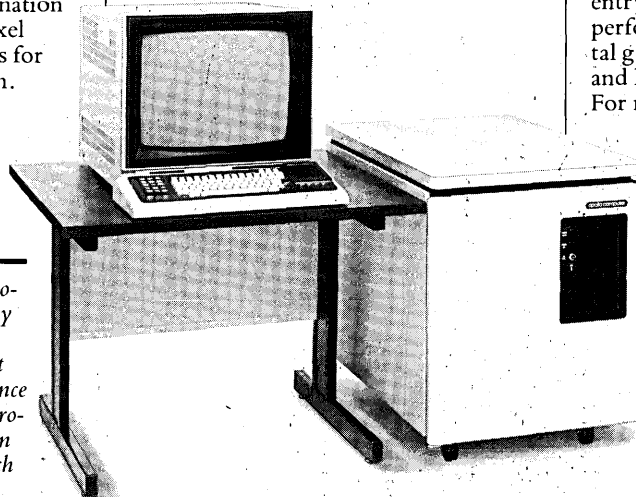
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Domain processing system, send in the coupon or call Apollo's marketing department at (617) 256-6600. Apollo Computer Inc., 19 Alpha Road, Chelmsford, Massachusetts 01824.



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Branch & Health Associates Limited is a member firm of the Institute of Chartered Accountants in England and Wales (ICAEW) and is a member of the Chartered Accountants' Association (CAA).

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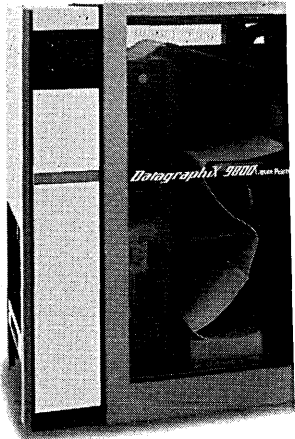
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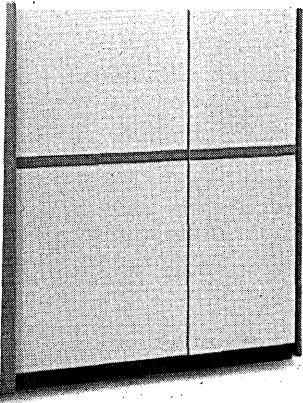
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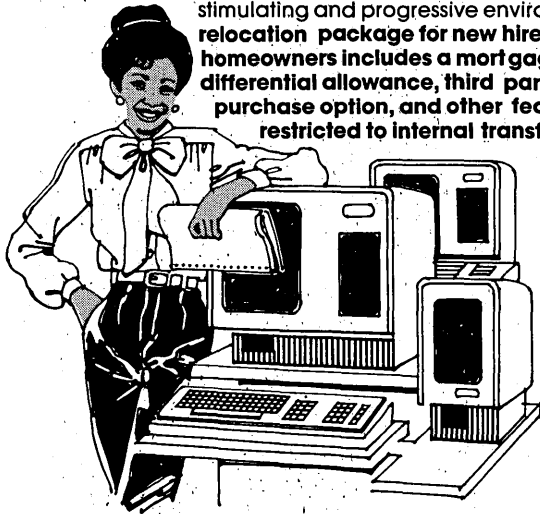
MANAGER, DISTRIBUTED INFORMATION SYSTEMS

SOHIO, a Fortune 20 corporation, continues to invest millions in energy research, petroleum exploration, production, refining, chemicals and new business ventures. Information Systems and the qualified professionals supporting its extensive operations must keep pace with these rapid expansion efforts. We anticipate significant technological advancements which will continue to prevail in the years ahead — advancements crucial to our strategic plans.

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"Help us Help to Assure America's Energy Future"



NEWS IN PERSPECTIVE

mentation can kill or close software deals, insist some users. Then comes ease of use and a product's "flexibility," the ability to adapt one package to several operating environments as well as to a variety of user specifications, such as the number of digits in an invoice number or the different terms of sales, seven days versus 30 days, for instance.

Merrit Lutz, group vice president, software products group at Informatics General Corp., Woodland Hills, Calif., claims that more customers are requesting plant tours and asking more probing questions before they sign on the bottom line. "One positive aspect of the recession," said Lutz, "is that customers are looking at the undercarriage of a product." He considers the product's architecture to be one of his company's sharp competitive edges. "We look ahead five, maybe 10, years out, trying to determine where databases and hardware will be, then design our products so that they can grow in those directions," said Lutz.

Using a modular design, Informatics sets aside that code which interfaces to

A blessing as well as a curse, the recession has stimulated business for software houses.

the IBM system, explained Lutz. When IBM changes its hardware or software, "we can go right to [that module], cut it out, and replace it fairly quickly." While Lutz believes few software companies take such a "strategic" approach to software design, users appear to be taking notice. "How much money a package saves you is still not enough. It's got to be able to grow with you," insists Joe Chaudoin, national credit manager for Ocean Spray Cranberries Inc., Plymouth, Mass.

The ravages of recession have also taken their toll on the sales cycle. It has been stretched out to as much as 12 months or more, say vendors. Part of the reason is that customers are sending their "buy requests" farther up the corporate ladder for evaluation and clearance. Another reason is that department managers or department heads have a finite pool of dollars to work with and those dollars have to be managed according to user needs and corporate priorities. Low priority packages, such as performance tuning packages, are seeing the longest delays or are cut from the list completely.

The result is that vendors are claiming "fantastic" backlogs. The question is, will all that backlog bear fruit? Not always, says SPSS, which has already seen some promises to buy its product canceled. David Eskra, president of Pansophic Systems, Oak Brook, Ill., also is skeptical. He thinks next year will be worse. With business still in the doldrums and continued requests for more cuts in staffing and capital goods plans, Eskra wonders "where the money

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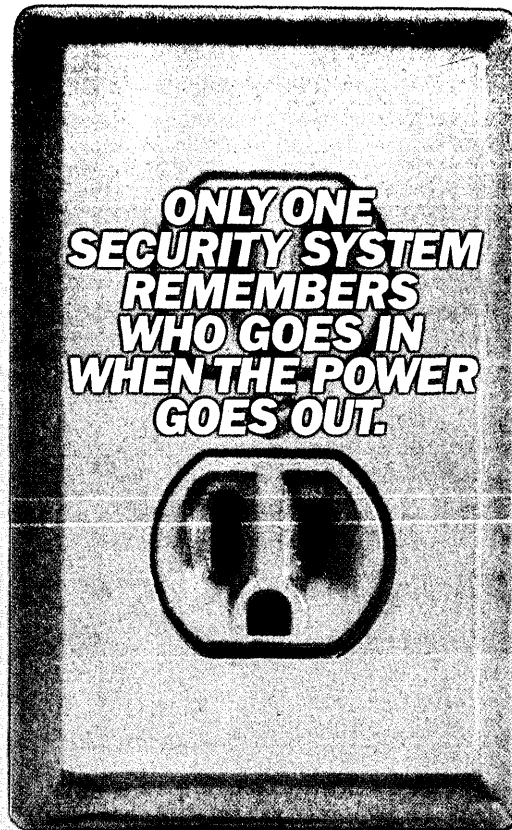
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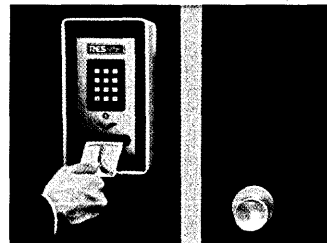
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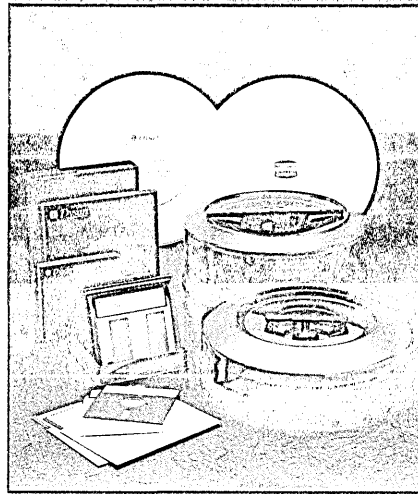
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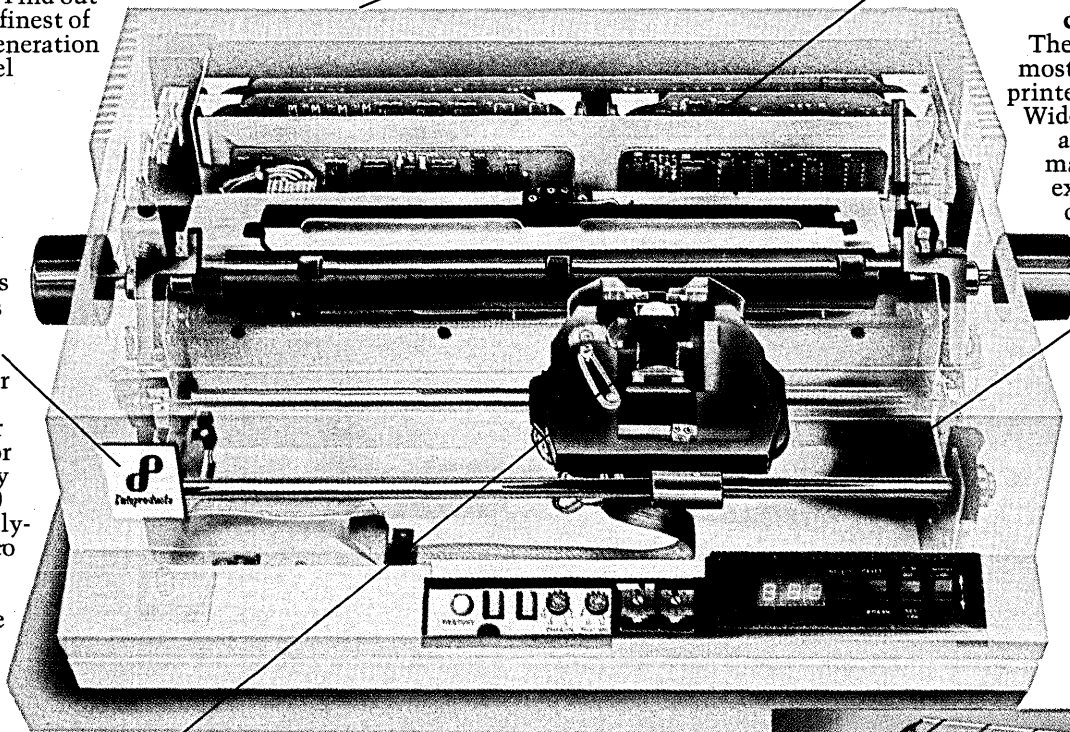
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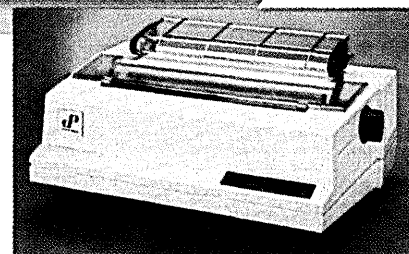
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CIRCLE 64 ON READER CARD

NEWS IN PERSPECTIVE

[to buy software] is going to come from?" To combat the budget squeeze, vendors already are offering discounts and creative financing solutions that include balloon payments that can be slipped over into the next quarter or the next budget year.

Nothing is cast in stone these days, not even a company's installed base. It seems that more and more companies are reevaluating their packages, replacing or removing those that are seldom used. "We are evaluating all our packages, maybe replacing some," revealed Dave Fisher, manager, collection and credit for Dow Jones & Co. On a more upbeat note, Fisher did say he is willing to take risks and buy from smaller companies—those without a long list of satisfied customers and large staffs—as long as the product meets his needs and has a good payback schedule, and he is comfortable with the expertise of the people within the company.

The way users prescribe their annual budgets also appears to be in a state of change. There won't be lump sum budgets anymore, predicts Pansophic's Eskra. "Everything will have to be justified and predetermined." Each dollar may not be nailed down to a precise product name, but general categories will be decided on at the beginning of the year based on user needs and priorities. This approach could open up a whole new bag of worms from the vendor's

perspective. Suddenly, finding a corporate sponsor, a champion to lobby for a general slot on the budget, a slot into which company X's product could fit, becomes key to any future sales into that company. The rules of the game have changed, and developing savvy marketing tactics takes on new meaning.

Competition is another bellwether of maturity. While the low cost of entry and the lure of huge profits still draw entrepreneurs like singing sirens draw sailors, there's yet a more formidable class of com-

"Buyers are doing more preparation up front before starting to look for a package."

petitor coming on in growing numbers. The industry has reached that age when offshoots from its own branches are popping up regularly, entrepreneurs with a better idea are breaking away from the bigger boys and doing their own thing. Hardly greenhorns, these folks come to the venture capital party with years of experience and, quite often, sound ideas about how to avoid the pitfalls that tripped up their previous employer. SPSS' Rabjohn expects to see seed money for startups "to be used much more selectively over the next few years because there are better choices out there

and more knowledge."

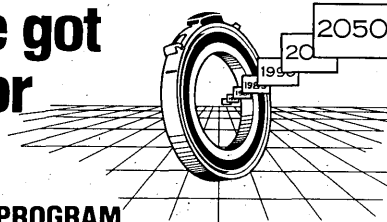
Startups are not the only group that will find it harder to get and keep a foothold. Bigger software companies are also finding the marketplace more competitive, observes the University of Chicago's Blattberg. "Their growth rates have flattened or are starting to decline; others get nervous as they watch a key competitor imitate their product and take an aggressive marketing stance." He has noticed that within the past several years computer software companies seem to be showing more interest in marketing strategies and tactics.

And well they should, encourages Sy Kaufman, a general partner with the California-based firm of Hambrecht & Quist. He describes the software industry as "one of the most poorly managed technically driven industries." He attributes part of that to the fact there are "no barriers to entry" in the software business. Others in the industry agree, noting that the combination of more savvy users and a recessionary economy are serving to separate the steady growth companies from those that waver under pressure, the marketeers from the product pushers.

"Too many people get overwhelmed with the technology when what really matters is marketing" was Kaufman's succinct analysis.

—Jan Johnson

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FINDING THE BUGS

A newly formed quality assurance department is helping one software company catch the mistakes before they leave the door.

With a degree in law and criminology from Oxford University, Liz Hall never expected to be working for a New Jersey company selling computer software to corporate personnel departments. Even less likely was the prospect of being responsible for quality control of the 180 or so reels of tape the company ships each month. But that's exactly what the British-born Hall does, with enthusiasm, for Information Science Inc. in Montvale, N.J.

In May, Hall was put in charge of a newly formed quality assurance program at the vendor of personnel software systems. Five other workers are involved, making sure that customers get just what they've asked for: a copy of the specific InSci package required, tailored to their unique computer configuration.

"We found that a couple of our programs going out had particular problems," says Hall. "For instance, the systems aimed at DOS/VSE were found to be not fully compatible with those for OS. Plus, DOS shops tend to be less experienced, so that whatever problems did show up were compounded."

InSci thinks it is leading the software industry in its quality assurance program. The company says that even in the brief time the program has been under way a significant amount of progress has been made in catching errors on software tapes before they are shipped to customers.

"We've been tracking the tapes lately and have found that about 10 problems arose every month," Hall notes. "We're catching those now. It's better for us to spend money and have satisfied clients who otherwise would have bumbled around."

InSci tailors its shipment tapes on its own mainframe using software it writes in-house. That software configures the basic InSci package for use under different operating systems, with batch or on-line access, and for use with previously installed InSci packages already running on the customer's machine. Each package shipment includes three to five reels of tape, according to Hall.

The quality assurance team at the company is trying to keep track of statistics it collects on the installations it makes. Hall says those statistics, along with data collected from customers through surveys, will help pinpoint trouble spots and elimi-

nate future problems. In addition, her team is attempting to develop better documentation for the products in order to provide its marketing team with better tools and to provide customers with up-to-date information.

"Documentation used to be done the night the program went out the door," she states. "Now we're doing it on a word processor linked to a mainframe so that we can keep track of it and keep updating it as we go along."

Perhaps most helpful to the overall quality assurance effort at InSci is Hall's involvement with product designers right from the beginning of the design process. In that way, quality problems can be removed early on and the QA team Hall runs will be more familiar with the products under development, she says.

The company recently found through its client surveys that customers were not installing the upgrades to their InSci software as quickly as the company was shipping them. "We may cut back on the upgrades," says Hall. "It seems personnel is not always a priority item at user sites."

InSci has some 800 customers, about 200 employees, and annual revenues in the \$18 million range, Hall notes, pointing out that the privately held company does not release specific financial figures. The firm competes with half a dozen or so other software companies selling personnel software to IBM 370, 303X, 4300, and 308X users. The company recently signed a deal to offer a color graphics system made by Boston-based Computer Pictures Corp.

—John W. Verity

LANGUAGE PARALYSIS

Dp departments are pleading for a single, easy-to-use command language to integrate modeling, graphics, database, and statistics.

Information centers, by now old hat to many data processing managers, have helped to solve a whole pack of problems related to the explosive rise in on-line users that otherwise threatened to bring the dp department to its knees. Today, outfitted with a management strategy and armed with an array of end-user tools—database systems, graphics, statistical modeling, data analysis, report writers—dp shops are just beginning to experience a second wave of problems.

"There are too many languages," begins Mark Yash, supervisor of the time-sharing support/information center for

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NEWS IN PERSPECTIVE

American Can in Greenwich, Conn. Among the resources available through American Can's center are Information Builders' Focus, Execucom Systems' IFPS (Interactive File Planning System), ISSCO's Tell-a-Graf, and a complement of languages including FORTRAN, COBOL, and BASIC.

"It takes a unique kind of [technical] person to work in this environment," continued Yash, who looks for someone who can catch on "very quickly," react quickly, and shift gears quickly from COBOL to Focus to FORTRAN. The effect of

this "multilingual" environment on the nontechnical end user is summed up in a word—paralysis. Most dp managers report that their end users tend to learn just one package and one command language. Few users take the time to sit through one training program, let alone several. Then, if that newly acquired knowledge is not regularly used, it gets rusty or disappears. "What is clearly needed is an integrated product—one that integrates modeling, graphics, database, and statistics under a single easy-to-use command language," said the MIS department head of a large West Coast bank.

Many mixed vendor dp departments that offer end-user tools from various vendors have tried providing their own integration. Recalls Gary Gilster, manager of business data services for Hughes Aircraft's communications and data processing division: "We pulled a bit out of one package, a bit out of another, and put it all together under yet another package." Gilster admits that the command language is not always the easiest thing to learn. "The higher up [the corporate ladder] the user is, the more that becomes a problem," he said.

The dp manager with the West Coast bank mentioned that his shop also tried its skills at integration: "We built bridges among several products, but the resultant product was very cumbersome to use. Besides, any time one of the vendors changed its package we had to go back and make modifications."

Sensitive to this growing problem, many vendors offer linking utilities. Often requiring two to three steps, these subroutines accept data from a print file, manipulate it, then load it inside the main program. The problem with this approach is that the user has to deal with "static" data, canned

Many mixed vendor dp departments that offer end-user tools from various vendors have tried providing their own integration.

reports that may or may not contain exactly what the user is looking for.

Execucom's Dataspan is one such product. Wayne Jobe, vp of marketing for the Austin-based company, refers to Dataspan as a "crude, first attempt" at allowing users to interface with the print files of other systems. Jobe said the company is developing more sophisticated interfaces that will permit more direct, easier to execute links into other systems, such as database or accounting systems.

ISSCO Graphics, the San Diego maker of the popular Tell-a-Graf graphics package, recently released its linking product called Data Connection. In addition to accepting data from a print file, Data Connection will read information stored in conventional file formats. It will also link Tele-a-Graf directly to user application programs, but not without some effort and more patience than the average department-level end user might have.

Another solution to the integration problem is the approach taken by Information Builders Inc., New York. That company rounded out its product, Focus, by offering a little bit of database, a little bit of graphics, and a little bit of statistical modeling—all under the same umbrella. "If I had to buy one product that would serve as my information center, Focus would probably be it," said Larry Harris, president of Arti-

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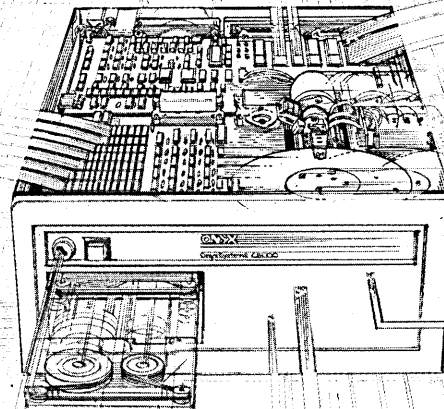
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Winchester disk drives that utilize slow-moving stepper motor head positioning devices won't do.

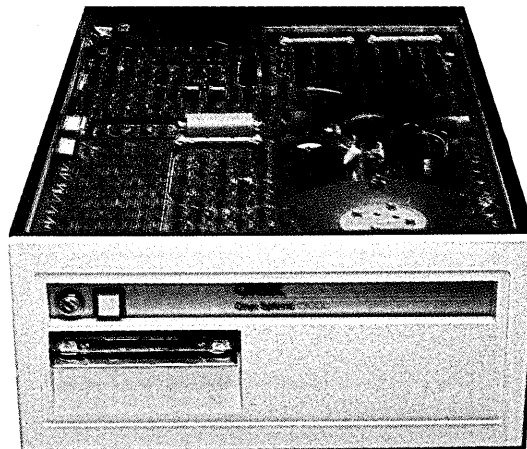


ONYX's IMI Winchester disk storage system, with its servo-driven voice coil head positioning, is more than twice as fast!

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And, as developed, the ONYX C8002 features expandable memory up to 1 Mbyte, and disk storage up to 160 Mbytes on-line. Its cartridge tape backup offers cyclical redundancy checking on every backup. Both the Winchester disk storage system and the cartridge tape backup are *internal*.

In the UNIX operating system environment, the disk becomes an extension of main memory. "Swapping" programs between the disk and main memory



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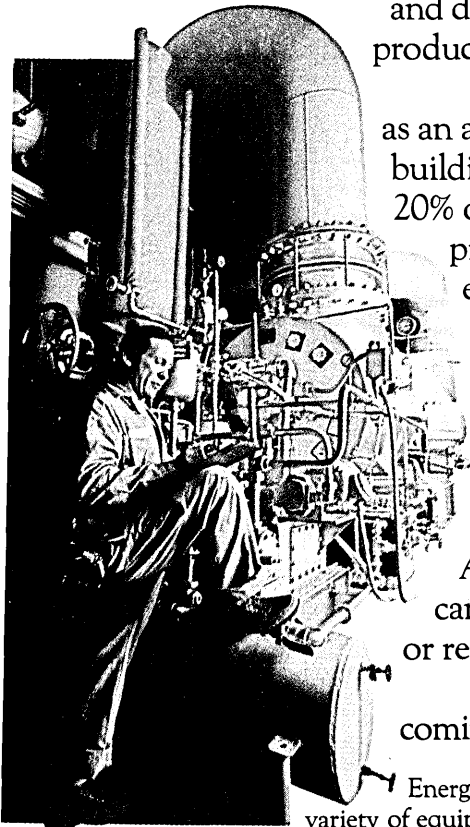
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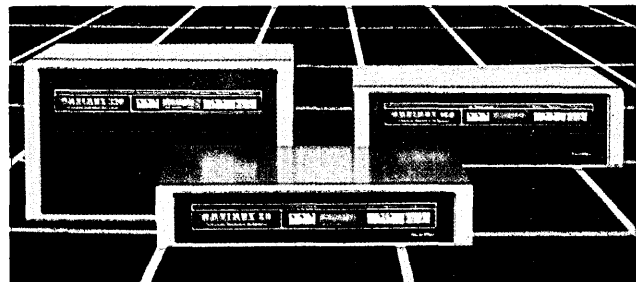
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NEWS IN PERSPECTIVE

ficial Intelligence, Waltham, Mass. Harris's company, which created and markets Intellect, the first and only commercially available English query language, has looked at the products of almost all of the major vendors of information center tools. "But if I wanted to go the route of having the best database, the best graphics, the best decision support system, I would end up buying different packages from different vendors."

"Even within Focus," he added, "the user has to learn how to ask the question to get the graphics done. But at least it more or less does everything else." For instance, getting an answer to the question "What is the percentage of total sales in each state?" requires several formal steps in Focus, said Harris. A first pass over the data pulls out the totals and stores them in a hold file. Then the hold file has to be reopened and run back through, dividing by the grand total to compute the percentages, before the data can be sent to the graphics program.

Harris has a cure (albeit somewhat self-serving) for the paralysis that sets in when users are exposed to too many formal commands. Install Intellect on top of all the information center tools. Then, a user simply asks a question in his or her own words: "Can I get a pie chart showing the percentages of total sales in each state?" As Harris explains it, his system "decides what data to get from the database system, getting only what is needed to answer the question and using all the special idiosyncrasies of the system to get that data quickly and cheaply. It automatically invokes whatever summaries are necessary, calculates the totals, and the percent of totals, and dynam-

Artificial Intelligence wants users to install its Intellect on top of all the information center tools.

cally passes that data off to the graphics system."

At present, Artificial Intelligence supports "dynamic" interfaces to four of the major database systems and recently announced an interface to IBM's PGF (Presentation Graphic Facility). The company plans to announce additional interfaces to SAS, a file management program from SAS Institute Inc., Cary, N.C., and ISSCO's Tell-a-Graf.

Getting into the graphics programs is "no big deal," says Harris, since most of the systems were originally designed to be called as subroutines; "The really nice thing about graphics programs, the really elegant aspect of them, is that they separate out the data from the graphics formats, things like the size of the pie, color, type of label, lettering, and the 100 to 200 other elements you could specify. What we do in our lexicon, then, is define a format so that

when the graphics program is called, it also includes the format. This way we get by without having to ask the user to define the 200 or so things."

In most other systems that offer a predefined graphics format, the user loses the ability to go inside the graphics program and take advantage of all of its power. Not so with Intellect, said Harris. "We allow the nontechnical person to get a nice-looking chart without having to know anything. But by hitting a button on the keyboard, the user can enter into the graphics subsystem and, if he is willing to learn the language, play to his heart's content."

Down the road, Harris plans to extend Intellect's reach into modeling and statistical packages. That feat is easier said than done, he noted. It has to do with the way those types of packages were designed—as standalones, not as callable subroutines. For that reason, they are harder to get into, said Harris.

"For instance, to get into Express [a financial information/graphics display system from Management Decisions Systems Inc., Waltham, Mass.], you have to run as a subtask a routine that is called by Express. That means I have to first get into Express." What Artificial Intelligence has to do, said Harris, is go around and "coerce" these vendors into supporting a callable interface. He lays claim to some successes

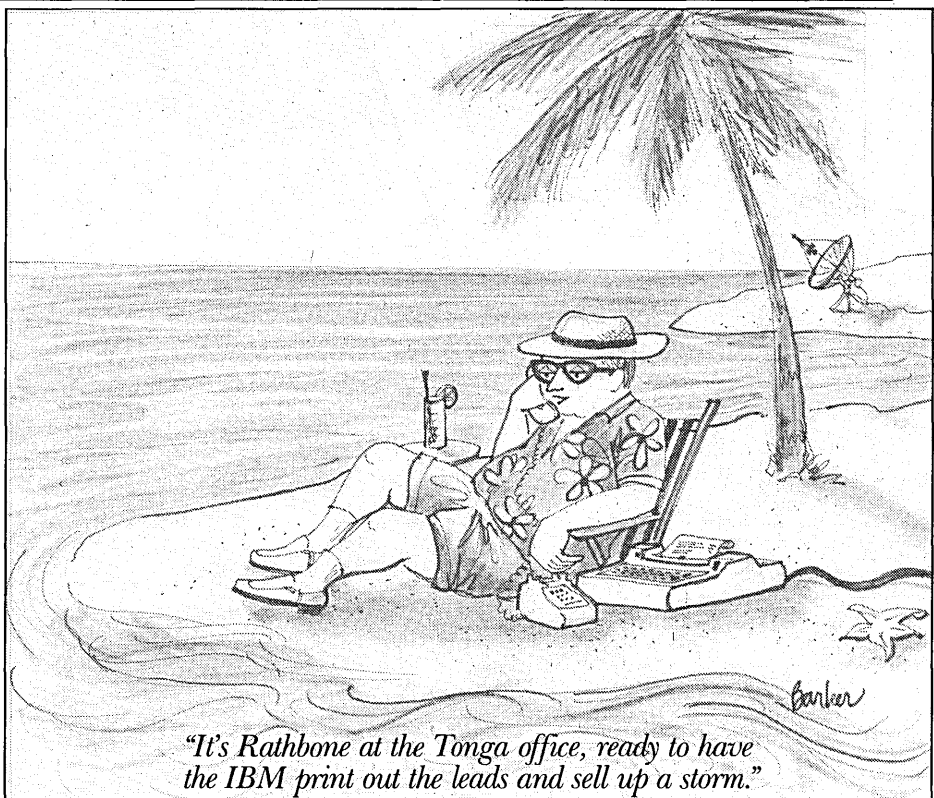
already. The makers of SAS have agreed to reconfigure their system specifically for Intellect. They have built a callable entry point and will add that to a subsequent release.

Intellect, however, has its share of drawbacks that make potential users shy away. Says Execucom's Jobe, "One of the problems with Intellect is that it's a resource hog. It takes a big system to tie all this stuff together and justify the resources."

In most systems that offer a predefined graphics format, the user loses the ability to go inside the graphics program and take advantage of all its power.

While agreeing that Intellect was easy to learn to use, our anonymous dp manager of the also anonymous West Coast bank felt that Intellect was "rather inefficient. We look on it as a quick query tool for very small applications, not against large data files."

Jerald Cohen, president of Information Builders, had this to say about Harris's handiwork: "Intellect solves one small class of problems—query requests. By and large, queries are only 10% of the applications."



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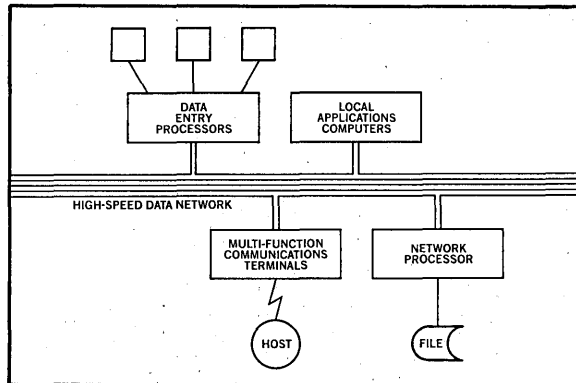
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How you get the data in, how you prepare a report, and what the report has to look like are more common applications that Intellect is not well suited for, he added. "Intellect just becomes another tool."

At Fleet National Bank, Providence, R.I., where Intellect resides as a tool within the bank's information center, information center analysts steer users away from Intellect and toward Focus if users want to use the language against a personal database. Fleet National does not have a database manager, so Intellect has to work off the existing file structure, which means it is a long and involved process to add new data to an Intellect database.

"It's because we don't do file definition or automatic lexicon construction," said Harris. A source at the bank confirmed Harris's statement. The message was clear, said Harris. "If we are going to get into the personal computing environment, whether it's on a mainframe or in a PC, we would have to provide file definition and automatic lexicon construction." Harris indicated he is already thinking about how to add those capabilities to Intellect at some future date.

From an end-user point of view, the lexicon is designed essentially as a read-only data structure. It is not flexible enough to support adding definitions dynamically. Which means it takes a dp professional to build and maintain Intellect's lexicon.

In release 200, due out during the first of the year, the lexicon has been "re-configured," said Harris, so that it can ac-

Intellect could be put on a micro with a hard disk and about a meg of core. There may be programming difficulties, but not a conceptual problem.

commodate the automatic lexicon feature. In addition the loading facility that loads data from a sequential file to an index form that can be quickly accessed has been changed so that it operates "much faster."

What about putting Intellect on micros? Harris says it can be done, "but only on a micro with a hard disk and about a meg of core, roughly speaking." Since all the programs that make up Intellect run separately, said Harris, they can be overlaid. The English analysis portion of the package breaks into three or four pieces that can be run one after the other. The multifile navigation portion, which is another big chunk of code, runs independently. "It's not as if these things have to be running at the same time; if that were true, then we would have trouble fitting Intellect onto a micro. Size is not a problem. I'm not saying that we won't run into programming difficulties, but we don't face a conceptual problem with micros."

—Jan Johnson

LEGISLATION

SOFTWARE TAX BREAK

California exempts custom software from sales taxes. Many anticipate a ripple effect in other states.

After 10 long years, the state of California has exempted custom software from state sales taxes. While becoming the 26th state to exempt such software, California continues to levy sales taxes on prewritten or "canned" programs that are sold without modification.

Watchers of the sales-tax-on-software issue nationwide are anticipating a ripple effect since many states have based their regulations on a California rule, specifically State Board of Equalization Rule 1502. That rule, covering "Automatic Data Processing Services and Equipment," has been in effect since 1972 and, despite considerable judicial, legislative, and just plain finger-pointing fights, has stood for years without successful challenge. Until now.

The new California legislation, Assembly Bill 11 2932, authored by San Jose Assemblyman John Vasconcellos, doesn't rescind Rule 1502 but it provides the first binding interpretation of it in its exemption of custom software. Interpretation of the rule has been what industry groups have been fighting for since 1978 when, many contend, the state's Board of Equalization began reinterpreting some sections of the Rule in a tax-hungry mode to come up with justifications for retroactive assessments.

California was a precedent-setting state back in 1972 when it began to impose sales and use taxes on software and some services. Many states attempted to follow its example with varying degrees of success. What's more, California's interpretation of its own law was not always consistent, that is, until the late '70s when the reinterpretations became widespread and retroactive assessments became the norm rather than the exception (March 1977, p. 155).

Now the new legislation, signed into law by Governor Edmund G. Brown Jr. on Sept. 22, could provide ammunition for industry groups seeking exemptions in 20 states that do levy sales taxes on custom software.

The states whose ranks California has joined in exempting custom software include Alabama, Arizona, Colorado, the District of Columbia (an entity, if not a state), Florida, Illinois, Indiana, Louisiana,

Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Texas, Utah, Vermont, and Washington.

North Dakota, which exempts all software from sales tax, does tax the media on which programs are delivered. It requires software companies to bill customers separately for the media.

Connecticut and South Dakota take the sales tax on software as far as they can. They not only tax both custom and prewritten software but add software that is delivered in human-readable form, which is exempt in all other states. Five states have no software tax laws.

But as the face of the whole data processing industry has changed, so has the face of the software tax fighters. The Association of Data Processing Services Organizations (ADAPSO), which has long had one of the strongest voices opposing taxation of any kind of software, may change its stance at a management meeting this month in San Diego.

Ronald J. Ralenski, ADAPSO's assistant general counsel, has indicated the organization might decide not to oppose state sales taxes on prewritten software, particularly off-the-shelf software for microcomputers. He said ADAPSO might concentrate its antitax efforts on custom software and prewritten software that is modified.

ADAPSO took a stand back in 1978 that software was intangible and therefore untaxable. "At that time," said Palenski, "personal computers were still on the drawing boards."

Now, Illinois, Indiana, and North Dakota, which exempt both prewritten and custom software from sales taxes, nevertheless do tax computer game cartridges and similar off-the-shelf programs.

North Dakota, New York, and New Jersey, which generally don't tax software,

ADAPSO might change its stance against taxation of any kind of software.

do require there be some vendor analysis of user requirements for the software and that the software be modified in some way to fit a particular hardware and software configuration to be eligible for an exemption.

Don Mulvey of Computer Services Associates, Oakland, Calif., believes the new California law will be "subject to a wide range of interpretations," as has been the case with Rule 1502. Mulvey's firm has been involved in lengthy litigation contesting retroactive assessments for custom software sales taxes. He noted that a payroll package contains many imbedded routines, such as those applying to differing union dues. "If they're changed, does it make the package a custom package or is it still a canned package?"

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CIRCLE 80 ON READER CARD

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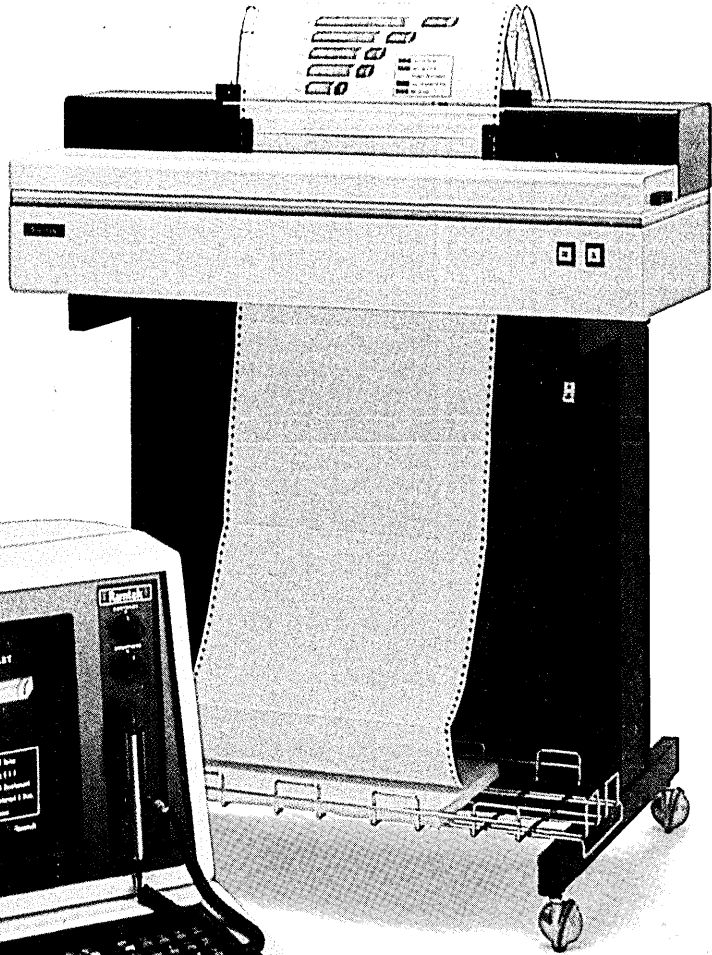
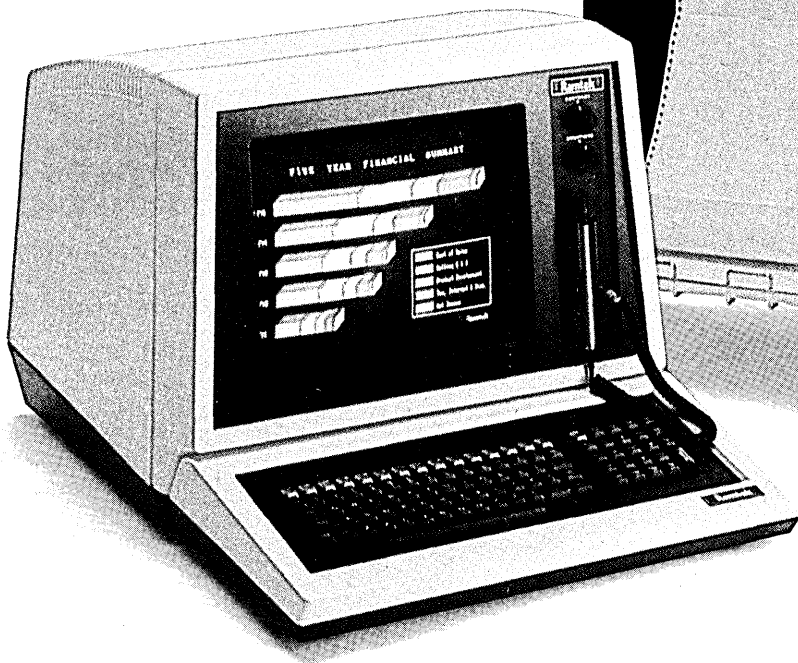
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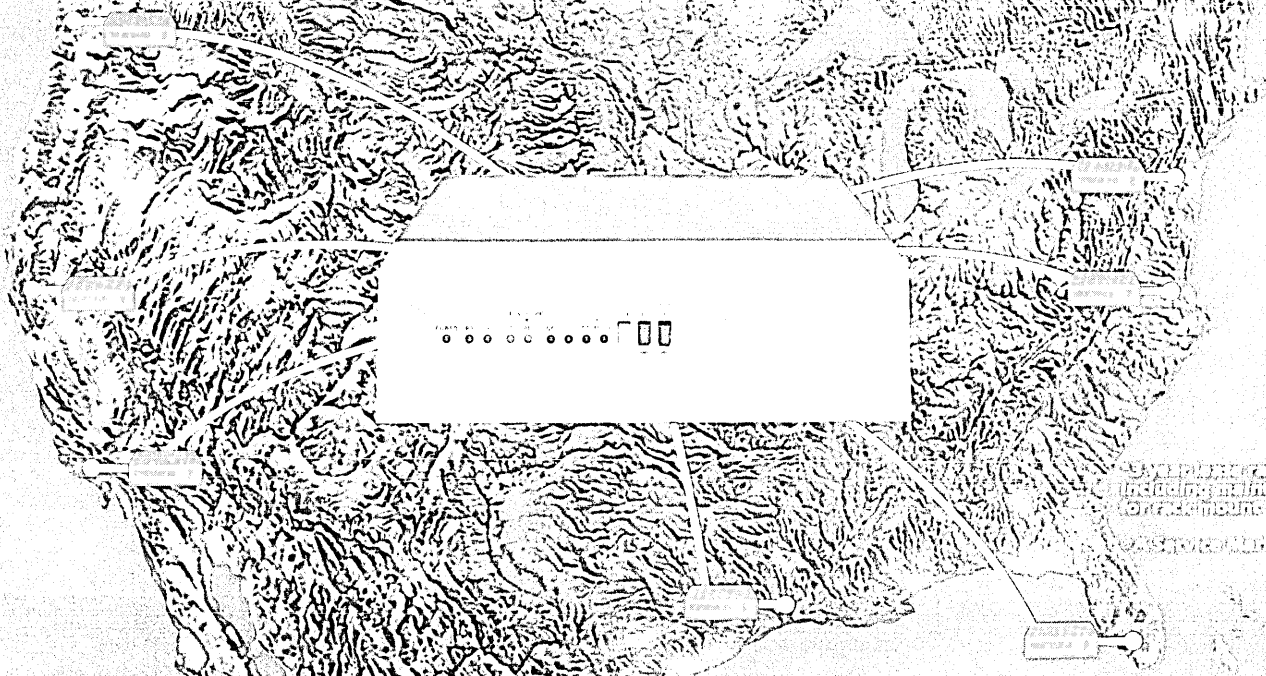
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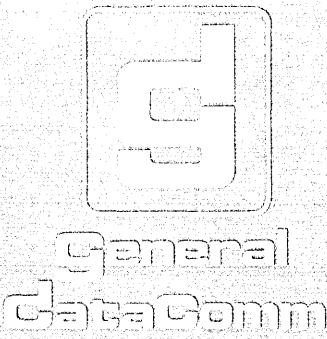
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CIRCLE 17 ON READER CARD

NEWS IN PERSPECTIVE

In Michigan, the state's Department of the Treasury is fighting exactly that point. It is appealing a case it lost to Macca-bees Mutual Life Insurance Co., which had argued successfully that prewritten but modified application programs it was using could qualify for tax exempt status because they were modified to be uniquely suited to the company's data processing needs.

California's new law likens custom software to legal or architectural work—a service. There is difference of opinion on what the new law will cost the state. The Board of Equalization contends it will grant huge computer firms a tax break to the tune of a state tax loss of some \$100 million.

G. Ann Strangman, president of Software Services Assn., a group of small software programming firms that has been supporting the bill, believes it will be more like \$1 million per year. Strangman believes most big software firms and computer manufacturers aren't interested in the specialized business of custom programming.

Board of Equalization member William M. Bennett disagrees. He claims the big beneficiaries of the new bill will be industry giants like IBM, Xerox, International Telephone and Telegraph, and Sperry Univac. He has called the bill "a public outrage."

Outrage or justice, even those tax issue watchers who have been contending for 10 years that "it all started in California" can't say it has ended there. Interpretation is still the biggest part of the issue.

—Edith Myers

TERMINALS

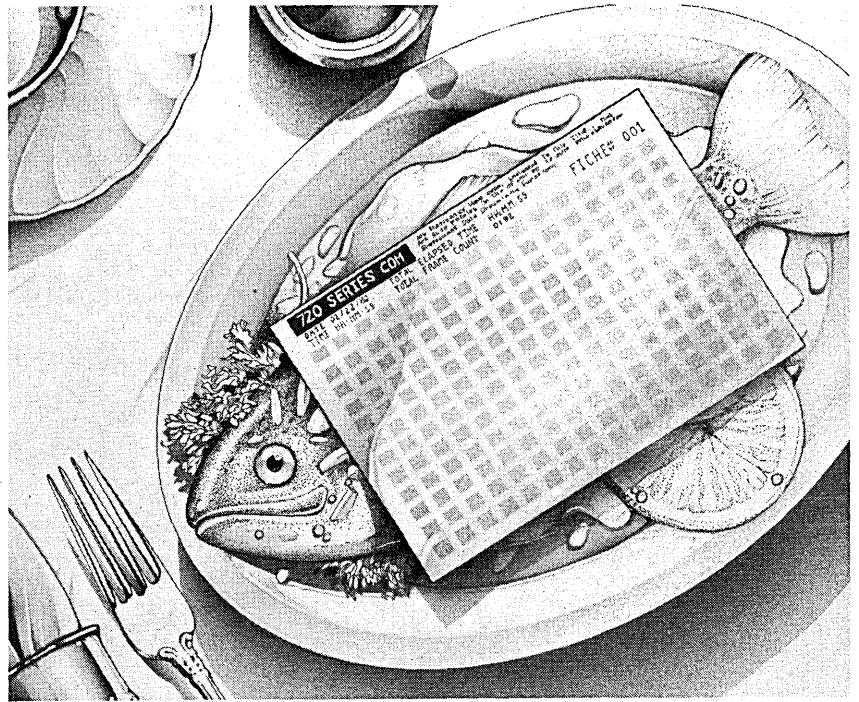
RUNNING START

Epic Computer Products had a leg-up on most startups.

Not many companies can lay claim to the whirlwind start of Epic Computer Products Inc., San Diego, Calif. When the company first opened its doors last May, it did so with 60 retail dealers in place, 18 multiproduct service centers nationwide, and \$20 million in annual sales. But then, other doors had been opened prior to Epic's launch date.

The idea for the company actually began much earlier, when Bill Terry decided to leave his post as president of Lear Siegler's Data Products Division. Having spent a lot of years punching crt terminals, Terry decided to start his own terminal design firm, Crown Mfg. But he also decided something else: he wanted more than just a terminal design firm.

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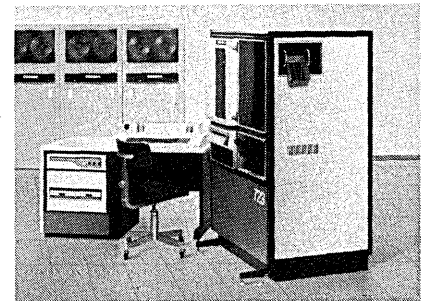
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CIRCLE 83 ON READER CARD

NEWS IN PERSPECTIVE

market niches, the business of selling a crt terminal alone will cease to exist in a few years," Terry asserts. "The profit margins simply aren't there, even for offshore manufacturers."

So he set out in search of a little help from his friends. He approached Roy Hollister, who was heading up MQI, a Lear Siegler distributor, about the idea of combining forces. Hollister liked the idea, as did David Crellen, president of Epic Computer Corp., a two-year-old San Diego firm with a microcomputer system and some software.

The next need was for money, and for that Terry sought out A. T. Zirkle, president of Key Tronic, the Spokane, Wash., data entry company. Zirkle liked Terry's ideas to the tune of providing 51% of the initial \$3 million capitalization for the new combined organization, to be called Epic Computer Products Inc.

"We had a running start," declares Terry.

What the founders like to think they have created is a U.S. mini-version of the large Japanese trading companies such as C. Itoh Electronics and Sumitomo. They want to move products all over the world in all directions.

Although some manufacturing is housed in the original Epic plant in San Diego, most is done offshore in Hong Kong. "Low overhead is the key," said Terry. In keeping with that thought, Epic designers use CAD/CAM equipment belonging to Key Tronic.

"Because we can offer small computer system products of all types made by both ourselves and by others, we provide buyers with flexibility not found in most small systems companies," said Terry. "We'll avoid the 50¢ war. If a customer wants a Lear Siegler terminal instead of ours, that's what he'll get."

And it isn't all terminals and systems. MQI is the exclusive U.S. agent, distributor, and manufacturer for Duro and Datentechnik GmbH (BDT), a German company that manufactures automatic sheet feeders for word processing systems.

First Epic-designed product offered by the new company is an 8-bit microprocessor-based small computer system that runs CP/M. Called Episode, the Z-80-based unit offers dual minifloppy disk storage capabilities to 1.6MB or a combination minifloppy, mini-Winchester system offering up to 10MB of hard disk storage. With it is the Supervyz applications software package designed by Epic Computer Corp.

Second product, introduced at the National Computer Conference, was the Epic 14-E, a microprocessor-controlled crt video display. Next to come, at Comdex late this month, will be a beefed-up version of Episode, complete with new software.

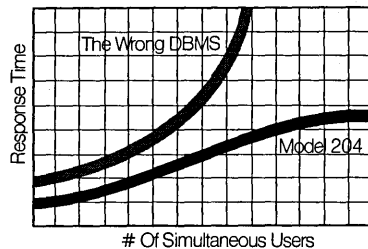
Terry is no stranger to combining different operations. In 1971, he was trans-

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ferred to California when GTE Information Systems acquired Ultronic, a New Jersey terminal firm for which he was working. "They wanted to combine it with two California firms they had acquired, Tempo Computers and Novar Systems, in what they thought was a synergistic coup," he recalls. "It was a hodgepodge," says Terry, who got out and joined Lear Siegler as quickly as he could.

He doesn't feel that way about Epic. "In the future, crt terminals will be manufactured and sold as adjuncts to small systems. If crt terminal manufacturers don't realize this, they could easily go the way of the dinosaur."

—Edith Myers

ANTITRUST

ANTITRUST PENDULUM SWINGS

The Justice Department is getting out of the antitrust business—for now.

There is a new patient in the Justice Dept.'s intensive care unit. Name: Sherman Antitrust Act. Age: 92. Health: failing. Cause of Illness: neglect and abandonment. Prognosis: poor short-term, questionable long-term. Cure: unknown.

Medical history indicates the patient has enjoyed better days. As a baby he was active, vigorous, and energetic, and much beloved by the juris-doctors, who spent much of their time and others' money ensuring his continued good health. With the exception of a few temporary illnesses, he remained in excellent condition.

Halfway into his 92nd year, however, he suffered a severe setback. After 13 years of tedious, thankless effort on his country's behalf, he was summarily dismissed by the standard-bearer of Justice, heretofore his staunchest protector. Friends and supporters who have paid him tribute over the years are gravely concerned this devastating blow will prove fatal.

His spirit remains as strong as it was on July 2, 1890, when Sen. John Sherman of Ohio created him. The Sherman birth is still recorded in the United States Code for all to see. The first part—"Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal"—isn't bad, but he always liked the second section best. From that he drew his strength. "Every person who shall monopolize, or attempt to monopolize, or combine

or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a misdemeanor." Sherman could punish people by fining them as much as \$50,000 or sending them to jail for a year. But no one pays much attention to him anymore. And the inactivity is killing him.

"Nobody looking at the government's antitrust activity could assume it is doing anything of importance," contends Ray Carlson, a Washington attorney who was chief government prosecutor on the IBM case from 1972 to 1977. Carlson has also been active in the recent attempts to reopen the case.

"Section 2 of the Sherman Act is absolutely dead," Carlson declares. "There are no investigations or prosecutions going on and nothing has happened in the last year and a half. Monopolization, if not okay, will certainly be winked at. Innovative prosecutions in acquisitions and mergers are not dead, but they're close. In essence, everything is pretty much okay unless it's a very high-level horizontal merger [one between concerns that are competitors]. And if that is politically important enough, [assistant attorney general for antitrust William] Baxter will probably let it go."

"It's pretty damn difficult to get around Baxter's philosophy these days," sighs an attorney whose client won a major antitrust victory over Bell. "Section 2 has suffered a serious impairment. It's not in good health.

"I doubt seriously that Baxter would have filed the AT&T case. Unless someone gets another piece of paper on him [similar to those that caused Philip Stern to petition U.S. District Judge David Edelman to reopen the IBM case] there won't be much coming from Justice."

Concern for Sherman's well-being is very evident on Capitol Hill. The Republican-controlled Senate last year passed a resolution questioning Justice's sincerity in enforcing the antitrust laws. Rep. Peter Rodino (D.-N.J.), chair of the House Judiciary Committee, has introduced a bill (H.R. 6361) to strengthen the Tunney Act, which mandates a public comment period before courts can accept settlements in government antitrust suits. The Tunney Act was the subject of passionate disagreement in the AT&T case and the linchpin in the attempt to reopen the IBM case.

Maintains Rodino: "Revision of the Tunney Act is especially timely now when the Justice Dept. is conducting a massive review of the 1,380 current consent decrees with the intention of seeking to terminate or modify many of them." The bill, a similar version of which is being sponsored in the Senate by Arlen Specter (R.-Pa.), would unequivocally apply the Tunney Act to all government attempts to settle or dismiss an-

titrust cases. Justice contended the Tunney Act applied neither to IBM (a dismissal) nor AT&T (a modification of an existing consent decree).

So Baxter fiddles while potential plaintiffs burn. Meanwhile, it's a jungle out there. All's fair in the struggle for the almighty dollar. And what once was unfair may soon be de rigueur.

"The signal from the enforcement agencies and the courts is that aggressive, hard-nosed behavior is what antitrust is all about," says Phil Verveer, a leading Washington antitrust lawyer and former head of the government's AT&T trial team. "There's much less chance to get a hearing or sympathetic ear now at the enforcement agencies. If you're filing an antitrust suit these days, you've got to be less optimistic than before. Apart from price-fixing and cartel behavior, anything else is going to be viewed very skeptically by the antitrust authorities. You can go into battle, but there are many fewer rules of engagement."

Therefore, there is less protection for the little guy. Baxter's preaching that "bigness is not necessarily badness" somehow seems to be emerging as "bigness is goodness" in practice.

"What troubles me most about this administration is whether it thinks size creates special problems," says Robert Pitofsky, a Georgetown University law professor and former chairman of the Federal Trade Commission. "It's very close to saying there's no way in which a dominant company can abuse its position. It's not accepting the old notion that size creates abuse problems just because of size."

"There's much less chance to get a hearing or sympathetic ear now at the [federal] enforcement agencies."

The message is unmistakable: in the marketplace we trust. Laissez-faire, neo-classical economics is in; government assistance, meddling, and regulation are out.

Exhibit A: IBM. Most observers agree Big Blue was on the wrong side of Sherman in the 1970s. But under the efficiency-over-equity theory, a dip into predatory pricing can be forgiven as irrational behavior. On a cost-benefit analysis in a recession, equity loses every time. While competition from smaller firms is cited by Baxter as the reason why AT&T, with 80% of the market, will not be able to lower its long distance rates to subsidize other parts of its operation, IBM's market share—estimated by some to be as high as 70%—is deemed competitive. An added bonus for IBM is being free at last—free at last to aggressively hold on to what it has.

"Corporations can now do anything to eliminate competition," according to Jack Biddle, president of the Computer and Communications Industry Association



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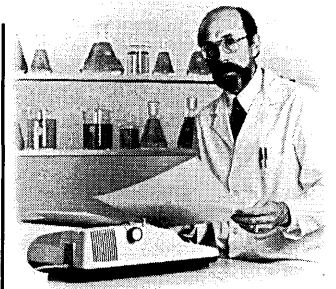
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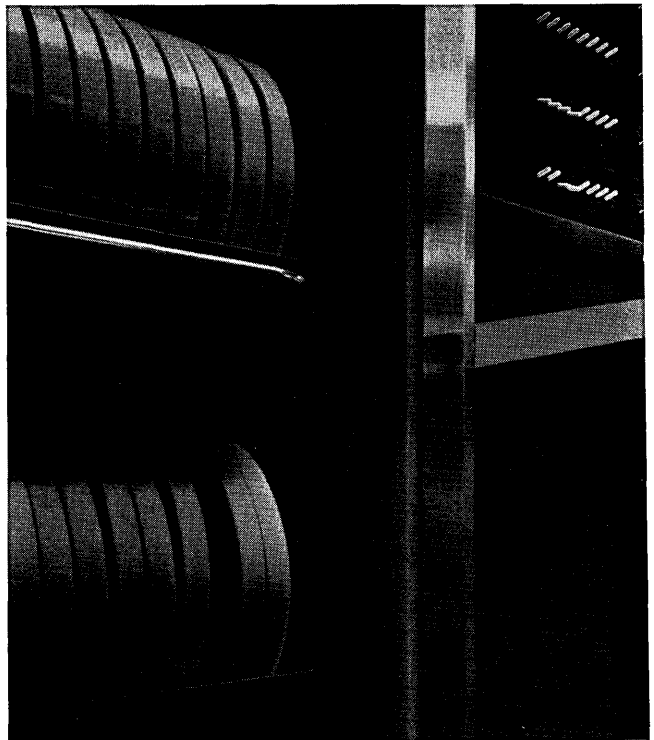
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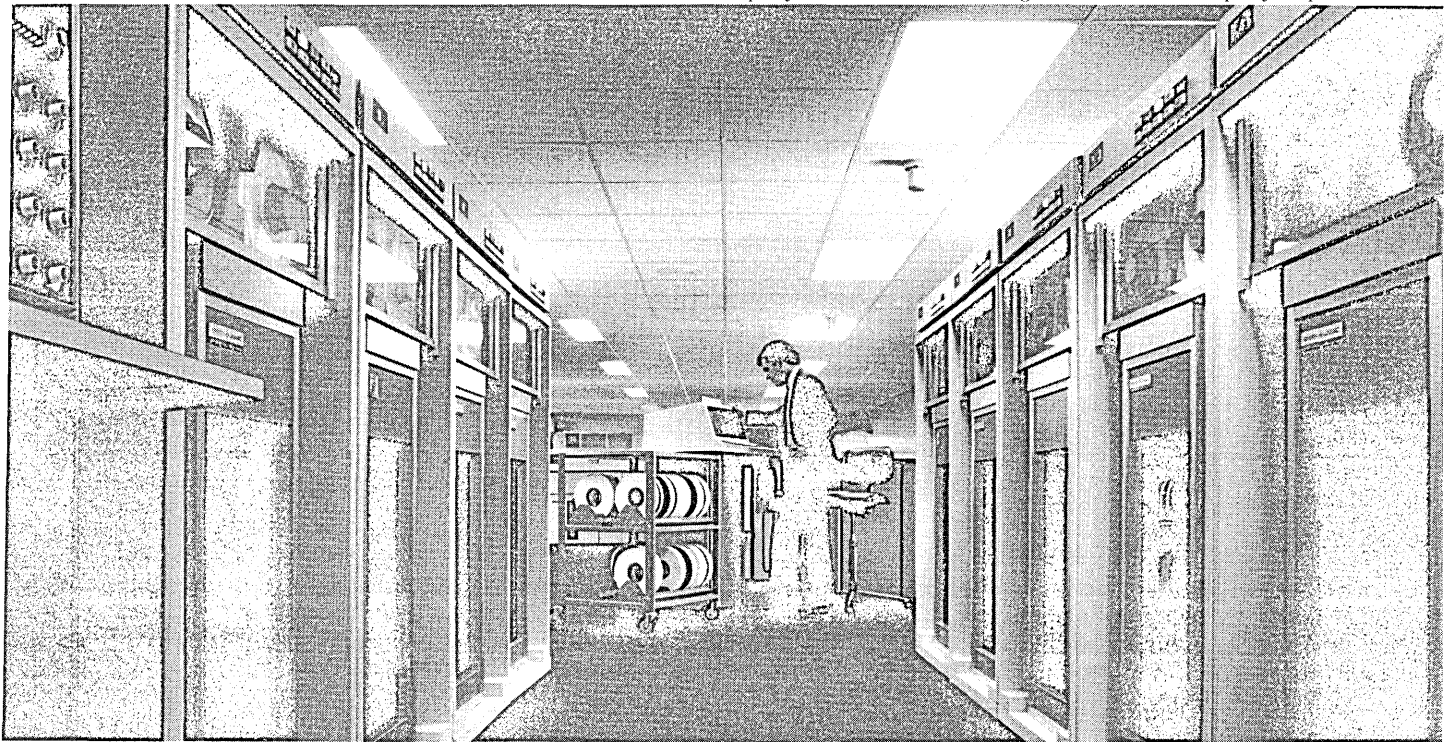
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NEWS IN PERSPECTIVE

(CCIA). The group is hardly one of IBM's disciples.

"Courts have shown themselves totally unable to deal with blatantly anticompetitive tactics hidden under the guise of technology," Biddle contends. "I don't mind a slugfest, but it has to be among equals. Current antitrust policy will clearly allow IBM to return to bundling, but it won't appear to be that. Someone coming into the computer business better not choose the niche that's dependent on IBM's benevolence or long-term compatibility with IBM products. This industry is heading toward a shakeout a la the auto industry. The five dwarfs (Honeywell, Sperry Univac, Burroughs, NCR, and DEC) are dwindling as they lose their customer base. They can't gain because of IBM's entrenchment."

So grab the micros and minis, and pass the chips. Life in the fast lane will be more frantic, and staying out of Big Blue's path more difficult in Baxter's fiefdom. The communications industry ought to be calmer, if only because AT&T will continue under U.S. District Judge Harold Greene's watchful eye for the time being. Federal and state supervision should keep the regulated monopoly and local loop portions relatively stable. The unregulated areas of communications equipment and services, however, will spark heavy fighting with the possibility of accompanying private suits under Sherman's aegis.

But is taking care of yourself all that horrible a fate? Ask AT&T's antagonists, some of whom have done right well with Sherman and without the help of the Feds. IBM's adversaries have not been so fortunate.

Throughout its history, antitrust has ebbed and flowed.

nate. Perhaps Justice's blindness toward Sherman is appropriate. Let the market decide. Call it the Baxterian theory of the fit-test.

"These things happen all the time," Verveer insists. "Throughout its history antitrust has ebbed and flowed. During the war in the '60s and for most of the '70s the courts were fairly determined not to let the big guys use their muscle. Right now it's not being used to adjust business relationships to what one might think is equitable. But in five or 10 years it could look very different. You might see some vibrant activity."

You can see it now, although not the type ordinarily expected from one in Baxter's position. Most of his predecessors have vigorously opposed vertical (customer-supplier) price-fixing cases. Such arrangements were declared illegal early in Sherman's life. The good assistant attorney general dissents from that philosophy. He considers such relationships competitive and beneficial. Thus not only is he discour-

aging such cases, he is actively joining the alleged price-fixers in attempting to reverse the law.

"I'm not sure Baxter is doing anything other than exercising the same discretion all prosecutors do," Verveer contends. "He certainly isn't doing anything illegal, improper, or illegitimate. He's simply saying 'I defy you to show me a vertical price-fixing case on which I'd sue.' The next antitrust head might do the same thing. But there's not much doubt Baxter does define the extreme."

Small comfort to the company that's just been undercut by IBM or AT&T. With minimal legal resources it is unlikely to challenge a questionable practice without assistance, even the moral kind, from Justice. But Baxter would like to get out of the support business and is expediting this exit. That may well diminish the volume of cases, 95% of which are filed by private parties.

But as the seven- and 13-year histories of AT&T and IBM respectively indicate, antitrust suits have a long life. Plaintiffs' allegations always cover a period of years, although complaints must be filed within four years of the alleged violation. Even if Justice fails to file a case during Baxter's tenure, that does not mean there won't be a plethora immediately following his departure.

"No assistant attorney general has been so vocally anti-antitrust," a leading Washington communications attorney says. "A little bit of Baxter might be a good thing. He's admittedly going overboard, but that doesn't stop private parties from suing. What Baxter does or doesn't do should be inconsequential to companies like Southern Pacific, Litton, and MCI." (SP is currently suing AT&T; Litton and MCI have won healthy judgments against Bell, which is appealing both.)

"There's no question this climate will give rise to more opportunities for bundling," warns one attorney whose client beat Bell. "You can make an all-or-nothing package with no trouble if you're careful. It's Baxter-chic to tie it all together and tell everybody else to go to hell."

"I see this great plastic egg around computer systems soon. Nobody will know anything that goes on in there. No other vendors will be allowed in. It's going to say 'trust in me.' And you won't have a choice."

"The whole thing is cyclical," says the communications lawyer. "What did you expect the Republicans to do? [Well, they did file the AT&T case.] Antitrust enforcement is always political. I think it's caught a slight cold which could lead to pneumonia unless treated in a few years. But it will be back."

Hear that, Shermie? You're going to be okay. It just may take a while.

—Willie Schatz

COMMUNICATIONS

DATA COM IN THE OFFICE

Internal politics may be the biggest influence in determining the winner of the corporate datacom sweepstakes.

It's an accepted industry cliché that computers and communications are merging. The tons of paper that have been produced on the subject by industry publications, consultants, and federal agencies such as the FCC have focused on the technology involved in combining these two disciplines. But an issue that may be even more crucial to the success or failure of this impending marriage has been almost totally overlooked—the issue of internal corporate politics.

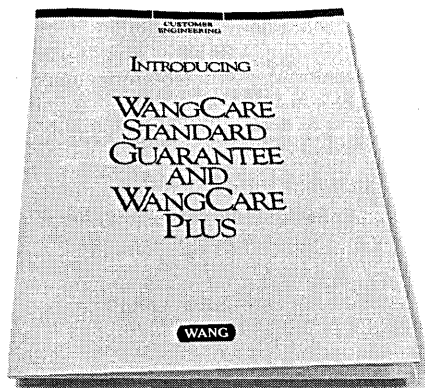
In every company, the integration of computers and communications has raised operational and organizational issues that strike at the heart of corporate information handling departments. Yet most organizations tend to concentrate on the technical impact, leaving the more people-related aspects to be sorted out through internal politics and seat-of-the-pants managerial decisions.

In most corporations the payoffs will be lucrative for those who win the information handling sweepstakes. Many organizations are evolving a management structure that will include segments of today's data processing, office automation, and telecommunications departments.

Many industry observers believe the dp/MIS staff has the best prospect of leading the march toward an emerging companywide information handling profit center. But others are not so sure, pointing out that telecommunications and office automation departments have unique capabilities that cannot be matched in the dp center.

While it may be difficult to predict what will happen in specific companies, certain trends are evident. To appreciate today's relationships between internal dp and communications groups, it is useful to step back and examine their past interaction.

Early corporate communications networks were an enhancement to computer operations. These data communications facilities were developed as a subset of the data processing operation to provide access to dp center resources. IBM coined the phrase "teleprocessing," which indicated that such specialized communications staffs were service organizations chartered to ex-



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pand computing out to remote locations.

Although teleprocessing did not become a widely accepted phrase, those responsible for data communications functions generally reported to dp management. At the same time, most companies had a telecommunications department that concerned itself primarily with voice telephone installations and an occasional Teletype.

As computer-related communications grew in complexity, it became evident that interaction with telecommunications staffs was a necessity. Data communications lines were using dial-up facilities through the company PBX, the phone company was beginning to supply data lines, and an increasing level of phone traffic was being used for data transmission.

Thus the telecommunications and dp staffs entered an era of closer cooperation: the communications team handled phone company-related problems while the dp people worried about front ends and specialized software to interface the network to dp systems. Despite the increased level of cooperation, top management did not view this as an alliance of equals.

Data processing had enjoyed high corporate visibility from its earliest days. Computer resources were regarded by the executive suite as the leverage that could optimize profit levels if used effectively. At the same time, telecommunications was equated with the monthly telephone bill, a burdensome overhead item with few options. This image held by top management derived from the fact that the computer industry was highly competitive, presenting the user with a wide range of options, while the telecommunications industry was regulated and offered few alternatives.

Although the communications industry became more and more competitive during the 1970s, management's basic perception of the industry remained the same. At the same time, product and service options began to proliferate for the telecommunications manager, and he began to plan communications networks in the same manner as a dp manager would plan a computer center. It was also during this period that corporate telecommunications managers first began to deal with data issues, which led to their more recent consideration of the integration of voice, data, and other communications-related disciplines.

Today there is a new awareness among top management that communications is a corporate resource to be exploited for the corporate good in much the same way as data processing. The barrage of articles that appears almost daily in the business press—tantalizing features about a deregulated Bell System, the AT&T/Justice Department antitrust Consent Decree, pending congressional legislation on data-com issues, a host of new satellite and value-added services—has focused executive attention on corporate communications.

From a dp/MIS standpoint, this may present some new opportunities. Howard Frank, a founder of Network Analysis Corp., now part of Contel Information Systems, speaks frequently on these management issues. He views the increased importance of corporate communications as a steppingstone for dpers. "There are spectacular opportunities in datacom for dp-trained people. In fact, those opportunities are greater than the dp end of the business. Telecommunications is growing faster and is closer to the pioneering spirit than dp is."

Frank believes there are two pieces to the telecommunications management puzzle—dp and telephony. "While the academic world doesn't handle telephony well, those [telecommunications] skills are learnable in short courses and seminars. Frankly, telecom skills aren't that hard to master. Management is management—it has nothing to do with telecom," he says.

While Frank is bullish on the ability of management to oversee the communications function, he readily admits that the

"The activity level of the corporate network is really a mirror image of the activity level within the corporation."

two operations must work together to achieve an efficient network product. "It could be warfare between the two functions or it could be cooperation. If it's warfare, both could end up losing because running the network is not a transferable skill. You don't easily become a professional operator of the network—not even in a year."

As might be expected, a somewhat different perspective is expressed by telecommunications managers themselves. One of the more innovative is Robert Bennis, manager of communications systems at Westinghouse. Recognizing several years ago that the telecommunications management function was taking on new importance, Bennis began spreading that word both within his own corporation and within various industry user groups.

Bennis believes the reason telecommunications lacks an image is the environment into which it was born. "The Bell System was the only supplier. So, if the network worked, Bell got the credit. If the network broke down, Bell got the blame." As a by-product of fierce telecom competition in the '70s, the telecommunications manager became more visible within the corporation, Bennis explains. At the same time, he candidly admits, "in the past, the telecommunications manager has not been as aggressive as he might have been."

But today the rules have changed. "There is absolutely no question that top management has discovered telecommunications. If telecom managers don't get their views across today, they'll never be able to do it." Bennis believes that today's telecom

network can be a source of vital information to top management if network managers can capitalize on the resources around them. "The activity level of the corporate network is really a mirror image of the activity level within the corporation. Certainly this concept is not yet understood in many corporations."

Bennis is alluding to a new generation of network management systems that can collect network activity data in a form meaningful to the MIS staff as well as to top management. Few companies have yet exploited such capabilities since these latest systems were designed primarily to collect operational data for keeping the network up and running. Many people on the telecom side of the house predict that specialized software will soon be available to collect MIS-type data directly from these systems.

Lack of planning is one of the key factors that has impeded the telecommunications manager. Many of them are quick to admit that they have spent all their time fighting fires rather than planning ahead. Chet Bellairs Jr., director of communications at ABC, says there are "a lot of opportunities for the communications manager, who has traditionally worked in a day-to-day mode. But we must do more planning within the corporation to see if we can improve communications and make people more efficient, and possibly generate more profits as well."

On the other hand, a plus is the closeness of the communications function to the entry-level user. Here, communications staffs are more experienced than dp. Having provided phone facilities directly to end users, telecommunications staffers understand the need to provide user-friendly devices—whether it be for telephones, electronic mail, or word processing. Many of today's communications managers are even becoming part of corporate task forces that meet to standardize the choice of desktop computers. Their appreciation of user needs together with their knowledge of the technical requirements needed to interface with corporate network facilities give them a practical edge in such planning.

In the final analysis, the interaction between dp and telecommunications groups varies from company to company. But Contel's Frank sees the two groups being drawn closer together—by technology, if nothing else. "By the end of the 1980s, every telephone will look like a data processing terminal. With it, the user will be able to do electronic mail, voice store and forward, and all the things that we can now do with a \$3,000 terminal. The telephone will probably be an integrated workstation on a digital link.

"And rather than eyeing one another as adversaries, dp and telecommunications managers should really look at one another as partners in the same business."

—Ronald A. Frank



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San Francisco

Office Memo

To: Jack Burns, Division Manager

Date: November 10, 1982

From: Tom Donohue, President

Subject: Computer recommendations

Your purchase request for six personal computers just reached my desk.

What gives?

I thought you understood our growth plans, Jack, but the computers you've recommended are dead ends. They might do the job today, but what about tomorrow? They don't connect together to form any kind of functional system. The 8-bit models aren't compatible with the 16-bit models. And I doubt the software that runs on the computers you want will be of any use later when we're forced to buy computers that work together.

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See me before you go home tonight.

Tom

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How are corporations responding to the onslaught of the personal computer? A survey.

WE'RE NOT REALLY SURE HOW MANY WE HAVE...

by Amy D. Wohl and Kathleen Carey

Most computer-related technology has been slow to make its mark on the average office. This has been due mainly to the cost and complexity of implementing the equipment—barriers that required a high degree of marketing expertise on the part of the manufacturers to cost-justify the products and then to train and support the office user. Word processors are an example of this slow process, taking over 15 years to arrive in significant numbers on the office scene.

Electronic calculators and now their more powerful cousins—personal computers—are exceptions to this rule. The calculator took just five years to clobber the old adding machine in the office. The personal computer is showing signs of gaining a strong foothold in the office in an even shorter period of time, both as a lower-cost alternative to dedicated word processors and as a computation or information processing tool for individual managers, professionals, or executives. Indeed, the personal computer may even affect the ways departments handle regular data processing within the corporation, and could provide the gateway for automating the office in the '80s.

Why the forecast for a quick success? First is cost: hardware and software are relatively cheap. Even today's simple, game-playing personal computers come with a bang-per-buck price tag that would have been impossible just a decade ago. Second is perceived complexity. Though just as hard (or easy) to use as, let's say, a word processor, the personal computer, coming from a home, game-playing environment, is perceived as simple to use or apply. Vendors don't have to go into gyrations to sell the product, and need

not do much (if any) user handholding.

Finally, personal computers now come supported by a wide variety of software. Third-party packages compatible with the "universal" operating systems of CPM, MS-DOS, Apple DOS, TRS-DOS, etc., allow personal computers to be applied to a great many office and business tasks. True, much of this software may come from basement or garage shops, but there are increasing numbers of good packages being marketed by reputable program houses.

So, with or without the blessing or knowledge of corporate management, personal business computers (PBCs) are now being squirreled away in the nooks and crannies of almost every office. Many managers are unable to say just how many are currently installed in their organizations, and opinions on how to govern their acquisition and application are many and varied.

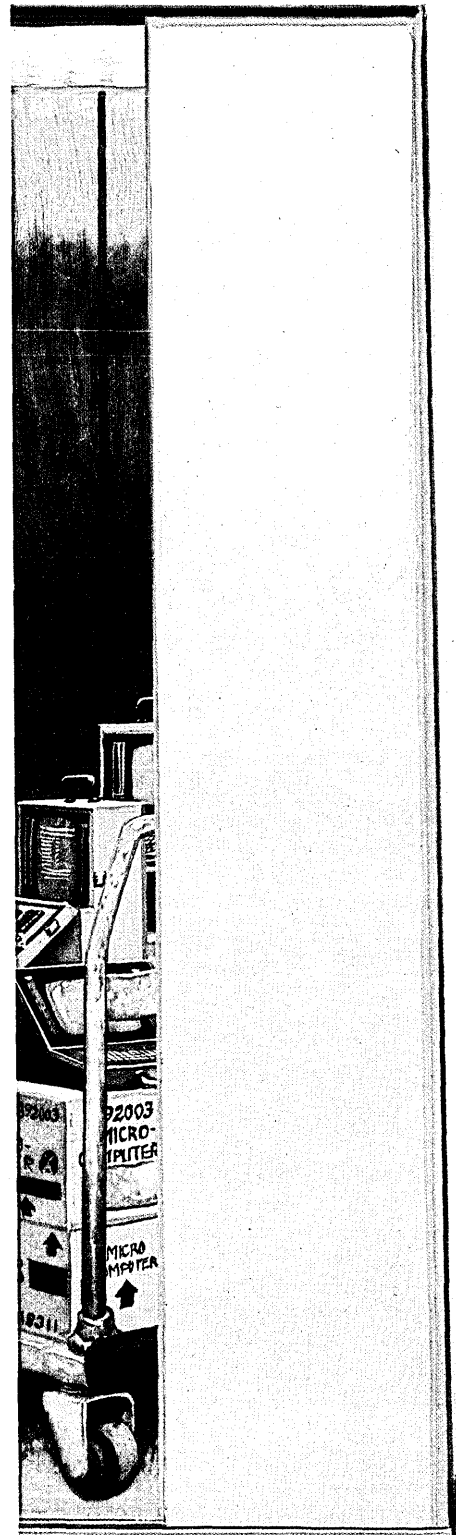
To gauge the extent to which PBCs have penetrated the corporation, and to determine their users and uses, Advanced Office Concepts conducted a survey. The following discussion summarizes the results found in AOC's full report, *Policy for the Personal Business Computer*.

Of the almost 250 corporate users responding, fully 26% came from the ranks of the U.S.'s 1,000 largest companies, with 60% having 1,000 or more employees. Over 75% employ IBM mainframe computers and 50% use other mainframes. The main businesses of the respondents, when given, are shown in Table I.

Among the companies that could count their installed base of personal computers, almost 17% found more than 30 installed.

Note, however, the "could count" caveat. Most companies do not know with

15 16 17 18 19



Tom Newsom

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19



More than 67% of the corporate users surveyed have no guidelines for personal computer use.

absolute certainty the actual number of PBCs they have paid for, let alone the users or uses to which they are applied. The numbers given (see Table II) may therefore be on the low side.

APPLE MOST POPULAR

Which are the preferred brands? At present, the Apple is by far the most popular; almost 70% of those responding to this question use at least one Apple, and most listed multiple installations. Predictably, Radio Shack came in second, with over 40% employing TRS-80 models. Third in popularity was the IBM Personal Computer; we feel that the 30% that listed IBM included a significant number of machines that are on order. All other brand names were mentioned in far less significant numbers (see Table III). By next year, however, this overall complexion of brand preference should change, with IBM gaining a higher market share and other vendors such as DEC and Wang joining the list.

Participants were asked to name the highest and lowest level of employee presently using a PBC. In the lowest-level category, the professional employees—managers, programmers, financial analysts, and technical and accounting staff—were mentioned almost 44% of the time (see Table IV). Non-professionals were cited by 27%.

In the highest-level category (Table V), middle management was mentioned most frequently with 39%, followed by upper management with almost 33% and professionals with 7.5%.

As for the uses to which these workers are applying their computers, almost 80% are found to be performing financial calculations (see Table VI). VisiCalc and its "Visi-clones" are also probably represented in the 21% used for marketing applications.

Nearly 40% of the respondents said that PBCs are supported as terminals on a mainframe. This information is displayed in Table VII, along with the answers to two related questions:

- Are file transfers permitted from the mainframe to personal computers?
- Is database updating permitted from the personal computer?

Mainframe/PBC file transfers occur in nearly a third of the companies, with an additional 14.7% planning to permit them in the future. On the question of database updating, the nays were more resounding. Over three quarters of the companies do not allow database updating from PBCs, and only 5% plan to permit it in the future. The negatives may represent the large amount of off-line, departmental work currently done on PBCs, rather than a firm bias against the practice.

A mere 8% of the corporate respondents indicated that firm guidelines govern-

ing the acquisition of PBCs were in place (see Table VIII). Only 24% reported that informal rules were being applied toward the purchase of PBCs on an experimental basis. That leaves about 67% of the present PBC corporate users surveyed with no guidelines or procedures in place. And, of this number, only 36% stated intentions to implement guidelines. Thus, it looks like the free-for-all market for personal computers in the office environment will exist for some time to come.

THE APPROVAL CYCLE

Although corporate-wide policy towards PBCs is still unclear, the respondents did indicate that some department was involved in the approval cycle. Not surprisingly, the dp department leads in this area, with nearly 55% of the responses stating that dp was involved in final approval (see Table IX). The individual user department, however, still has a good deal of autonomy, with 43% stating that approval rested there. The purchasing department came in a distant third with only 14% of the responses.

Multidepartment approval was involved in about 12% of the cases surveyed. In some companies, more than one approval is required or the end user has a choice in the purchasing source.

Rephrasing the question, participants were asked if the dp department had absolute approval or veto power over the acquisition of a personal computer. In at least one third of the companies surveyed the dp group does have such authority (see Table X).

The survey indicated a degree of confusion about setting policies, as well as a lack of planning, strategic or otherwise, in the implementation of PBCs as part of an overall information system. To complicate matters further, PBCs may function independent of any centralized dp facility as an executive work tool or gadget or, in the same environment, as nodes in a distributed network. Left unresolved at present are issues involving the overhead PBCs might place on such networks in their communicating modes; the compatibility of personal versus mainframe data or test files; the interfacing of personal computers in their own independent local networks; and the use of PBCs in local nets as office automation systems. With at least 1 million units expected to join the present PBC installed base over the next 12 months, now is the time to consider these issues and define some guidelines.

Amy Wohl is president and principal consultant of Advanced Office Concepts Corp., Bala Cynwyd, Pa., and a contributing editor of DATAMATION.

Kathleen Carey is a staff consultant and associate editor at ADC.

TABLE I

RESPONDENTS BY INDUSTRY TYPE

INDUSTRY	RESPONSES	
	NO.	%
Manufacturing	48	38.4
Government	17	13.6
Insurance	17	13.6
Education	16	12.8
Utility	14	11.2
Banking finance	13	10.4
Total	125	100.00

TABLE II

INSTALLED PBCS

RANGES	RESPONDENTS	
	NO.	%
1-5	64	45.1
6-10	26	18.3
11-20	20	14.1
21-30	8	5.6
31+	24	16.9
Total	142	100.00

TABLE III

PERSONAL COMPUTER BRANDS

VENDOR	RESPONSES	
	NO.	%
1. Apple	126	69.6
2. Radio Shack	72	41.4
3. IBM	57	31.4
4. Hewlett-Packard	15	8.3
5. Commodore	12	6.6
6. Health Zenith	9	5.0
7. Xerox	7	3.8
8. Atari	6	3.3
9. Osborne	5	2.7
10. Texas Instruments	5	2.7

*Based on 181 total responses, several respondents listed multiple vendors.

TABLE IV

LOWEST LEVEL OF PBC USERS

PROFESSIONAL	
POSITION	TOTAL
Manager	15
Programmer	14
Financial analyst	9
Technical	7
Accounting	6
Total	51
Percent*	43.6

NONPROFESSIONAL	
POSITION	TOTAL
Secretarial	14
Clerical	13
Sales	5
Total	32
Percent*	27.3

*Based on 117 total responses

TABLE V

HIGHEST LEVEL OF PBC USERS

UPPER MANAGEMENT	
Vice president	31
President	14
Ceo	5
Executive	2
Total	52
Percent*	32.7

MIDDLE MANAGEMENT	
Manager	36
Director	13
Financial advisor	9
Supervisor	4
Total	62
Percent*	39.0

PROFESSIONALS	
Consultant	3
Engineer	2
Programmer	7
Total	12
Percent*	7.5

*Based on 159 total responses

TABLE VI

APPLICATIONS

	RESPONSES	
	NO.	%
Financial	135	78.9
Word processing	63	36.8
Scientific	55	32.2
Marketing	35	20.5

*Based on 171 total responses; several respondents listed multiple applications.

TABLE IX

WHO APPROVES PBC PURCHASE?

	RESPONSES	
	NO.	%
Data processing	113	54.6*
Individual departments	89	42.9
Purchasing	30	14.4

*Based on 207 total responses. Several respondents listed multiple answers.

TABLE VII

PBCS AS TERMINALS

	TOTAL RESPONSES	YES		NO		PLAN TO	
		NO.	%	NO.	%	NO.	%
Supported now	199	76	38.2	123	61.8	0	0
File transfers allowed	156	49	31.4	84	54.0	23	14.7
Databased updating allowed	150	25	16.7	117	78.0	8	5.3

*Percentage of total responses for this function.

TABLE VIII

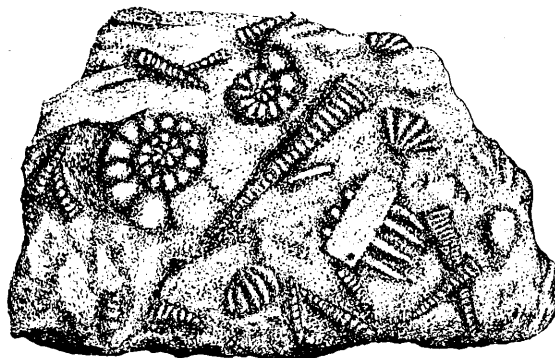
DO YOU HAVE A POLICY IN EFFECT NOW?

TOTAL RE-SPON-SES	NO		YES		OTHER	
	No.	%	No.	%	No.	%
240	162	87.5	20	8.3	58	24.2

TABLE X

DP—ABSOLUTE APPROVAL OR VETO?

TOTAL RESPONSES	YES		NO	
	NO.	%	NO.	%
200	67	33.5	133	66.5



*DATAMATION

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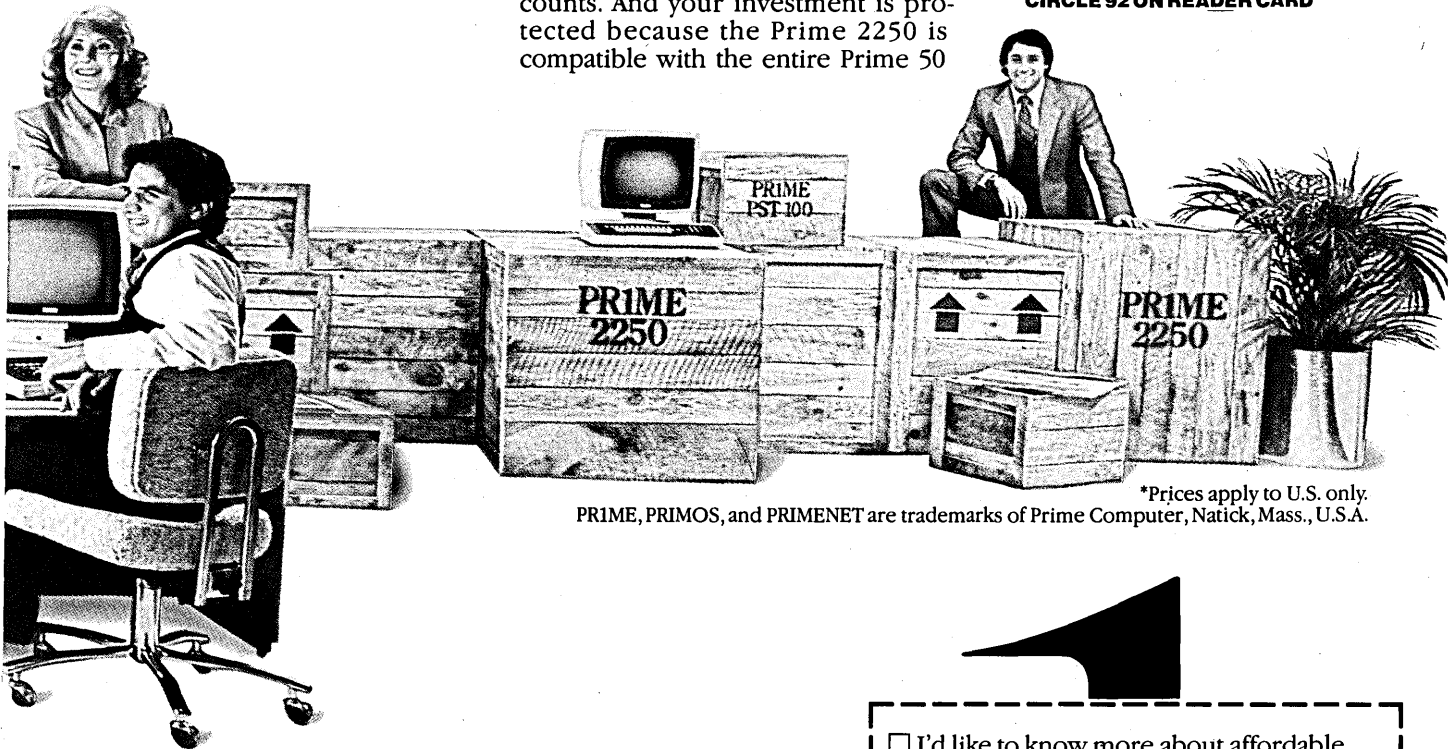
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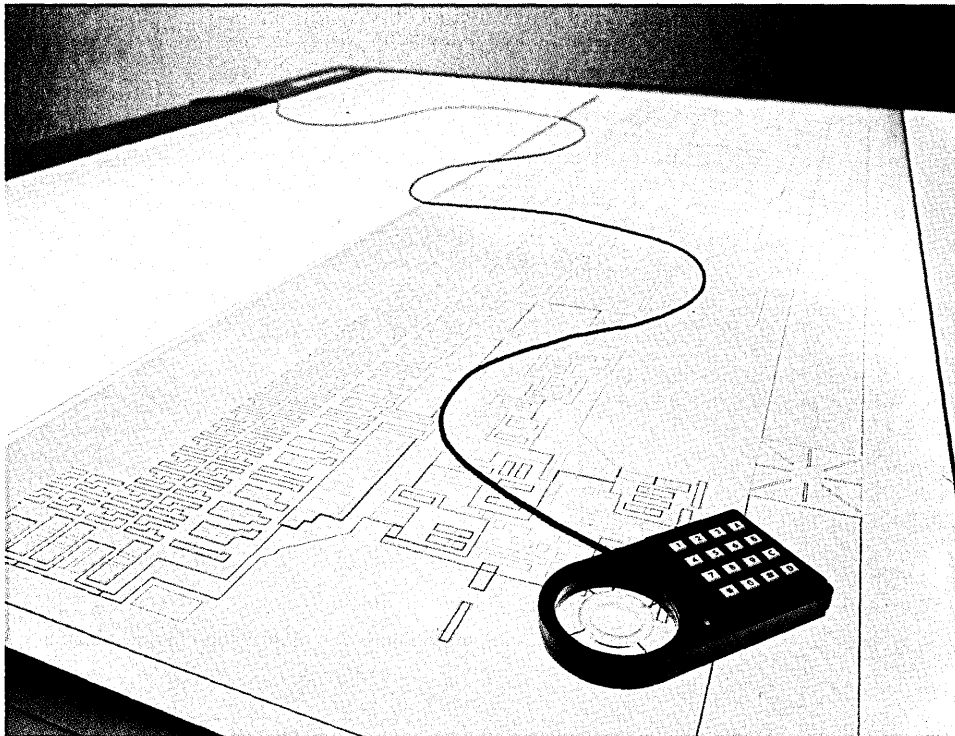
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Employees rarely labor alone, so why should their micros? Here's a strategy for big companies using small computers.

SHARING WORK AND LOGIC

by Joel Schwartz and Wesley P. Melling

Applications sell personal computers, applications like word processing, spreadsheet analysis, and desktop scientific computation. As a result, microprocessors are sliding into corporations as standalone systems. A lot of them are being expensed by department managers, for example, to run VisiCalc during budget season. Personal computers put a processor, file storage, high-level languages, and problem-solving tools into one neat, nonthreatening package. Even managers with acute computer anxiety are bound to notice all that potential. Soon, they're drawing up wish lists of things they'd like to do with their micros after they've solved the problem they bought the system for.

"I wish I could directly access data in the corporate files. I wish I could edit reports on this thing. I wish" Ultimately, the wish lists lead to the conclusion that managers and professionals who use standalone micros could be a lot more efficient if their personal computers were integrated into an overall corporate computing strategy.

Shared logic systems are the foundation of corporate computing strategies today. When computers were big ugly boxes that cost a lot and used a lot of power, we had to share them *serially*. In the early '60s, that meant we all lined up in front of the 7094 with our grocery carts full of punched cards. Then around 1962 Burroughs figured out how to run two or three jobs at the same time. Two years later IBM announced the 360 and we spent the rest of the decade sharing computers *concurrently*. In the '70s we did *interactive* computing and used software to create the illusion that the individual user had the computer all to himself.

While all of these improvements in our ability to share logic gracefully were being made, the price of logic was falling at the rate of 40% a year. In the early '60s the cpu represented 80% of the \$250,000 that a big ugly system could cost. Today's microprocessors can deliver comparable processing power on a desktop and cost the manufac-

turer about \$30 to \$70. Additional cost reductions are taking place in storage and I/O devices. Disk systems are going down 25% per byte per year. Crts cost 15% less per pixel every year. Even printers, with their high proportion of mechanical components, are coming down by 5% annually. In the mid-'70s the ratio of hardware to software costs was about 4 to 1. Now it's about 1 to 1.

Power and packaging costs are flat. So logic tends to go where you've got power and packaging. Stuff a VLSI board in a disk drive and put all your file management software on it and you've got a back-end processor. Stuff a board in a crt terminal and you've invented a personal computer.

It is tempting to conclude, then, that logic is so cheap and accessible that it no longer need be shared. We cannot, however, substitute independent personal computers for dumb terminals and accomplish the same thing. Cost is not the only reason for sharing logic.

THINGS PCs CAN NEVER DO

There are some things that you can do on timesharing systems that 40 independent personal computers will never be able to do, no matter how powerful they get. Big payrolls, corporate-wide accounting systems, number crunchers like finite element analysis and econometric modeling, for example, will always require large computers, large centralized databanks, and extensive software libraries.

There will always be data files, no matter how small or esoteric, that are inherently not the property of any one person within the organization. These are the kinds of files that have to be concurrently accessible to all of the members of a department or to a handful of people involved in carrying out a specific project assignment. Such files end up on a shared system.

But most important is the need to support interaction between people.

The original strategy behind the development of timesharing was to support a working team—six to 10 people who work together on a project with common goals,

common tools, and common documentation. Each member of a working team takes responsibility for accomplishing a specific segment of work that, together with the results of the other members' efforts, must be integrated into some sort of totality. For example, programmers working on a big application may create a number of discrete programs, but they haven't successfully completed their assignments until all of the programs work together. However, while timesharing systems permit the sharing of files and software tools, they only support non-dp working teams in bits and pieces because so much emphasis is placed on the efficient use of large, expensive systems. The most compelling reason for networking personal computers is the need for team members to share work and information. Standalone systems can't support this kind of interaction.

With the advent of third generation personal computers that have communications capabilities and file compatibility with larger systems, organizations can afford to provide each member of a working team with the specific bits and pieces he needs, without isolating him from the larger corporate dp and communications environment.

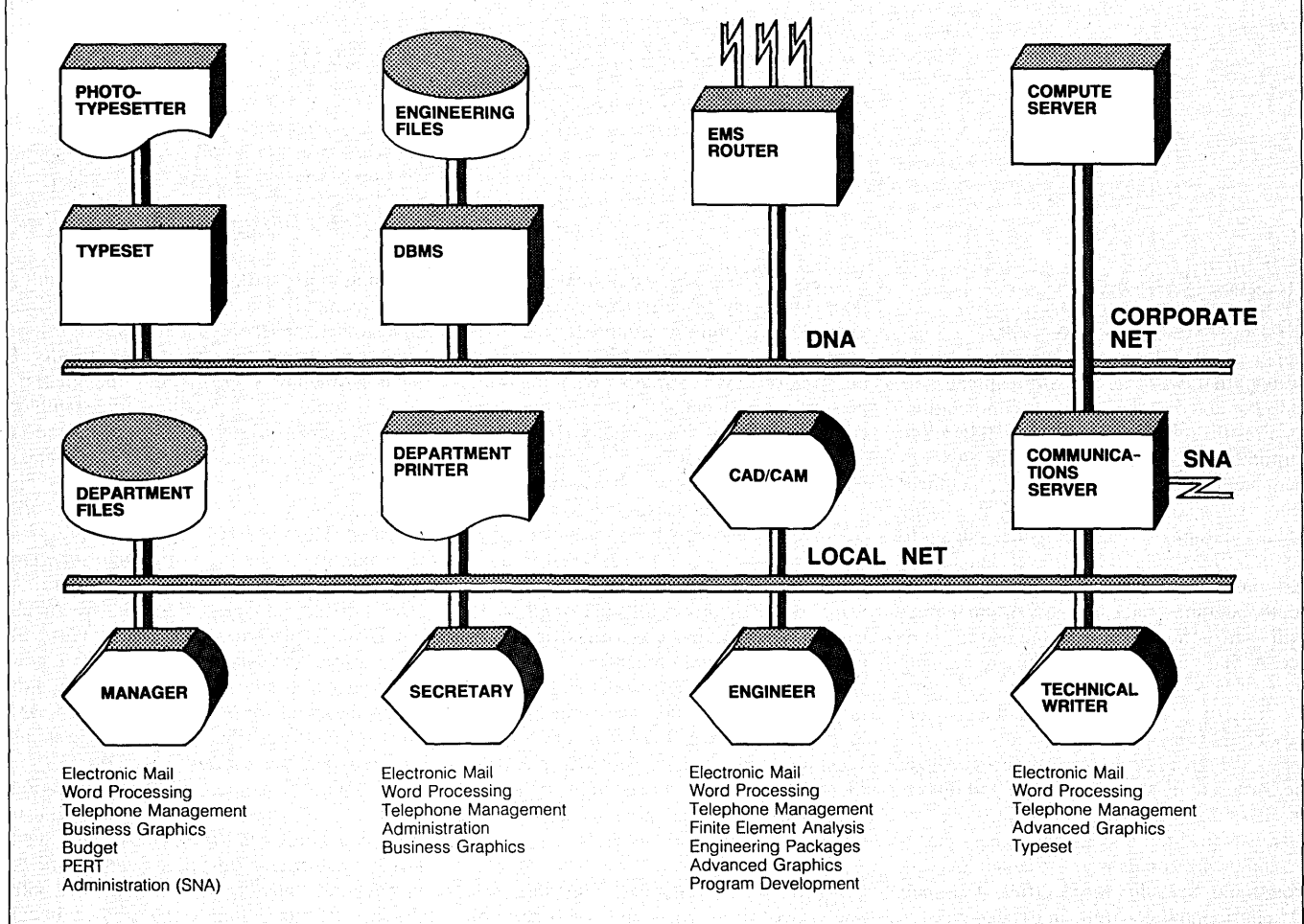
The alternative to a bunch of dumb terminals, a word processor, a scientific/engineering desktop computer, and a bunch of smart but circumscribed personal computers—none of which can talk to each other—is a range of compatible personal computers clustered with back-end processors or servers. This arrangement permits resources like printers and common files to be shared among the working group. If we look at a hypothetical aerospace engineering group (Fig 1), we can follow a planning pattern that moves from an organizational overview downward. A good plan for integrating personal computers into the network might proceed through these steps:

1. Define users as individuals who interact with each other, with external groups, and with systems outside the group.
2. Identify the points of interaction.
3. Provide common services at the points of interaction.

With a range of compatible personal computers clustered with back-end processors, resources can be shared among a working group.

FIG. 1

PERSONAL COMPUTERS IN SUPPORT OF A WORKING TEAM



4. Identify unique individual requirements for applications and levels of support.

5. Assign computing services to the systems that do them most effectively—i.e., character editing on the desktop and number crunching on big systems.

6. Provide access to interaction, common services, and individual applications through a single window—the personal computer.

For the sake of illustration, we'll keep our working team smaller than is usual. Bob and Carol and Alice and Ted are one of the many teams assigned to designing various components of a new transport aircraft. Bob heads the group. Like most American managers, he spends 55% to 70% of his time on the job communicating.

Thus, our planning starts with communication; it is the glue that holds the entire corporate data processing strategy together. First, it provides the means for the working team to interact. Second, it provides access to

all of the services a professional worker needs.

Something like 80% of all communication takes place within the local environment and that data interchange is highest between people who share files—our working team. So we'll install personal computers sized and configured to meet the needs of the members of Bob's group and tie them all together with a high-speed local network.

Economically it doesn't make sense to provide each person with a printer, large hard disk storage and a full range of applications that may be needed only sporadically. So we'll store department files, some user task and file management software and commonly used programming tools on a shared file server and ship it back and forth to the personal computers that need it at the speed of a system I/O bus. We'll allow access to other shared devices by the same means.

For that, we'll need to install a base-band local network like Ethernet, which uses

LSI and VLSI technology to provide high bandwidth and transmission speeds up to 10 megabits per second. We can support interaction between a number of groups on the same local network up to a practical range limit of about 16 miles.

A local net is a good idea, too, in terms of its easy connectability. Bob's group is periodically uprooted, modular furniture and all, in the corporate game of Space Wars. The local net allows faster and cheaper relocation of equipment than is possible when cables have to be physically moved around in a building.

Old wiring schemes in old buildings are one practical consideration for the long-range planner. A somewhat larger consideration is the existence of multiple-vendor data communications networks that cost a great deal of money and are not about to be swept away by glittering new technologies. Even if a universal protocol emerges next month, Bob's group is still going to have to access

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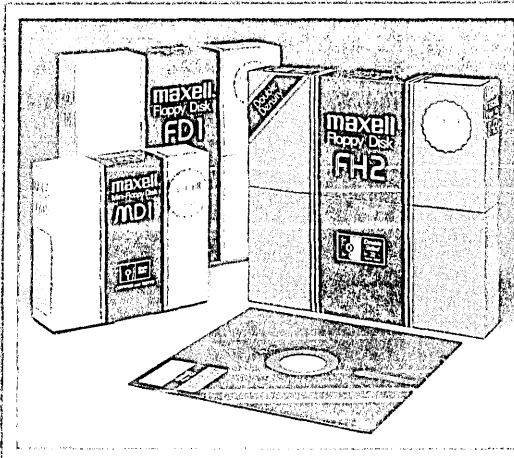
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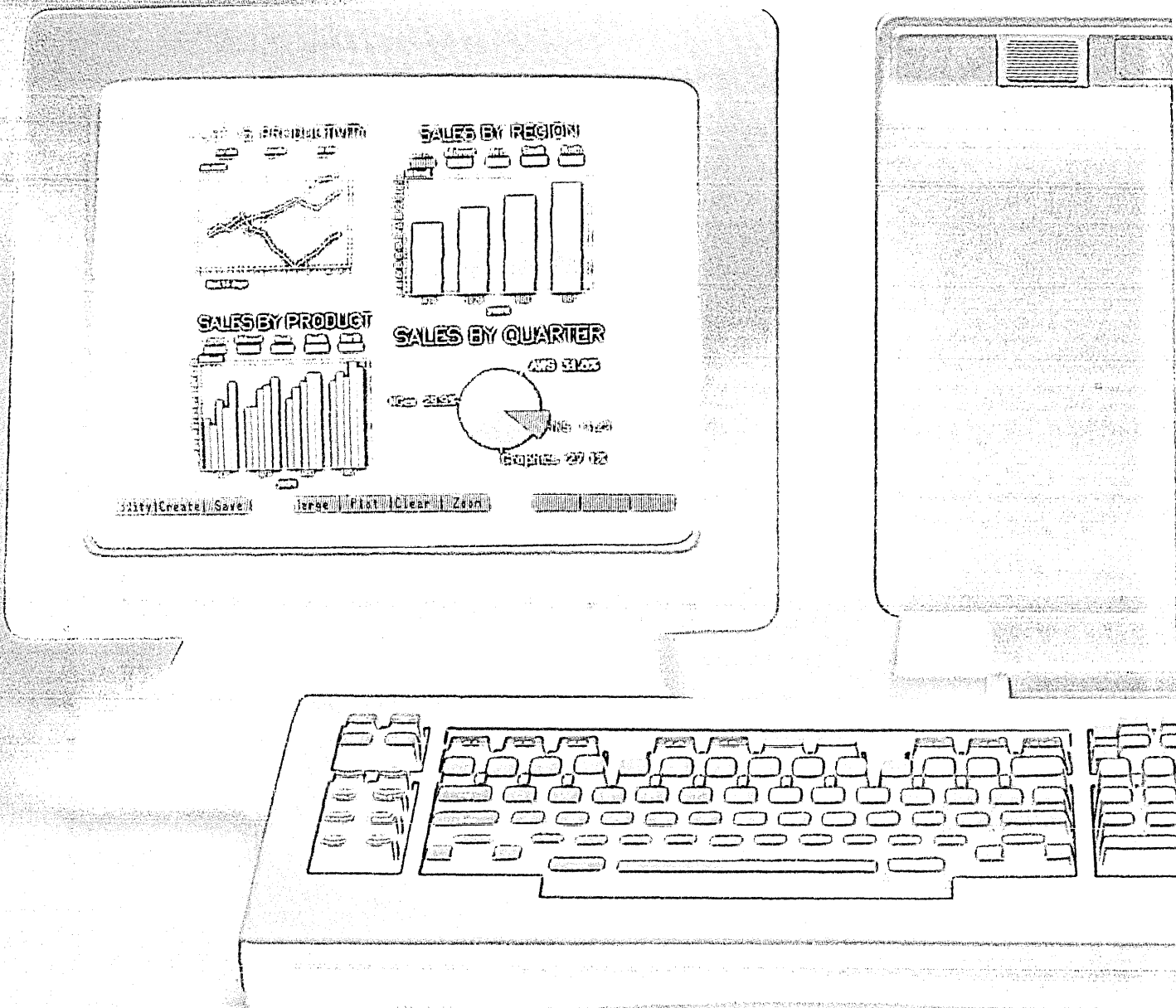
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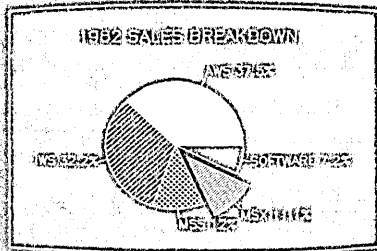
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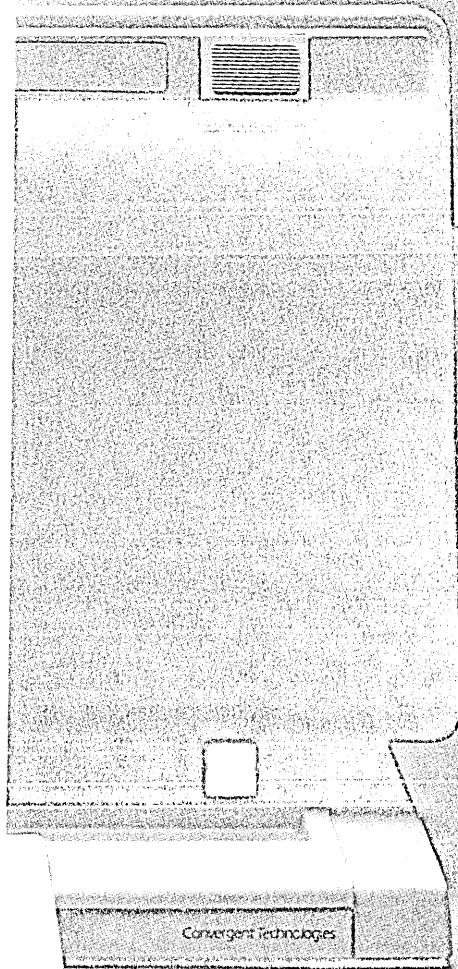
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Supporting the interactivity of the working team is the primary goal of this corporate computing strategy.

SNA, DECnet, and conceivably a couple of other network architectures for a long time. Communications processors that perform protocol translations can be implemented as gateways between the personal computers and the organization's wide-area networks.

Let's look, then, at the list of computing services we have to provide for Bob and Carol and Alice and Ted and figure out how to deliver them in an integrated computing strategy.

Memos are one of the most common means of communication between individuals and groups. So we can start our top-down applications planning with electronic mail in mind. Up at the top of the chart, we'll put in an electronic memo routing system that serves the entire corporation, and we'll make mail service available at Bob's personal computer.

The second common need is for some kind of word processing capability. We tend to think of word processing in terms of secretaries and dedicated systems for capturing keystrokes. The fact is, however, that for everyone in Bob's group, communicating information—whether in the form of a memo, a report, a business letter, or a technical document—means writing, rewriting, and editing. Bob, a two-finger typist at best, doesn't need a full-blown wp system. He needs to be able to edit memos, so we'll provide that capability with a little piece of resident software on his personal computer. An easy-to-use business graphics application can also reside on the system. And we'll let him "own" VisiCalc. We'll deliver support for project management (i.e., PERT) in two ways. For small projects—say 200 nodes—Bob can run

a program on the desktop. For the big ones, though, we'll provide the same service on a big system and deliver the result on the desktop.

Voice is still the primary means of communication in the office. A manager spends up to 17% of his time on the phone, so it may be a good idea to provide Bob with some kind of telephone management system right on his desk. A voice digitizing unit in his personal computer with appropriate software can take messages, allow him to do voice annotation of text, and perform automatic dialing, for example.

When Bob functions as an administrator, he's got to tie into a central IBM system. (A lot of custodial accounting is done on IBM gear.) He's responsible for doing reviews and giving raises and making sure everyone doesn't go on vacation at the same time. He's going to be calling up personnel forms on his personal computer as if it were a 3277 or 3278.

The next person in the group is Carol, a secretary. As she is given more and more automated support and as terminal density in the department rises, the time Carol spends keyboarding goes down and her task mix changes. She becomes an expeditor, a preparer of overhead slides, a coordinator, an archivist, and more of an administrative assistant. A standalone word processor isn't enough to support the expanded job. She needs a multi-function personal computer capable of handling electronic mail, word processing, telephone management, and administrative and business graphics applications. And while everyone has access to them, Carol is the custodian of the department files and printer.

AIDS FOR DESIGN ENGINEER

Alice is a design engineer. She spends about 2.6 hours of the day doing design engineering. She spends the rest of her time on the kinds of things that eat up Bob's time—obtaining and disseminating information, writing reports, handling mail, tracking down people on the phone. So we'll include office automation applications as the first step in making our technical professional more productive in her job.

Alice's job is to do wing flutter analysis. For that, she's going to need access to a classic shared file system. Safety standards, stress tables, and approved parts lists are maintained on a minicomputer in the engineering standards department under Engineering Change Order (ECO) control where a lot of people can get at them. Alice can use her personal computer to access a database management system, pull the data she needs back to her machine, put together her NASTRAN, STRUDEL, or ATLAS run, and then ship it off to a big number cruncher.

Then she brings the data back and decides she actually wants to watch the wings flap up and down. A really good dynamic graphics workstation costs between \$50,000 and \$75,000, and Alice is only going to use it for a fraction of the 2.6 hours a day she spends doing engineering. We'll put a \$10,000 computer on her desk that makes her more productive during the major part of her day and let her walk across the hall to use a dynamic graphics system she shares with other engineers.

We'll provide her with input editing for program development and engineering packages on her own system. Sometimes she'll compile and execute right there, but often she'll use her personal computer as a terminal to a bigger system to save time.

The department tech writer, Ted, needs electronic mail, telephone management, word processing as sophisticated as Carol's, and the ability to insert graphics into text—all for essentially the same reasons that we supply office automation applications to Alice. We're also going to allow Ted access to shared phototypesetting equipment via the corporate network. No one else will have to duplicate his keystrokes, and turnaround time for printed material will be faster.

If we accept the premise that supporting the interactivity of the working team is a primary goal of our corporate computing strategy, we can identify six points where personal computers must be compatible with other computing and communications elements. The six are languages, development tools, file structures, network architectures, task partitioning, and human interfaces.

The language and development tools issue is pretty much straightforward. Wheth-



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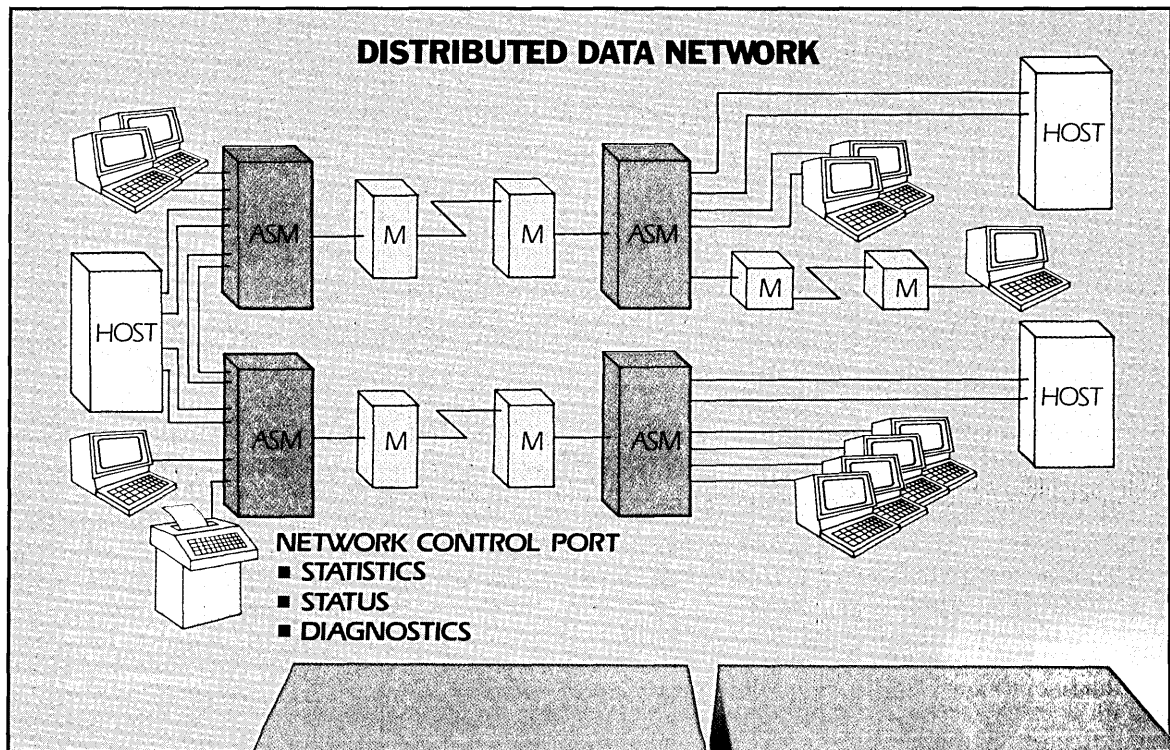
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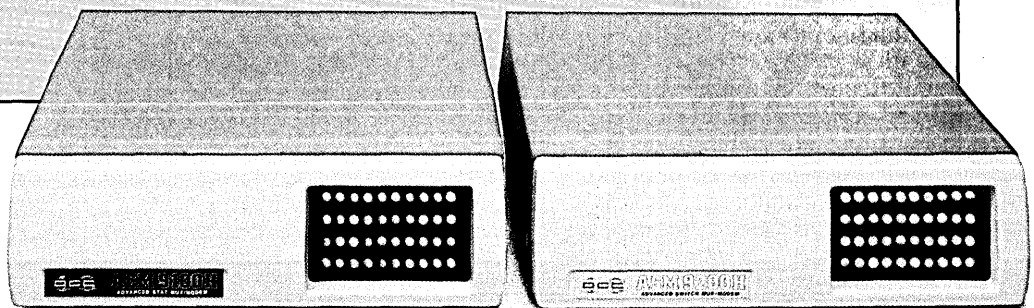
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Like the elusive universal datacom protocol, the universal user interface has yet to appear.

er applications software for micros comes off a third-party shelf or out of the organization's dp department, production and testing are facilitated by compatible compilers, debuggers, editors, and utilities that enable development work to be done on larger systems. And programmers should be able to use the same languages and development tools whether they're writing for big systems or for personal computers.

File structure and network compatibility means that data can be transferred between disparate computer and communications systems.

Task partitioning is breaking a program down so that little machines do the part they're good at and the big ones do what they're good at. Ideally this becomes a system function, not something the programmer has to worry about.

These first five areas of compatibility can be handled successfully given the capability of today's microprocessor-based personal computers (where manufacturers have exercised some concern in designing their personal computers to be compatible with their larger systems) and, to some extent, by providing gateways between vendors.

EASY TO LEARN INTERFACE

Ideally the interfaces between people and the systems they use should be consistently easy to learn and transferable between systems. This is the major challenge in integrating personal computers into an overall corporate computing strategy.

When Bob uses his personal computer as such, to run a spreadsheet analysis program, for example, he is confronted with one set of procedures, HELP messages, and error diagnostics. When he wants to tie into the corporate SNA network, he is faced with a separate set of interface requirements. A naive user confronted with five or six separate interfaces to learn will balk at using the system. Like the elusive universal datacom protocol, the universal user interface has yet to appear.

If we look again at our hypothetical working team, we see that there is no such thing as a single purpose machine on any desk. Every personal computer is a multi-function system with an office automation component. The needs of the individual user determine the size and capabilities of the system.

A shared logic system is the centerpiece of the personal computer strategy outlined here. It provides the members of the working team with routers, DBMS managers, transaction processors, special function boxes, and a host for intelligent terminals. Networks are fundamental to a computing strategy in which personal computers support the individual user's role as a member of a working team with high interaction and a common goal. *

Joel Schwartz is vice president, Professional Computer Group, for Digital Equipment Corp., with overall responsibility for marketing and operations for the Digital Professional Series of personal computers. He received an MSEE from Case Institute of Technology in 1966.

Wesley P. Melling is a product manager for the Professional Series of personal computers at DEC, where he is responsible for definition of user and product requirements. He has a BA in economics from Trinity College in Hartford, Conn.

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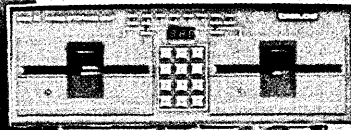
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Hewlett-Packard on Office Systems

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tile. And makes our data processing computer the driving force of a network that distributes on-line, interactive information all through your company.

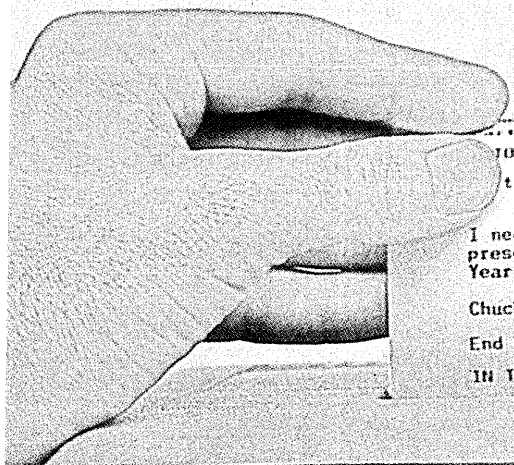
We call this solution The Interactive Office. And we think this is the way office computing will be headed in the future. But you don't have to wait. Because it's available from us right now.

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TO: Lynn JEFFERSON / HDQTR/05
Part 2.

I need our current production cost analysis for my 2 o'clock presentation. Plus fixed overhead cost projections for Fiscal Year '82. How about a chart?

Chuck

End of Item 1.

IN TRAY >

Subject: Cost Analysis
Sender: Charles TAYLOR / HDQTR/01
Part 1.
TO: Lynn JEFFERSON / HDQTR/05
Part 2.

I need our current production cost analysis for my 2 o'clock presentation. Plus fixed overhead cost projections for Fiscal Year '82. How about a chart?

Chuck
End of item 1.
IN TRAY >

for office automation and data can do it all.

So it doesn't matter if you use the computer for word processing, electronic mail, to generate management reports, or to create charts and graphs. Or to do any combination of those things. In The Interactive Office, you can sit down at one workstation and do it all.

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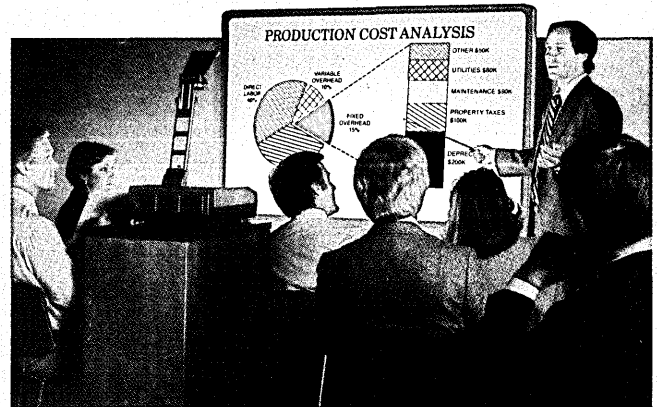
bine several different models into a multinode network. Without changing one line of software.

And besides our powerful office automation functions, we have a full range of software tools for your EDP department. Starting with our IMAGE database, which has won worldwide recognition for its versatility and ease of use. Then, there's our set of tools for programmer productivity, which help make them more efficient at designing, implementing, and maintaining new applications. To reduce the EDP backlog even more, we also have a range of off-the-shelf software solutions for manufacturing, distribution, and accounting.

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**HEWLETT
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DATAMATION knights the mightiest dp companies

REVIEWING EUROPE'S TOP 25

Throughout 1981 the worldwide recession continued to hold Europe in its grip—a situation that left the computer industry in a state of stagnation. Most companies struggled to maintain their 1980 revenue levels, and there were few success stories.

Unemployment continued to rise in Europe and in most countries the inflation rate was between 10% and 15%. Europe looks anxiously to America to lead it out of the recession, but very little growth in the U.S. economy is expected this year.



"Reaganomics," which is restricting the money supply and keeping interest rates high, will offer no relief, it is predicted, until 1983.

Companies on both sides of the Atlantic have been hit extremely hard by exchange rate fluctuations. European currency values fell very sharply against the dollar during 1981, some by as much as 30%. This means that while European revenues may have shown good growth in terms of local currency, these same revenues were dismally lower

when calculated in U.S. dollars.

IBM remains in an unassailable position at the top of the chart despite its poor performance in Europe. The company's proportion of the total revenues for the Top 25 in Europe dropped from 41% in 1980 to 37% in 1981. IBM's European revenues fell 6% despite a worldwide increase of 10%. It is obvious that IBM's growth is slowing down considerably, which is inevitable for a corporation of such size. IBM's net earnings also slumped between 1980 and 1981.

Although IBM still has a very strong hold on the top end of the market, large main-frame sales have become very sluggish. IBM made moves last year to improve its weak position at the lower end of the market, where industry growth is still impressive. IBM products are beginning to appear in retail stores, and the company has also enhanced its range of office products, personal computers, and small business systems.

IBM is currently facing up to the potential threat posed by AT&T's entry into the

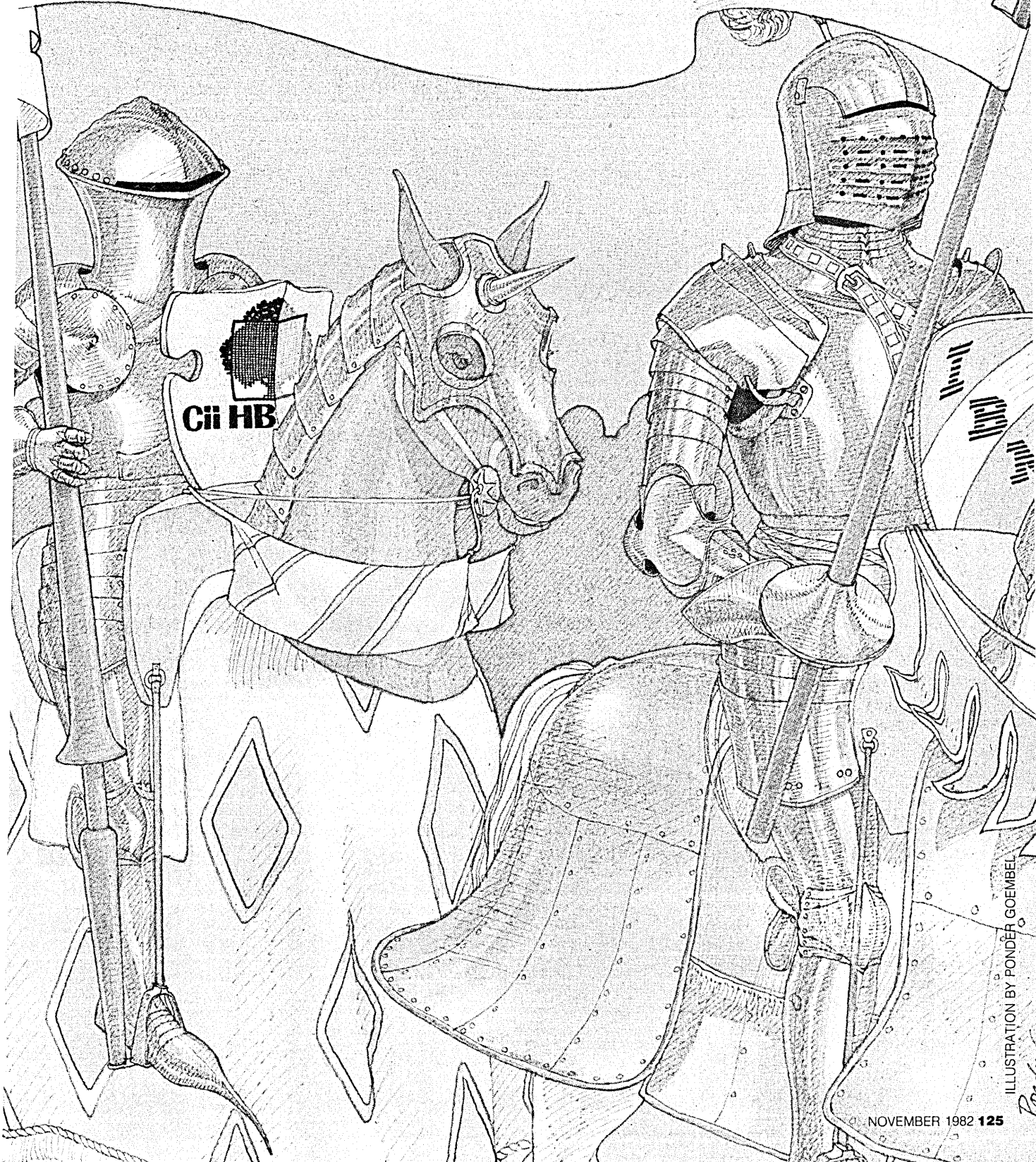


ILLUSTRATION BY PONDER GOEMBEL

The leading European company in 1981 was Cii-HB.

information technology market. Ma Bell comes even higher than antitrust suits on IBM's list of priorities. Finally, after 13 years, the U.S. government's antitrust case against IBM has been resolved in the firm's favor. Now the giant company must turn its attention to the litigation brought against it by the EEC—litigation that seeks relief for the same practices that have been given a clean bill of health in the U.S.

GROWING GRAPHICS MARKET

The fastest growing market in the dp industry at the moment is graphics, with some companies achieving revenue increases of 100% or more. The office automation arena is also showing very good growth at a current average of about 50% per annum. Although no microcomputer manufacturers have broken into Europe's Top 25, their entry should be imminent since growth in this sector continues at 50%. The previous spectacular growth of minicomputer makers has slowed to a steady 30%, but that is a good showing compared to most other large industry companies that have chalked up gains of only 10%.

The fastest growing companies in the European dp market are shown in Table I. As it was in 1980, this table is dominated by American companies. Comparing this table with last year's, it is especially noticeable that the overall market growth rate has slowed to virtually nothing. In 1980 ITT ranked last in our table with a growth rate of 24%. In this year's table the last place is jointly held by Honeywell Information Systems and Burroughs, both of which recorded a paltry 1% increase in revenues. The remaining companies maintained static or below par sales revenues. Against this generally gloomy picture, the growth of ITT, Digital Equipment, and Wang is quite spectacular, reflecting new trends in the market as well as new marketing strategies, particularly on the part of ITT.

Of course, when these companies' growth rates are calculated in terms of their own accounting currencies, Table I is transformed into Table II. Olivetti then shoots up to first place with a growth of 52%, due in part to its takeover of Logabax. Ferranti, Datasab, Nixdorf, Thomson-CSF, and Cii-Honeywell Bull outdistanced most of their American rivals in terms of 1981 growth. To the extent that a company's overall health is measured in its accounting currency, this difference is very significant. For example, the 25% increase in Datasab's revenue in Swedish kroner is the important indicator of its future, rather than the somewhat artificial 5% gain that results when its revenue is converted into U.S. dollars.

Nevertheless, 13 out of the Top 25 companies in Europe are American—the

TABLE I

TOP REVENUE GROWTH RATES IN U.S. \$

	DP% GROWTH RATE*
1. ITT	47
2. DEC	38
3. Wang	34
4. Olivetti	15
5. CIT Alcatel Univac	13
6. Hewlett-Packard	8
7. Datasab Plessey	5
8. Burroughs HIS	1

*European revenue, FY 1981

same proportion as last year. Together they account for 67% of the total revenues of all the Top 25 companies. If IBM is excluded, however, that percentage drops to 27%, showing that European companies have a strong, expanding Continental base.

Britain, France, and Germany each have three companies in the Top 25, while Italy, the Netherlands, and Sweden each have one. This accurately reflects the relative strengths of the dp industry in each of these European countries. It is unlikely that any other European nation will develop its computer industry sufficiently to produce a firm large enough to enter the Datamation Top 25 for some years to come.

IMPORTANT RANKING CHANGES

Several significant ranking changes have taken place since 1980. At the upper end of the table, DEC has moved up four notches from number eight to number four in Europe, knocking ICL into the fifth position. (ICL nevertheless achieved highest worldwide dp revenues of all the European companies.) Cii-HB and Siemens exchanged places, mainly due to a very poor year for Siemens. This means that in 1981 Cii-HB was the leading European company.

Philips, which had no official ranking last year because of the difficulty in obtaining exact dp revenue figures, has revealed itself this year to be a much more powerful force in the European dp world than a lot of people expected. Pegged in the ninth niche in 1981, Philips shows great promise of moving still higher in the future.

Meanwhile, ITT, with its 47% growth rate, has also made significant strides, jumping from 24th in 1980 to 17th last year.

TABLE II

TOP REVENUE GROWTH RATES IN ACTUAL ACCOUNTING CURRENCIES

	DP% GROWTH RATE*
1. Olivetti	52
2. ITT	47
3. DEC	38
4. Wang	34
5. CIT Alcatel	30
6. Ferranti	29
7. Datasab	25
8. Nixdorf	21
9. Thomson-CSF	19
10. Cii-HB	17

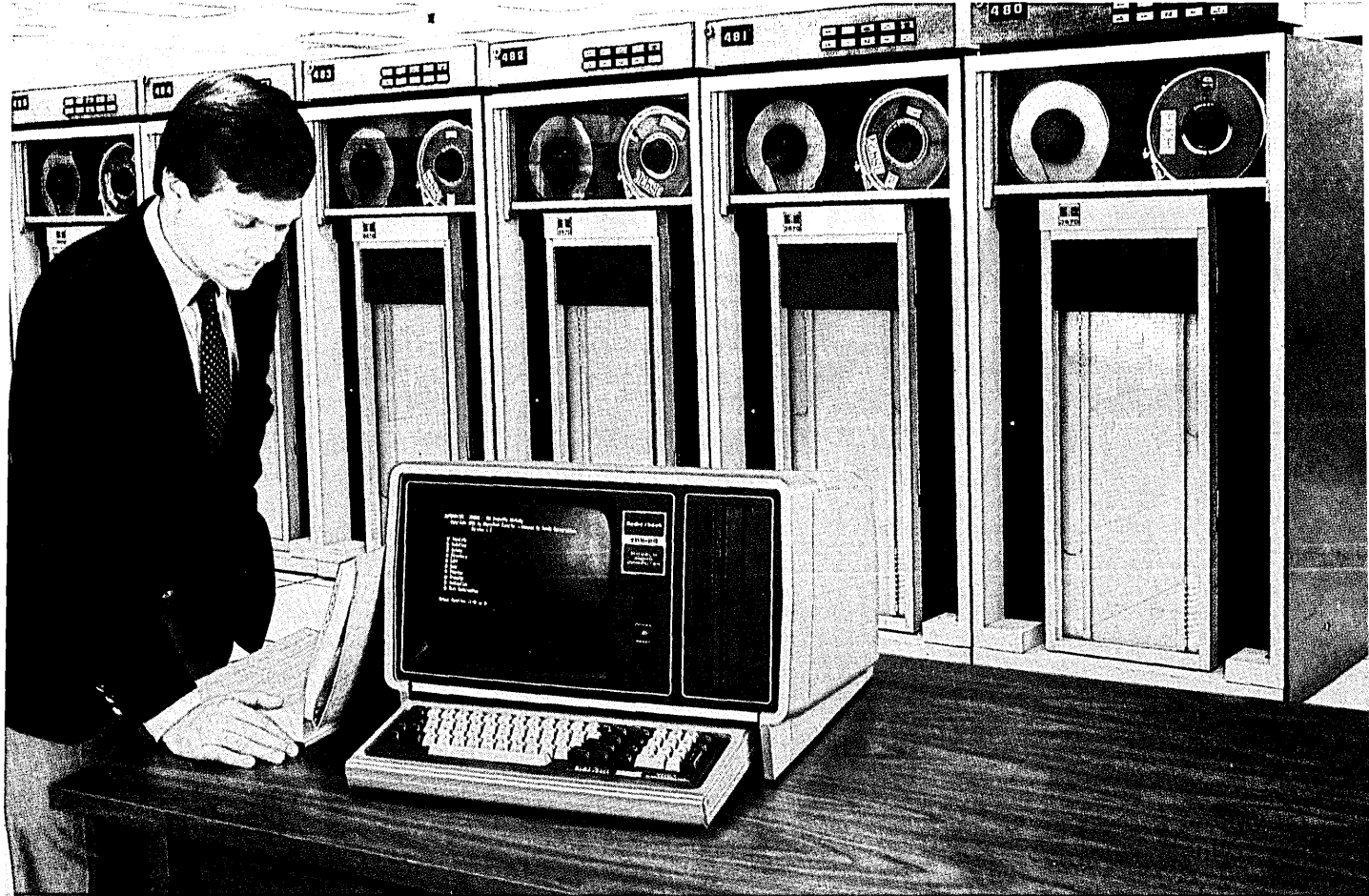
*European revenue, FY 1981

The only true newcomer to the Top 25 list is Wang, which shows up in the 23rd slot now that word processing revenues are included in our definition for the DATAMATION Top 25. The entry of Philips and Wang means that two companies have been pushed off the bottom of the table—the French software house CISI and the American plug-compatible manufacturer Amdahl. Burroughs' complete takeover of Memorex and Datasab's amalgamation with parts of its parent LM Ericsson portend some more dramatic changes in position for 1982.

Over the past year enormous changes have been wrought in the French dp industry as a result of the Socialist government's nationalization program. In the works since July 1981, the nationalization plans were finally approved last February. Negotiations on the details are likely to continue for a long time, and the reverberations from the nationalization effort on the European market as a whole are bound to affect the industry for some time to come.

The French government now has overall control of the three largest corporations that have electronics interests: Thomson-Brandt, with its subsidiary Thomson-CSF; Compagnie Générale d'Electricité (CGE), parent of CIT Alcatel; and Saint Gobain, with its affiliate Cii-Honeywell Bull. Honeywell's stake in Cii-HB has been reduced from 47% to 19%, and the government wants to take a 51% controlling interest from ITT in Compagnie Générale de Constructions Téléphoniques.

The past 12 months have been far from easy for those French companies caught up in the turmoil and uncertainties of nationalization. Even after the final nationalization



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CIRCLE 98 ON READER CARD



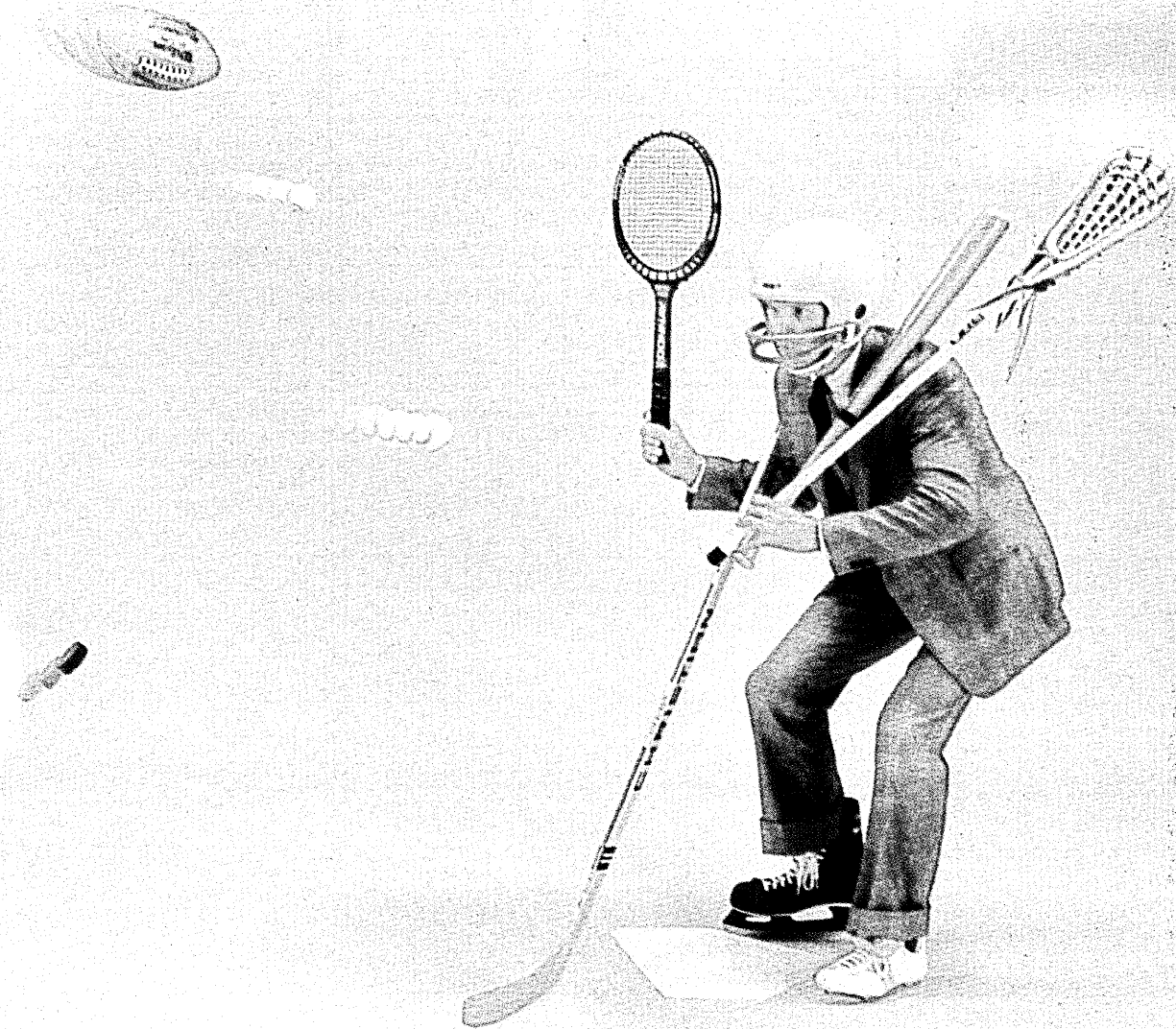
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 CONTROL DATA CORPORATION

CIRCLE 99 ON READER CARD

Around the world, 1981 was office automation year.

DATAMATION'S EUROPEAN TOP 25

1981 RANK	COMPANY	1980 RANK	PARENT COMPANY HQ	EUROPEAN DP REV. CAL. YR. 1981 (IN \$ MIL.)	% CHANGE EUROPEAN DP REV. FY 1980/81 (IN \$)	%CHANGE EUROPEAN DP REV. FY 1980/81 (IN ACCOUNTING CURRENCIES)	DP REV. DOMESTIC (PARENT CO.) FY 1981 (IN \$ MIL.)
1.	IBM	1	U.S.	8,846	- 6	- 6	16,945
2.	Cii-Honeywell Bull	3	France	1,311	- 9	+17	754
3.	Siemens	2	W. Germany	1,296	-15	+ 4	*
4.	Digital Equipment	8	U.S.	1,162	+38	+38	2,631
5.	ICL	4	U.K.	1,067	-11	- 5	826
6.	Olivetti	5	Italy	1,006	+15	+52	*
7.	Sperry Univac ¹	6	U.S.	850	+13	+13	1,737
8.	Control Data	9	U.S.	765	+0.1	+0.1	*
9.	Phillips ¹	n/a	Netherlands	750	*	*	*
10.	Burroughs	10	U.S.	742	+ 1	+ 1	2,037
11.	NCR	7	U.S.	728	-10	-10	*
12.	Nixdorf	11	W. Germany	678	- 4	+21	292
13.	Hewlett-Packard	12	U.S.	604	+ 8	+ 8	*
14.	CIT Alcatel	14	France	556	+13	+30	*
15.	Honeywell Infor. Systems	15	U.S.	497	+ 1	+ 1	*
16.	Thomson-CSF	13	France	460	- 7	+19	*
17.	ITT	24	U.S.	233	+47	+47	*
18.	Rank Xerox ¹	18	U.S.	219	-14	-14	467
19.	Ferranti	20	U.K.	213	+39	+29	*
20.	Kienzle	19	W. Germany	207	-0.5	+ 5	139
21.	Datsaaba	17	Sweden	203	+ 5	+25	136
22.	Plessey ¹	16	U.K.	203	+ 5	+ 8	189
23.	Wang	n/a	U.S.	201	+34	+34	701
24.	Data General	22	U.S.	171	+0.6	+0.6	478
25.	Memorex ¹	21	U.S.	158	-10	-10	*

n/a Not applicable

*Not available

¹Estimates

legislation was announced, it was still unclear what the government's industry plans would be. Under these circumstances, management has had little incentive to draw up strategy plans, and foreign customers have hesitated before buying their goods. U.S. and Japanese competitors did not miss this chance to make marketing inroads. The French firms, as a result, will have considerable ground to make up.

Back in the U.K. things were looking better for ICL at the end of 1981. In 1982 ICL is believed to be trading profitably and by 1983 it is expected to show an overall profit. The new management team of Rob Wilmott (managing director) and Chris Laidlaw (chairman) has breathed new life and dynamism into the old ICL, which seemed to have lost all motivation and sense of direction.

Significant changes have been made, including mass layoffs and plant closures, rationalization of product ranges, and deals with a number of manufacturers, notably Fujitsu, Three Rivers, Mitel, Sinclair, Rair, and Logica. These agreements are expected to fill in gaps in ICL's product line. Although ICL

slipped into fifth position in the 1981 DATAMATION Top 25, it may well move back up the chart to join the leaders by 1983.

The merging of Datsaaba with two divisions of its parent LM Ericsson to form Ericsson Information Systems (EIS) may signal the emergence of Sweden as a major power in the European dp industry. Revenues, coming mainly from office automation equipment and telecommunications expertise, could reach \$550 million in 1982. This almost doubles Datsaaba's previous sales figures and could mean a jump of several places in next year's DATAMATION Top 25 table.

As was true in 1980, no Japanese company has broken into the ranks of the European Top 25. Several European companies, such as ICL and Siemens, however, are selling Japanese mainframes under their own labels. Most of the Japanese manufacturers have set high export targets for the latter part of the 1980s. Nippon Electric (NEC) plans to be exporting 40% of its production—roughly \$455 million worth—by 1985. Hitachi and Mitsubishi both hope for 10% in 1983. Fujitsu, the largest Japanese exporter, sells

mainframes directly to Australia, Spain, and the Far East and indirectly in Europe through Siemens and ICL. It already sells subassemblies to Amdahl and will do the same for ICL for its Estriel machine. Fujitsu's 1981 exports totaled \$264 million—13% of its output. Exports are expected to grow 30% to around \$900 million in 1985. It is easy to predict that Japan Inc. will soon make an appearance in the DATAMATION Top 25—and apparently with an open invitation from most European manufacturers.

If 1982 is information technology year in the U.K., 1981 must have been office automation year around the world. The press was swamped with announcements from almost every major and minor manufacturer, detailing their electronic office strategies and plans. Despite the fact that very few of these announced products are likely to be automating anyone's office any time soon, enthusiasm was boundless and anyone without a publicized electronic office game plan was considered to be out of the race. The DATAMATION Top 25 celebrated this phenomenon with the entry of Wang into its ranking. Some

DP REV. WORLDWIDE FY 1981 (IN \$ MIL.)	TOTAL REV. EUROPE FY 1981 (IN \$ MIL.)	TOTAL REV. WORLDWIDE FY 1981 (IN \$ MIL.)	% CHANGE IN TOTAL WORLDWIDE REV. 1980/81	TOTAL NET INCOME WORLD- WIDE FY 1981 (IN \$ MIL.)	% CHANGE TOTAL NET INCOME WORLDWIDE FY 1980/81	TOTAL WORLDWIDE EMPLOYEES	YEAR ENDING
29,070	8,846	29,070	+11	3,308	- 7	354,936	Dec.
1,352	1,311	1,352	- 9	- 79	- 284	21,198	Dec.
1,330	10,917	15,854	-12	234	- 34	338,000	Sept.
3,198	935	3,198	+35	343	+ 37	66,000	June
1,513	1,134	1,513	- 6	-117	-392	24,625	Sept.
1,436	1,748	2,540	-0.2	*	*	53,471	Dec.
3,039	1,737	5,427	+ 8	*	*	*	Mar.
3,101	765	4,163	+ 9	171	+ 13	60,627	Dec.
*	9,500	16,964	- 8	143	- 17	348,100	Dec.
3,405	742	3,405	+17	149	+ 82	66,900	Dec.
2,838	904	3,433	+ 3	208	- 19	65,000	Dec.
856	678	856	+0.1	18	- 57	14,760	Dec.
1,771	1,205	3,578	+15	312	+ 16	64,000	Oct.
*	1,711	1,976	+10	*	*	40,000	Dec.
1,634	985	4,925	+ 9	259	- 10	29,000	Dec.
*	2,521	*	*	*	*	8,350	Dec.
528	9,700	23,200	- 3	677	- 10	324,000	Dec.
817	2,332	8,691	+ 6	598	+ 6	120,981	Dec.
249	555	634	+35	38	+ 78	6,153	Mar.
217	402	402	+0.5	*	*	8,700	Mar.
231	203	257	- 7	*	*	3,550	Dec.
301	1,413	1,973	+21	130	+ 45	47,339	Mar.
856	172	856	+58	78	+ 50	15,700	June
737	167	737	+13	51	- 7	14,920	Sept.
452	243	695	-10	*	*	*	Dec.

estimates pinpoint word processor sales growth as high as 50%, and major companies such as IBM, Wang, Xerox, and Philips are likely to be the main beneficiaries.

METHODOLOGY

Information for the European Top 25 survey was solicited through a questionnaire. For the purposes of the survey, Europe was taken to include Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the U.K. Dp and related activities were defined as covering the following product areas:

- Mainframes
- Minicomputers and microcomputers—computers with a minimum of system software—and small business systems and personal computers
- Terminals and peripherals—all those connected, either directly or via data communications links, to a dp system
- Software and services: bureau services, database services, software packages, etc.

- Word processing equipment
- Data communications equipment, including data connections (modems and equivalent) and communications processors (multiplexors, concentrators)

The following products were specifically excluded: general office equipment, electronic cash registers, electronic and magnetic card typewriters, instrumentation, dp supplies, and switching equipment supplied to PTTs for their data services.

The main ranking was based on 1981 calendar year revenues (in U.S. dollars) from dp operations in Europe for each company. Figures for companies whose fiscal year did not end December 1981 were adjusted, using published quarterly figures or estimates. All other figures appearing in this survey relate to the companies' reported results of their fiscal year ending 1981. In the main table, all results have been converted to U.S. dollars, using OECD exchange rate statistics for the appropriate time period. An additional column showing growth rates in actual accounting currencies has been included this year, due to the anomalies produced by fluctuating exchange rates.

While the 1980 ranking was correct, any inaccuracies uncovered in last year's table have been corrected and used for calculating the 1981 growth rates. Total revenue figures for Europe and worldwide refer to the parent company, where appropriate. When the parent company itself is not strongly involved in dp, the principal company has been considered as independent. Anomalies in the figures are inevitable since some companies do not give a revenue breakdown for the appropriate categories. Estimates were used for Sperry Univac, Plessey, and Rank Xerox because these firms did not provide answers to the survey questionnaire. *

DATAMATION's Top 25 survey was prepared by Logica, a London-based computer system and software house. Logica provides marketing consultancy services for the computer and communications industries such as the Eurodata Reports on data communications and Tarifica on communications facilities.

Networking standards. Nobody keeps your options open like Digital.

By now, everyone understands the need for standard communications protocols. Without them, an electronic Tower of Babel would surely ensue. But there have to be different standards for different networks. A local-area network is different from a wide-area network. A public network is different from a private one.

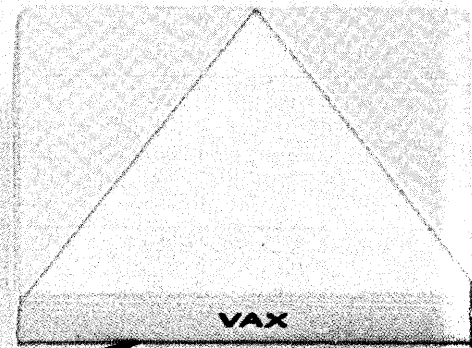
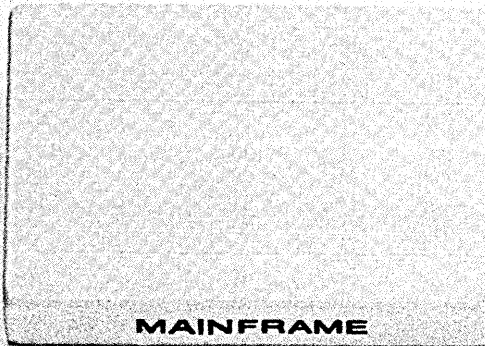
No single universal standard has emerged. Nor is one likely to. There are simply too many diverse networking environments, each fulfilling specific, mutually exclusive needs.

That's why Digital is committed to supporting and, in fact, actively promoting the more important standards now surfacing in the various environments.

Our goal is to offer our customers a range of standards to achieve any combination of networking objectives. And we've been pursuing that goal for many years.

A forward-thinking strategy.

When we first developed our networking architecture, we understood the need for flexibility. We consciously adopted an architectural strategy that would allow our networking software to work freely with a wide range of protocols, including



some that didn't even exist at the time.

The success of that strategy is now becoming apparent. As more

vendors enter the networking field, Digital is uniquely positioned to offer compatibility with the emerging protocols. We've gone farther than anyone to assure that your options are open.

X.25 and other public networks.

Digital offers the X.25 protocol for use with public packet-switched networks such as Datapac (Canada), Transpac (France), and PSS (U.K.).

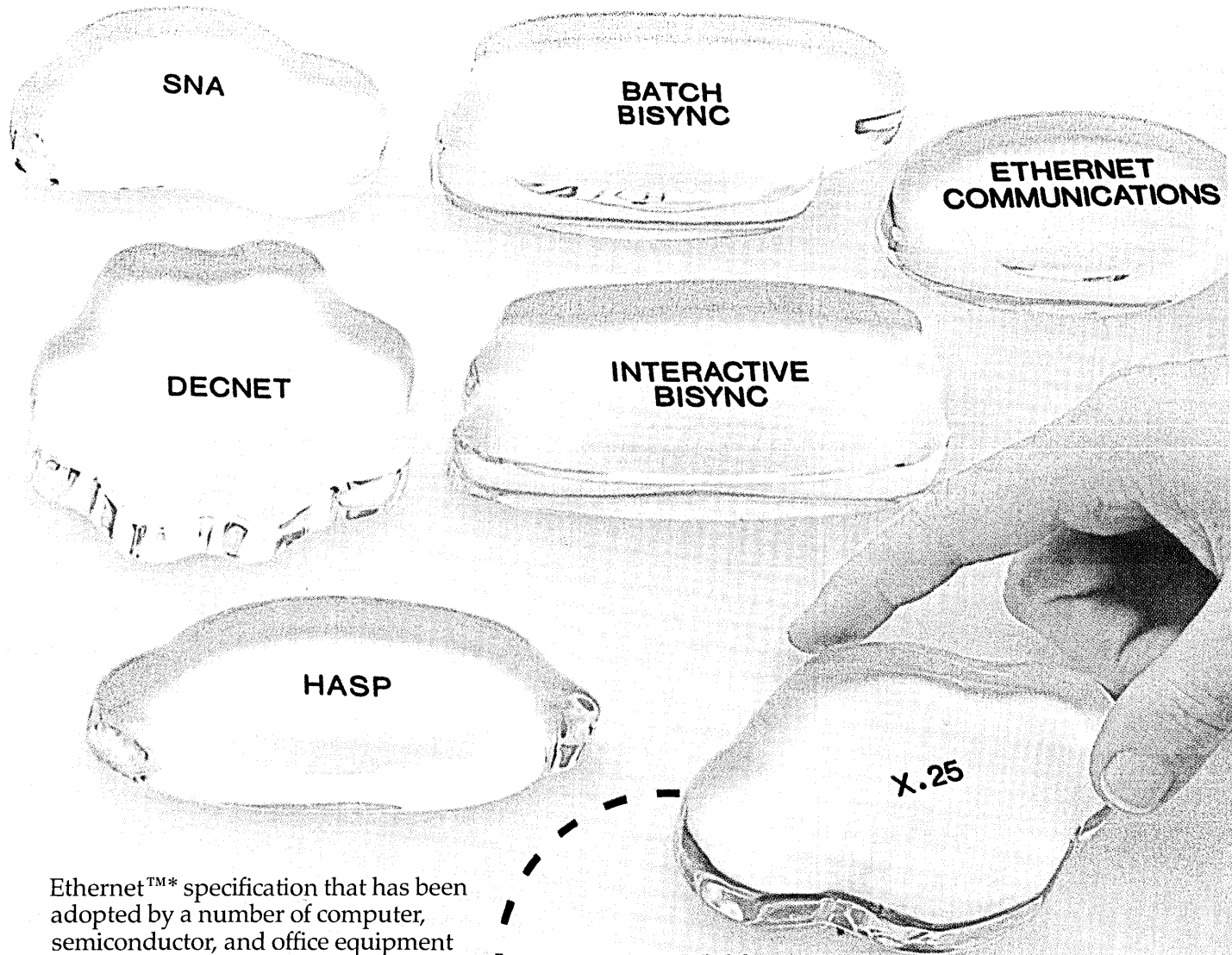
But when used with our computers, X.25 is much more than a simple link. We can provide you with the higher-level protocols that will take your systems beyond mere communications and into the sophisticated functionality that has made us a leader in networking software.

Hierarchical networks.

Even though we prefer to implement more flexible distributed networks, we are amply equipped to support SNA and related mainframe-oriented protocols such as Batch BISYNC, Interactive BISYNC, and HASP.

Local-area networks.

Digital is one of the original sponsors of the



Ethernet™* specification that has been adopted by a number of computer, semiconductor, and office equipment

manufacturers. We recognized early on the need for highly reliable local-area networks. We were in on the ground floor of the definition, development and, now, the implementation of the Ethernet specification.

Distributed data processing networks.

DECnet™ Digital's proprietary networking software, is based on a layered architecture. This is the same architectural approach followed in the model proposed by ISO. Our DECnet offers a wide range of quality networking products, products that allow such sophisticated options as adaptive path routing, down-line loading, and enhanced network management capabilities.

And so on.

We have listed a few of the many standards we are currently supporting. There are more.

But even more important than the number of protocols is the attitude we have toward them. We are determined to help you

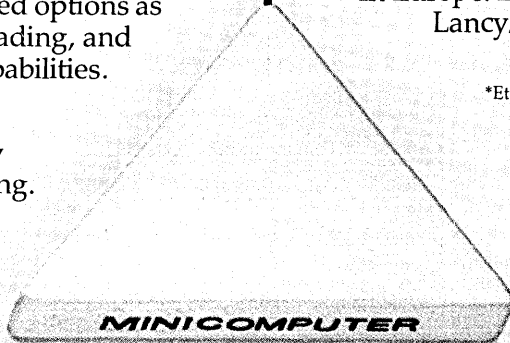
PROTOCOL

meet any kind of networking objective. And our capabilities in that regard are as far-reaching as they are farsighted.

So if you're planning a network, don't make the mistake of planning just for the present. Talk to the people who can meet your current needs and still keep your options open for the future. Talk to us.

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CIRCLE 101 ON READER CARD

Three associations currently compete to voice the industry's views in Washington. Are any of them worth their salt?

MAKING NOISE ON THE HILL

by Willie Schatz

Caesar would love it. Like a state-of-the-art Gaul, computer trade associations come in three parts.

The high-end mainframers are maintained by the Computer and Business Equipment Manufacturers Association (CBEMA). The mid-level manufacturers and pcms place their trust in the Computer and Communications Industry Association (CCIA). The software industry swears eternal devotion at the altar of the Association of Data Processing Service Organizations (ADAPSO).

Collectively, the troika claims to offer a most desirable Washington attribute: presence. Join us, they urge, and you shall have a voice in the affairs of disks and drives, not to mention the methods of buying and selling your product to the government. In bureaucratese, the latter is affectionately known as "procurement." In industry parlance, it's an unprintable. The three musketeers promise to do their damndest to render the federal procurement regulations intelligible, if not comprehensible.

They also pledge constant vigilance over the latest machinations of both portions of the legislature. Let senators and representatives beware, for one of the three is watching you. If the issue is sufficiently weighty, they may join forces, the better to convince the heretics. The electorate hath no fury like a trade association scorned, or so the associations would have joiners believe.

"Our members see us as the eyes, ears, and voice in Washington, which encompasses acting as the eyes, ears, and voice regarding the behavior of firms of government size that can influence the well-being of the industry," Jack Biddle, president of CCIA, says. "Or, I won't say firms. I'll say enemies, including the U.S. Postal Service, AT&T, IBM, the French government.

"If their moves are perceived by us to be counter to the interest of the industry, we see it as part of our charter to try to moderate

that behavior. The methods by which we moderate it may well involve anything from exposure of the issues to the press, to congressional testimony, to one-on-one meetings with the senior executive of a predominant entity to see if we can't gain an understanding of what's bothering us, gain an understanding of his perceptions, and see if we can't find a program where we can all be comfortable."

"CBEMA's principal activities are in the area of government relations," the organization's 1981 annual report notes. "The association keeps its members informed on issues and activities that affect the industry and its member companies, formulates and implements industry positions on these issues, acts as an industry spokesman, and represents its members before state and federal legislatures, regulatory agencies, commissions, and other bodies." Nice work if you can get it.

"ADAPSO has provided a forum for collective industry action to solve mutual problems and answer specific needs of the computer services industry," association president Jerome Dreyer writes in the 1981 annual report. "ADAPSO provides an opportunity for individual companies to leverage their concerns into industry action."

Thus do we have CBEMA four blocks from the Capitol and CCIA and ADAPSO a seven-minute drive across the Potomac River in Arlington, Va. None of the three were created in Washington. All knew other homes—CBEMA in New York, CCIA in California, and ADAPSO in New York and New Jersey—before acquiring the sine qua non of political life.

Yet talk is cheaper in the capital than anywhere. While presence may play in Peoria, it and 65¢ will get you a ride on Washington's clean, high-tech Metro subway. What you really want is clout. Then when you speak, they'll listen first and vote second.

"In terms of creating an image—con-

veying the issues of the information industry—none of the associations do that," a former communications attorney now working in the video field contends. "There's no framework for making people understand how important the computer industry is. When you have a positive, powerful image, someone voting on a bill is more likely to give you a yea than a nay. The computer industry doesn't have that yet.

"The budgets and salaries of officers of really high-powered associations are far more than any computer group's. Those companies are also much more concerned with their public image. Computer people don't understand the power of the press. They sell machines much better than they sell themselves. By and large Congress thinks of computers as blinking lights and disk drives. No one mentions Timex and IBM in the same breath. And almost all of them are trying to figure out what AT&T and IBM are doing in the same business."

"The current associations are absolutely not doing their job," a computer executive very familiar with the groups' operations says. "They're too narrow and too parochial. They have a one-year plan and nothing beyond. And there's something inherently wrong with how the trade associations function. It's not in the officers' interest to tell the members how it really is. If things are going well, will the association just sit there and make no noise? Of course not.

"Issues are overblown on purpose. They each lobby against each other's interest. The energy they waste could be put to much better use by presenting common issues and increasing the market share of all. But they aren't doing it. The result is no progress."

LET'S LOOK AT THE RECORD

Before a word or several hundred from the dissenters, let us look at the record. CBEMA is in its second reincarnation. It was created in 1916, a year the group calls "the dawn of the office equip-

"There's no framework for making people understand how important the computer industry is."

ment age," as the Office Equipment Manufacturers Institute (OEMI). In 1961 it became the Business Equipment Manufacturers Association (BEMA). Twelve years later it added the initial consonant "to more accurately reflect the dramatic changes in the industry."

Membership is open to manufacturers of data processing or business equipment and associated products. CBEMA currently has 39 members, some of which, such as IBM, DEC, Xerox, Honeywell, Burroughs, Sperry Univac, and Control Data, may ring a bell or two. Its members account for more than 80% of the computers and business equipment manufactured in the U.S., and their revenues exceed \$50 billion.

CCIA was born in 1972 "because IBM was kicking the hell out of us," as Biddle cheerfully confesses. Seven stompees—Telex, Intel, Memorex, Mohawk, Storage Technology, CalComp, and Gene Amdahl (who had not yet incorporated)—banded together as the last line of defense against Armonk. They prevented the blue meanies from overrunning their piece of the planet and simultaneously made their adversary see red. Membership has increased tenfold, we're told, but the names thereof are for select eyes only. This pair was not so privileged, but can reveal that, per "Why CCIA?," the group's recruiting brochure, 74% of members participating at meetings are chairmen or presidents and 32% are listed on the New York Stock Exchange. Members made public include Mohawk Data Sciences Corp., Pertec Computer, National Data, and Rolm. We're also told that 19% have annual revenues between \$201 million and \$500 million.

While CCIA and CBEMA covet some pieces of the same turf, ADAPSO flies solo in the services industry. The group was formed in 1961 by service bureaus that could "deliver an information product quickly and cleanly that increased the efficiency of operations and saved money for their clients." So says the 1981 annual report. There are 533 members, some so small as to be no more than a gnat on CBEMA's collective nose. The print-out of names consumes 22 pages. Some of the associate members—Merrill Lynch, Salomon Brothers, and Tucker Anthony & R.L. Day—are larger than most of their nonassociated brethren.

Now, as it must in Washington, comes the ubiquitous bureaucracy. Despite their allegiance to that big free enterpriser in the sky, the triumvirate has fallen prey to the inevitable. None are yet rivaling the Pentagon for office space, but neither are they corner computer stores.

CBEMA's board of directors, to which any member company may belong, determines overall policy and goals. Those are implemented in the nine-to-five world by the Joint Plans and Policies Committee. That

group, in turn, delegates the minutiae to seven standing committees. Four councils provide an intercompany information exchange among management personnel from member companies who have similar responsibilities. The group since 1961 has been secretariat of the American National Standards Institute's X3 (Computers and Information Processing) and X4 (Office Machines and Supplies) committees.

The CCIA board also is open to all. Once that group has finished its deliberations, the Executive Committee takes command. It retains most of the control over the association's activities, parceling some, but not much, to the six committees comprising the internal structure.

If ADAPSO's board were available to each member, it would have to hold its meetings in Madison Square Garden. So the group has gone macro. Eight officers, seven vice presidents of standing committees, three section presidents, and 10 directors practice mob control. The masses seem more than satisfied to this point.

None of this comes gratis, of course. As in the rest of life, money talks. But unlike the income tax system, there is rhyme and reason to the three dues scales. CBEMA charges \$130 per \$1 million in gross domestic sales. Members cannot pay less than \$2,000 nor more than 30% of the association's income. CCIA hits you up for \$3,000 plus \$110 per million of annual worldwide revenues. Payment stops after \$30,000. Membership cards in ADAPSO cost as little as \$400 or as much as \$62,000, based on the preceding year's revenue in the services business.

"In this industry dues represent virtually all of the association's income, compounded by the fact that you have multiple overlapping trade associations," CCIA's Biddle explains. "That results in a degree of competition between the trade associations to attract each other's members, because no member can afford both the time and money to support all of them, even though he thinks there's merit in all of them. So each tries to outshine the other in terms of their questions."

WHICH IS THE GROUP FOR YOU?

or services division of a conglomerate or multinational, doesn't have much to think about. It's ADAPSO all the way. But a pcm manufacturer or hardware company doesn't have it so easy. CBEMA and CCIA may put on happy faces in public, but there is intense competition behind closed doors.

The literature of both groups is replete with implicit come-ons. CBEMA "was one of

the leaders," "provided major supports," "has been out front," "stood out as the voice of reason and statesmanship," "worked to offset and correct," and "expects to play a significant role."

CCIA strikes back with "established access and expertise," "widely respected as a credible, pragmatic source of industry views," "established track record of anticipating developments of strategic importance to the industry," "access to key Washington policymakers," and "focuses directly on the unique problems of the computer and communications industry."

"We'll leave the prospect to make the judgment himself," Biddle says. "We compete, but we compete on results. I want company X, which is a member of another association, not ours, to begin to wonder why his association is not doing something about this issue that's a gut issue to him, and we are. Now, he has two choices. He can go back and change what his association does, maybe, or he can conclude it can't be changed for various reasons and go elsewhere. A lot of our membership has been elsewhere, then joins us because they think we're more attuned to the realities of the industry."

"We compete some with CCIA, but we work with them as well," CBEMA president Vico Henriques says. "The competition is another popular myth to be dispelled. When we've got an issue that really needs the troops drummed up, letters written, and so on, we go to them and we say, here's the issue, here is what we think, here is the position favored, and the suggested letter. What do you think?"

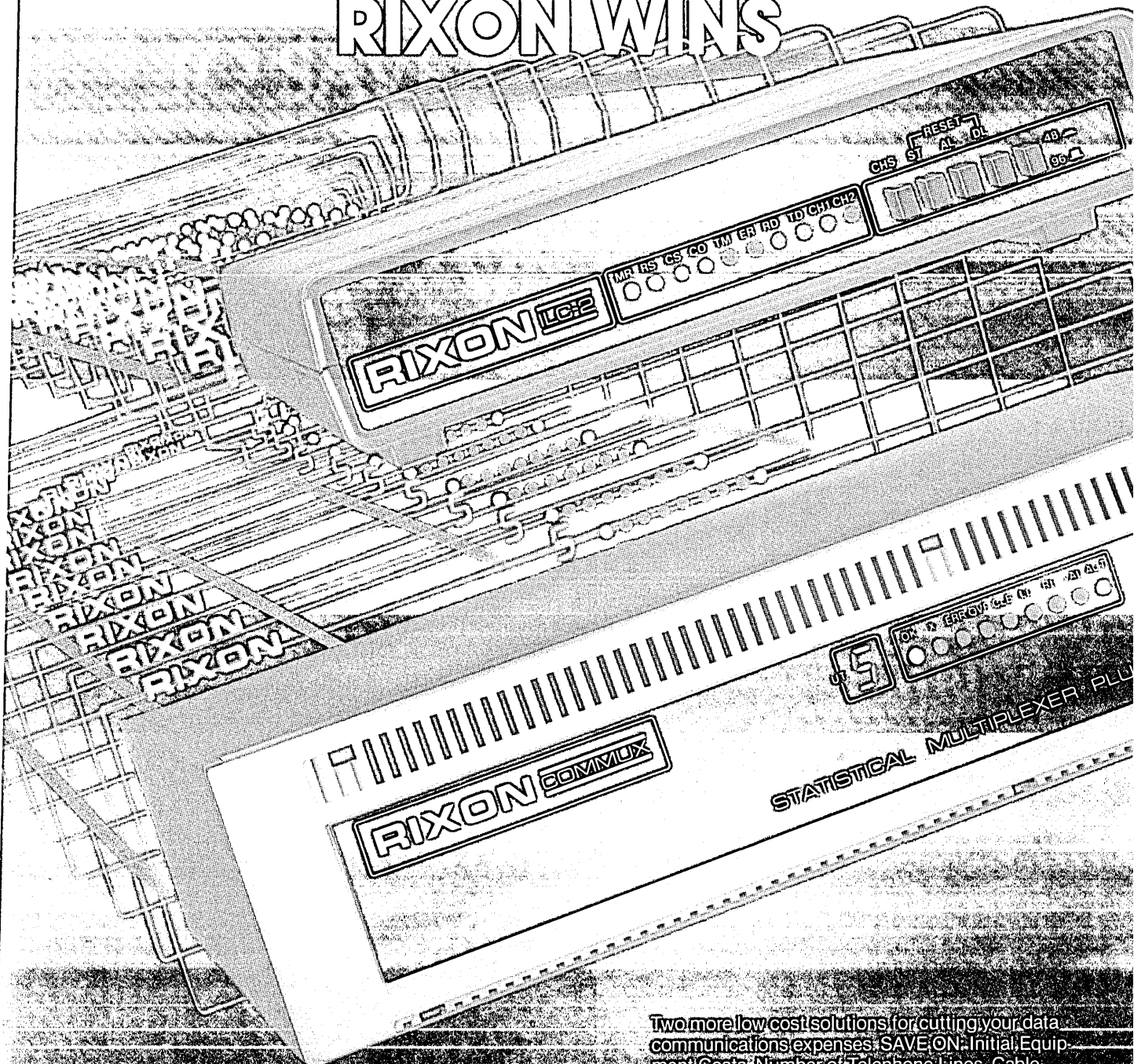
Most often, not much of what's proposed. There are three capital letters preventing better harmony among the pair. Asking CCIA to join forces with a group including IBM is not unlike Ronald Reagan seeking economic guidance from Lester Thurow.

"We [the original seven members] had to do something. We thought we were all going to be put out of business by IBM," recalls Dan McGurk, CCIA's first president and now an investor. "We weren't sure it would do any good," he admits, "but we knew if we didn't try it we'd never forgive ourselves."

TIME FOR CONCERTED ACTION

With little to lose, CIA (the communications "C" was added in 1976) minced no words. "The financial, technical, and marketing power of that one company [IBM] has been so vast as to prohibit the development of meaningful competition," thundered the first newsletter of Oct. 15, 1972. "The time has come for concerted action. It is a time to stop being divided and conquered. It is a time to work together for a more competitive industry."

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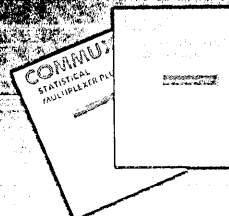
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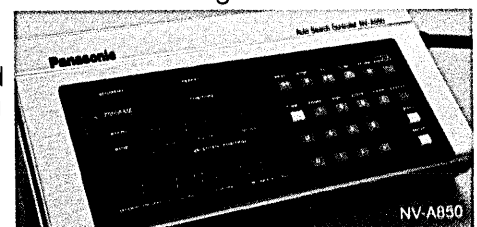
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Player/Recorder

NV-A850
Auto Search Controller

even pre-program it to automatically play back up to 15 segments in any order. The NV-A850 features LED readouts in hours, minutes, and seconds, as well as fast forward, rewind, pause, stop, and frame advance.

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To help you edit material exactly the way you want to present it, the Panasonic NV-A960 Editing Controller (optional) interfaces directly with the NV-8200 or NV-8170 so you can perform 1/2" to 1/2" assemblies. Or perform 1/2" to 3/4" edits. Accurately. And fast.

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The NV-8200 and NV-8170 are designed to stand up to rigorous use with critical components mounted on a rugged an-nealed aluminum die-cast chassis. And for low jitter and excellent picture stability, both decks feature a direct-drive video head cylinder and capstan servo. Both decks also have tough crystal-oriented HPF™ video heads. The results: A signal-to-noise ratio of 45 dB, horizontal resolution of 300 lines black and white and 240 lines color,

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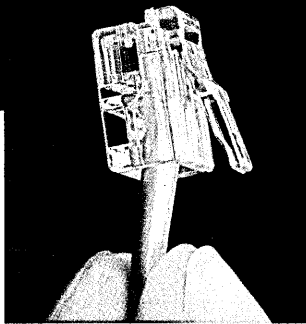
Perhaps the best part of

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CIRCLE 103 ON READER CARD



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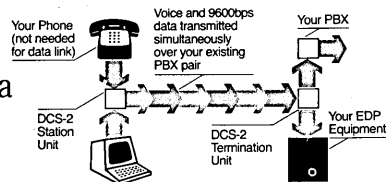
right under your nose? If you're tired of the endless hassle of expanding your local area network—not to mention the expense of installing cable and limited distance modems—Teltone has some very good news for you.

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CIRCLE 104 ON READER CARD

Asking CCIA to join forces with a group including IBM is not unlike Ronald Reagan seeking economic guidance from Lester Thurow.

Thus did CCIA become known, not without good cause, as a one-track organization. A suggestion that this remains the predominant view of the outside world was not well received.

"Totally false," Biddle claims. "We haven't mentioned IBM in the press for five years. In the early days we were a real pain. And we still are. They don't like dissent."

They don't seem to like Biddles, either. When Biddle's son was attempting to find work last summer ("being an entrepreneur," his father called it) and stopped at an IBM sales office to offer his painting talents for hire, the receptionist took one look at his résumé and said, according to the senior Biddle, "Are you related to Jack Biddle of CCIA?"

"When a receptionist is that attuned to us," Biddle says, "you know there's been some dissemination of views about us as recently as last year. I admit Tom Barr [chief counsel for IBM's antitrust defense] hates my guts. We're responsible for causing the Telex vs. IBM case to be held with open doors and not in a sealed courtroom, as IBM asked for. We made the documents available free to the press and to others for our cost. [The latter, according to McGurk, received the materials at considerably more than cost, providing a desperately needed financial windfall.] Tom Barr, I'm sure, was severely chastized for being outmaneuvered in the courts by this little, upstart, seven-member organization."

Barr may have heard it from the home office, but not from CBEMA. If CCIA is viewed as IBM's mortal enemy, CBEMA is seen as its marriage partner. When IBM plays, CBEMA dances, or so the prevailing perception holds. Of the 39 members, 38 are presumed to weigh less than one. With the industry's deepest pocket, IBM can send in waves of reinforcements while others are barely holding the fort.

"There is absolutely no structural evidence that we are IBM-dominated or IBM-run," Henriques counters. "They have one vote. They are restricted in the amount of money they can pay into the association. No, no one else pays as much as they do, but some people pay almost as much.

"Certainly, they have resources beyond belief and personnel strength that goes on forever. But our members constantly say that in 95% of the cases, the stuff their guys do is very good. And if we had done all the work we'd be in agreement with them. If the work done is professional, good, and representative, they buy it. And these are people who watch IBM like hawks. They sue them probably once a week or so."

"I think that's total b.s.," concurs Maury Longsworth of Honeywell, chairman of CBEMA's international trade committee. "It's a smokescreen. Everyone has veto pow-

er. All you have to do is object strongly and you can stop something. Besides, how can you be 70% of the industry and look like you have 10% of the influence?"

Aye, there's the rub. You can't. Imagine how the rest of the telephone business feels when AT&T comes to play. But influence is everyone's field. The name of the game is how to get what you want and prevent your opponent from getting his heart's desires. Winning may not be everything, but it beats the hell out of losing.

BUSINESS NO LONGER SILENT

No longer is business the strong, silent type. Staying in the background is strictly for extras. Each association has its own rules for playing the game. Each believes it does so successfully.

"For the last three years we have been much more aggressive on Capitol Hill," ADAPSO's Dreyer says. "We've just gotten a professional government relations director. We're looking for things instead of being in a reactive mode. We know the competitive and international arenas extremely well now. We try to alert our members before something happens. We'll flush something out and bring it to their attention.

"But without credibility it wouldn't matter what we did or how we did it. We've shown that we are knowledgeable and effective. We don't have to call the Hill any more. They call us."

When ADAPSO answers, its course of action is predetermined. The board of directors has set a long-range plan, which has been implemented by an appropriate committee. That committee operates by consensus, defined as a quorum.

CBEMA spells consensus similarly, but defines it differently. It means either near or complete unanimity, depending upon the timeliness of the issue and the tenor of the debaters. Combine that need for harmony with the basic conservatism of most of its members and you see why it has often been difficult for CBEMA to make felt what on paper is its considerable weight. Some, who shall remain nameless, say there is madness to the method and it causes temporary paralysis.

"In some instances that's accurate," Henriques concedes. "But what you don't see is the 97% of the other things that go on where there is consensus so that things just keep rolling. The only issue I can think of that paralyzed us was the telecommunications position relative to the legislation. But when there is an internal squabble or a lack of consensus, then everybody is going to say we're not doing anything."

Some would submit that that is the association's usual position. "Most people on the Hill don't even know who Henriques

is," the former communications attorney says. "They're quietly professional," the computer executive says. "But they need to be at a higher energy level. They probably can still speak more effectively, because money talks. But they could be much more influential if they were more visible."

"We'd rather be effective, necessarily, than noticed," Henriques says. "We were invisible for a while. But as the membership realized what was going on, what was needed in Washington and that we would not go out and stumble over our shoelaces, they said, okay, go out and raise your head a little bit, be more visible.

"But I'm not out beating the bushes for issues because if I don't find any then they're going to fold the thing up and go away because it's not serving them. To continue to be effective, you have to be trusting. There are two ways you can go at it. Kick the door down or have the guy come over and work the thing through. We don't stab people in the back. We play it out front, very openly. We try to be diplomatic, thorough, and statesmanlike. We hardly ever get incendiary or inflammatory. When we decide to join an issue we have no problem being heard or understood. And we have an influence proportional to what we represent."

NO TIME FOR THE NICETIES

Born of defense, desperation, and discord, CCIA had little use and less time for procedural niceties. It touts the speed with which its executive committee, composed only of the main man in the organization, makes decisions as the cure for CBEMA's perceived disease. It promulgates its 74% chairman/ceo body count as more weighty in a congressional or agency witness chair than the masses below.

"We're not built on a hierarchy of committees that look at legislation, think about it, come back in a few months, and decide to support or oppose it," CCIA's Biddle says. "I'm like a division that's responsible for Washington. I see something, I act on it. The key is having a high degree of authority to represent my members without committee or other input. And we're not faced with a situation where one member has a big chunk of the budget and if that member walks, the association collapses.

"Our job is an early warning system for the industry. We're the guys who say, hey, the sky is falling. What's happened is they've begun to find out that when we said it was going to fall, it did. In that sense I think we have gained credibility; when we raise an issue it's not a phony one to build our membership. It's a real gut issue, and we're going to fight it."

"CCIA knows how to make noise on the Hill," the former communications attor-

"I don't think we're ready for a super trade association. I think we're probably ready for a series of alliances or federations."

ney agrees. "But they're screamers, always taking cheap shots and crying wolf. Most people on the Hill say, 'Jesus, here's Jack Biddle again.'"

"CCIA should be doing far better than it is," the computer executive maintains. "Some people feel CCIA has not always served the best interests of its members. It's abdicated to Biddle the right to decide what ought to be pursued. He is CCIA. He knows how to make himself heard on the Hill. But is he leading or following the political process? Is he looking at the problems of the ceos or just raising hell on the Hill for himself?"

So, after much time, energy, testimony, communication, and enough trade associations to make a year's supply of alphabet soup, "the computer industry" remains—despite its economic significance—relatively silent. While the subsets and subgroups and classes and manufacturers and vendors preen, strut, and promulgate their best inter-

ests, no part has accepted responsibility for the whole.

SINGLE GROUP PROPOSED

There is one that would do so. Whether it will is the next question the industry must answer. During his group's spring meeting, CBEMA chairman and Univac exec Glen Haney proposed an association "whose objective is to reach out to the breadth of our business and to represent it." The new creation would unite the various fiefdoms, feuding and friendly, into a single entity that would give the industry the clout it deserves.

To say the ensuing reaching out has been tentative somewhat overstates the activity. Haney first proposed the idea to CCIA, which was and has been lukewarm to it. Dreyer and friends are not interested, but the ADAPSO leader had initiated discussions between groups sharing what seemed to be

common goals. The theory behind the talks was establishing a framework for collective action when a common foe—oh, let's say AT&T—brought its influence to bear on a particular issue. The reality in front of the talks was that everybody lost interest after two sessions, and Dreyer suspended further negotiations.

"I think you need several associations to keep the Hill honest," Dreyer says. "But there's no reason why we can't coalesce where we have common interests. We're all dwarfs compared to AT&T. A super association wouldn't really help us much because we're such a separate part of the industry. But we ought to ensure good relations with other associations that have a commonality of purpose."

"I still think it [an industry-wide association] basically makes sense," Biddle says. "But in ADAPSO and CBEMA you have strong, entrenched committee structures, where the senior association staff performs a secretary function of simply carrying out the instructions of the committees. My style makes the committee-oriented associations nervous. All these vice presidents don't like the idea that their power and stature go down. We don't operate that way."

"I think it could be structured as a President's council, which is what we proposed. But the question is still top down and bottom up and the special interest groups. Let's face it, the hardware manufacturer could care less about Citibank going into the dp business. And I don't think the bulk of our members would condone a merger with CBEMA if IBM were to continue to be the dominant power."

"I don't think we're ready for a super trade association," Henriques says. "I think we're probably ready for a series of alliances or federations. It's a maturation process. If you look at what steel does or automobiles or petroleum, they do it better than we do it. The information industry is not a cohesive group. And we're not mature."

"You look at the IEEE, the ACM, the DPMA. They're off like skyrockets. They all have their own pet thing going. There's no body, there's no structure to what it is they're doing or what they're worried about. I don't even think the software houses are organized. You talk to one, he says talk to another," says Henriques.

ALLIANCES FORMED AS NECESSARY

The immediate future holds no promise of the industry's equivalent to the American Petroleum Institute or Iron and Steel Institute. The outer limits will be an issue-by-issue canvass and the formation of alliances as necessary. As those bodies metamorphose from strange to familiar, with more and more participants in



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SCIENCE/SCOPE

Electronic circuits as complex as 100 Los Angeles street maps printed on a thumb tack are being developed for military systems of tomorrow. The so-called Very High Speed Integrated Circuits (VHSIC) will give military electronics systems a tenfold increase in data processing capability. These "super chips" will be more reliable and need less power than the integrated circuits now in use. Hughes is one of six firms involved in a tri-service program to develop VHSIC. In addition to developing chips for various high-speed signal processing uses, Hughes will develop the VHSIC high-speed electron-beam lithography system to process the chips, a requirement of all VHSIC contractors. Hughes also will build a demonstration processor for a two-way system for Army troops to communicate among themselves and find and report their positions automatically.

A new PIN diode switch that achieves full band performance at either K or Ka band has joined the Hughes line of millimeter-wave transmitter products. The switches are single-pole, single-throw reflection type switches. They use advanced propagation techniques to cover full waveguide bandwidths. Minimum guaranteed isolation is 20 dB with associated insertion loss of less than 1 dB over the full K band and less than 1.5 dB over the full Ka band. Switching speed is less than 5 nanoseconds if switches are bought with a driver.

Multilayer printed circuit boards with up to 10,000 terminations are now being tested at a high rate and with minimum cost by Cinch-Graphik, an operation of TRW Electronic Components. The company uses a Hughes FACT® (Flexible Automatic Circuit Tester) system. The analyzer is completely programmable, with random access switching for automated continuity and leakage testing. In its semi-automatic mode, the system can test forty 6,000-termination multilayer boards per hour versus just 200 to 250 terminations by the old manual method. Also, the FACT system eliminated inspections based on a statistical sampling procedure because it can test every board in a fraction of the time previously needed.

New fiber-optic connectors feature superior characteristics to meet stringent military requirements. The connectors' ultra low insertion losses and excellent durability have been proven in testing of 1000 mating and unmating cycles. A combination of split tube and special bushing provides for precise axial and angular alignment as well as interface gap control. A single connector can accommodate fibers ranging from 100 microns to 1.16 millimeters in size. Several types of standard connectors are available.

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“Without credibility it wouldn’t matter what we did or how we did it,” ADAPSO says. “We don’t have to call the Hill any more. They call us.”

the same place on the same issues, a single, egalitarian group may emerge.

Until then, members must continue to place their faith in those to whom they write their dues checks. But not to worry. Objections to the associations’ performances are rarer than liberal Dixiecrats.

“ADAPSO does a lot for me and my industry,” swears Marty Kogon, president of National Dynamics in Smyrna, Ga. “It’s totally fulfilled its obligation of promoting awareness that there is a dp service business. Before ADAPSO, people only thought about hardware. That recognition has come about through the efforts of the association. Having that expertise available for image enhancement, advocacy relationships, or lobbying, not just to win points but to explain to little companies like mine, is tremendously important. It’s been terrific for us.”

“CCIA is doing very, very well,” says Steve Keane, president of the Sorbus Division of MAI. “You get presence in Washington for a small amount of dues. The association is stronger than one company, and people listen much more than they would to an individual. It gives you quick action when you need it. It’s definitely on the right path.”

“CBEMA is doing an excellent job,” Honeywell’s Longworth says. “It’s very professional and well respected. Could we be doing more? Of course. Couldn’t everybody? But I like where we are now and where we’re going.”

Where the trio, and the industry as well, is going is international. Such issues occupy more than half of CBEMA’s time. ADAPSO is focusing heavily on the international ramifications of its activities, and CCIA is shedding its domestic-only clothes.

It is no longer possible to discuss domestic telecommunications policy without considering its international implications. What Bell does or does not do here will have major effects on the international marketplace. Privacy, proprietary rights, software protection, and standards have become subjects for all the world to ponder. They are not just made in America.

“I see three things we have to do,” Henriques says. “First, create a public awareness of the industry and its problems so that it is appreciated in the best sense of the word. I don’t think that exists now. If you go to some guy on the street and talk to him about the current economic situation, he’ll

talk about cars and grain. He doesn’t know a god damn thing about the balance of trade in computers.

“Second, we’ve got to create an awareness in the government that the industry is important to them and their functions and that we can help them so they don’t make some really dumb moves about information. Third, we have to create a better dialog with the users, whoever they may be. We have to form a partnership with them.”

Perhaps they should attempt to develop a more meaningful relationship among themselves. Somewhere among the rhetoric and recruiting lies reconciliation. You just have to want it to find it.

In five years, CCIA expects to have 100 companies, with more than half in the DATAMATION Top 100. The staff will be larger, the office more automated. Can CBEMA and ADAPSO afford to grow any less? In the process, will the industry enhance its effectiveness and image? Steel and autos may be dying businesses, but they are alive and well on Capitol Hill.

The computer industry is hardly ill. But it might be infinitely healthier in Washington if its three main parts became one.*

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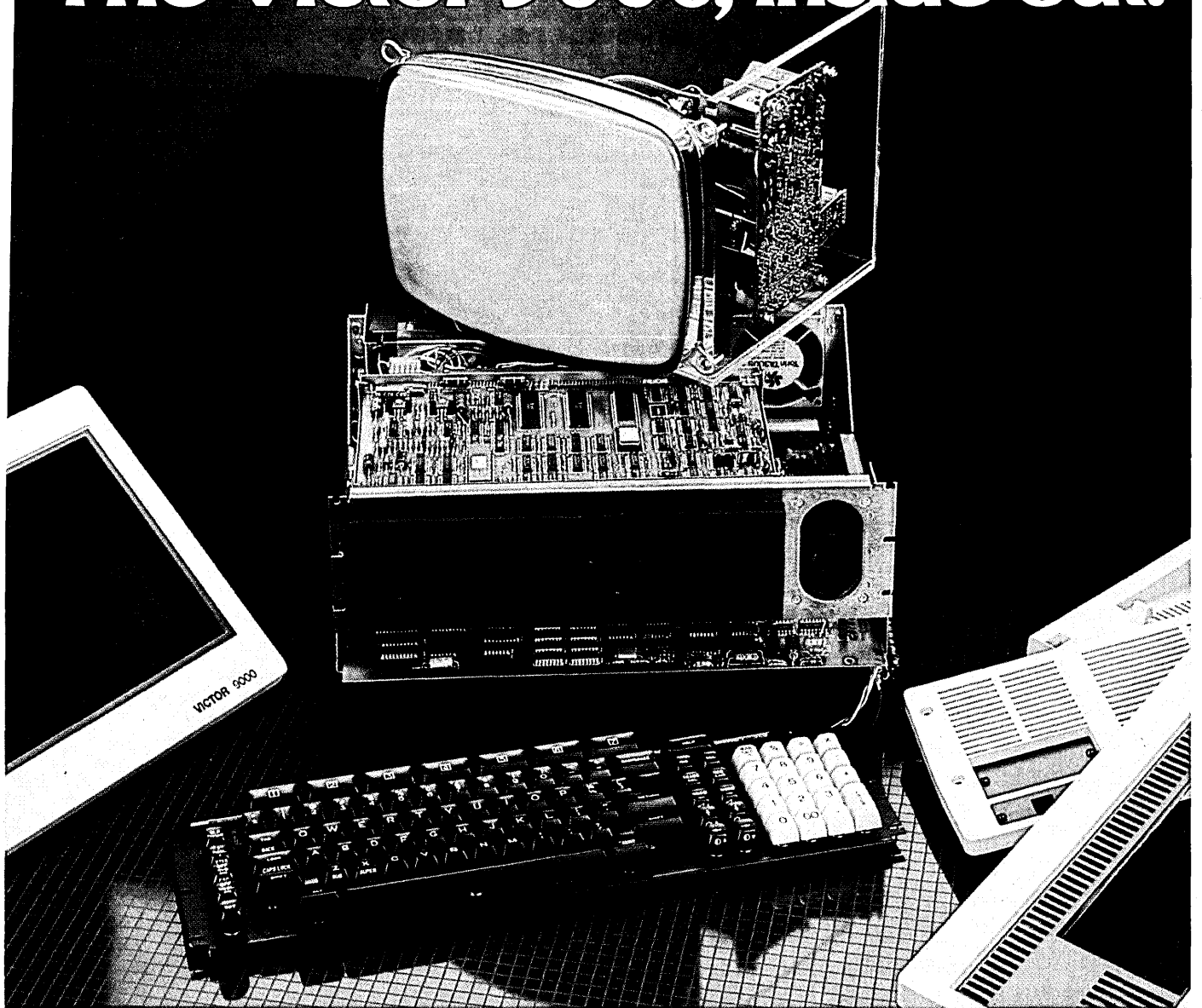
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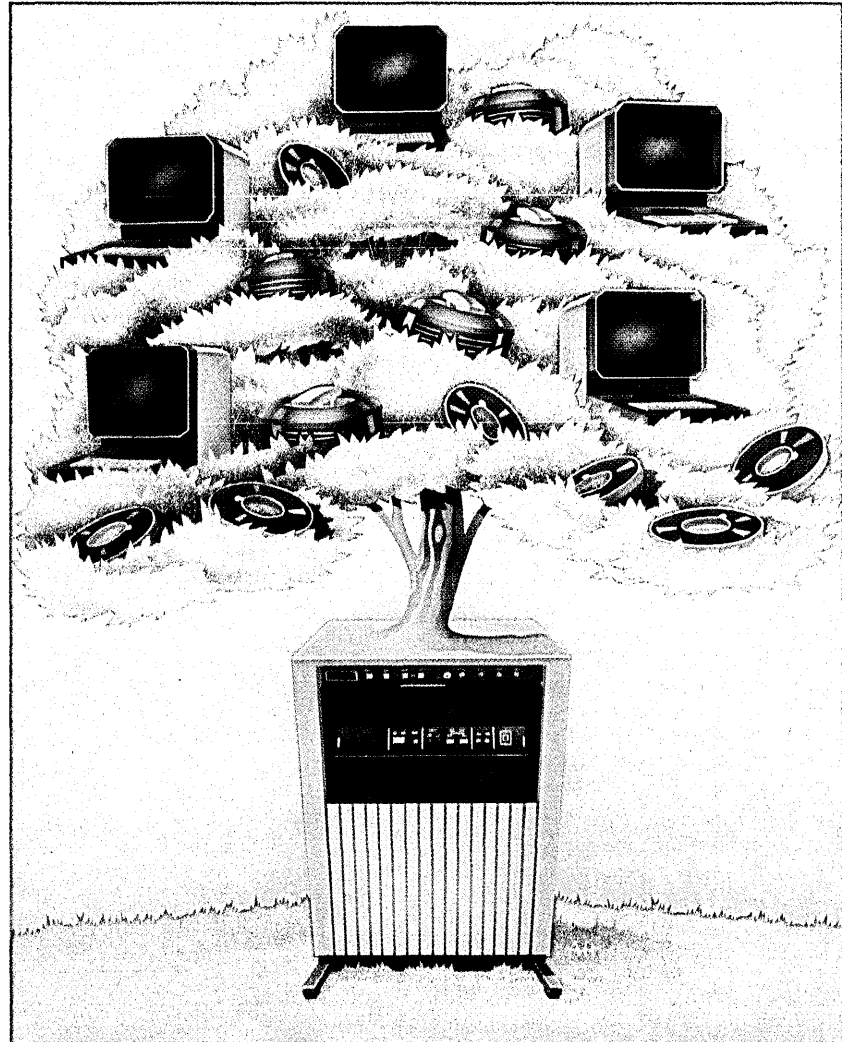
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CIRCLE 107 ON READER CARD

Data communications plus standardization yields autonomy for the local offices and control for the folks at headquarters. You might call it...

COMPUTER FEDERALISM

by Robert H. Richard

To centralize or decentralize a dp operation is no longer the question.

A third option now exists, namely, for a company to structure its systems and programs to meet simultaneously the individual and collective needs of its corporate office and operating units alike. The current state of data communications equipment, software, and transmission techniques make this alternative a viable one for companies of all sizes.

We have software that permits computers of various sizes to communicate easily with one another, reliable packet switching networks, and front-end processors that are not only intelligent but are able to relieve the host computer of most of the actual communications load.

These developments mean that an application such as general ledger no longer need run in a variety of forms at the corporate, division, and even subdivision offices. Why have several different general ledger systems when there is an excellent argument for making them all compatible? The ability to run applications at a company's corporate and remote offices on a standalone but effectively interfaced basis will permit each to have the control it requires while permitting the data to be queried and merged into corporate systems for consolidated reporting and planning. Data communications permits a company to attack its business needs on a global basis.

Standardizing software across multiple processors enables a company to view networked computers as transparent processing units, and thereby enjoy service while keeping costs down. It eliminates the need for expensive applications, database, data communications, and systems programming support at each computer site. But much will depend upon how well a company plans its applications and networks.

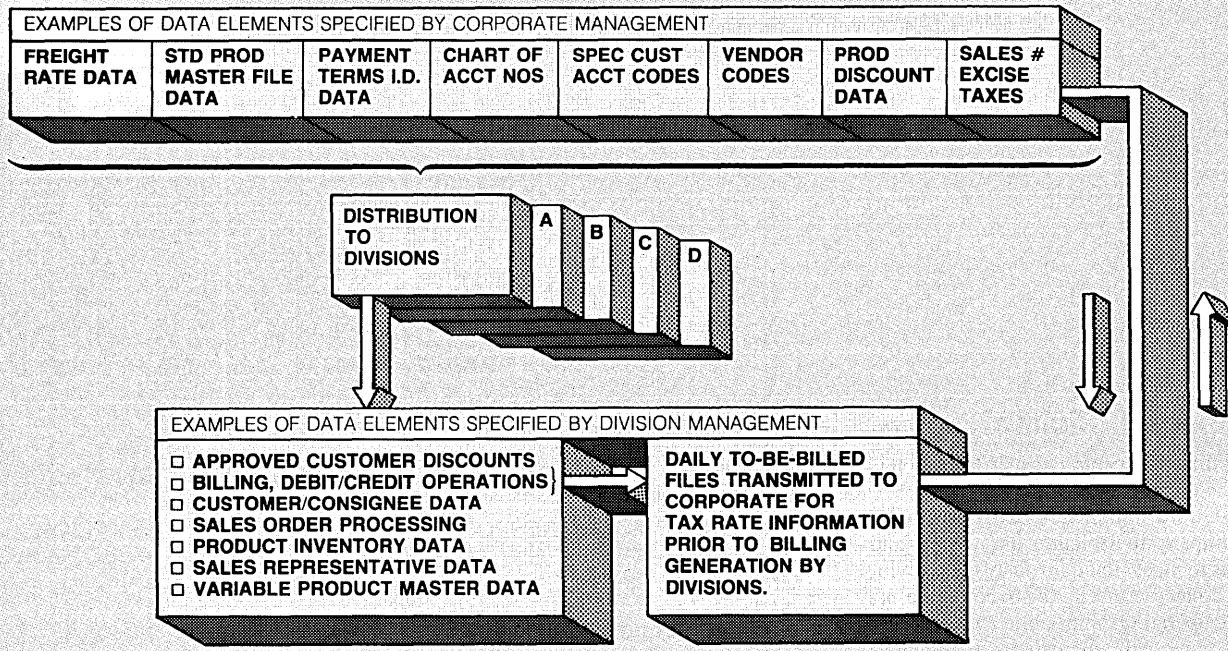
TABLE I

APPLICATION SYSTEM REDIRECTION PLAN

DESCRIPTION	RESPONSIBILITY	TYPE	REMARKS
Order entry	Division	Operating	
Finished goods inventory	Division	Operating	
Physical inventory reporting	Division	Operating	
Billing	Division	Operating	
Accounts payable	Corporate	Operating	Planning to decentralize
Accounts receivable	Corporate	Operating	Planning to decentralize
Word processing	Corp & div	Operating	
Production scheduling	Division	Operating	
Traffic scheduling	Division	Operating	
Raw material rqmts planning	Division	Operating	
Name & address label generation	Corp & div	Operating	
Sales analysis	Corp & div	Control	Planning to restructure systems for direct division access of history files at corporate
General ledger	Corporate	Control	
Fixed assets	Corporate	Control	
Wage and salary	Corporate	Control	
Cash forecasting	Corporate	Planning	
Automated profit planning	Corporate	Planning	

Users are given responsibility they couldn't have in the past because of resource, cost, and technology constraints.

FIG.1
DATA RESPONSIBILITY



A discussion of our experiences at Bird & Son Inc., a national manufacturer of building materials, should help to substantiate these claims. Our strategy in recent years has been to optimize the use of communications in the design of applications and the development and support of software. This has given us the flexibility to move applications back and forth between centralized and decentralized nodes.

Bird & Son's information processing goals require that:

- All computing equipment be able to support a common communications protocol, on-line interactive and timesharing processing from multiple local and remote terminals, a compatible multikey file manager, and application programming languages (i.e., BASIC, COBOL, FORTRAN) for both business and industrial purposes.
- All programming be performed at a central point while each division retains full control over the operation of its task-level software for maximum data file control.
- All user-system dialoging, whether for data entry, query, or report generation, be performed through menu-driven terminals supported by adequate audit and recovery facilities.
- All application systems be designed to permit each remote user system to run its day-to-day work on a standalone basis with a minimum of on-site technical expertise. Each sys-

tem must be able to operate on any node while also permitting corporate systems interfacing when necessary.

TYPES OF SYSTEM DESIGN

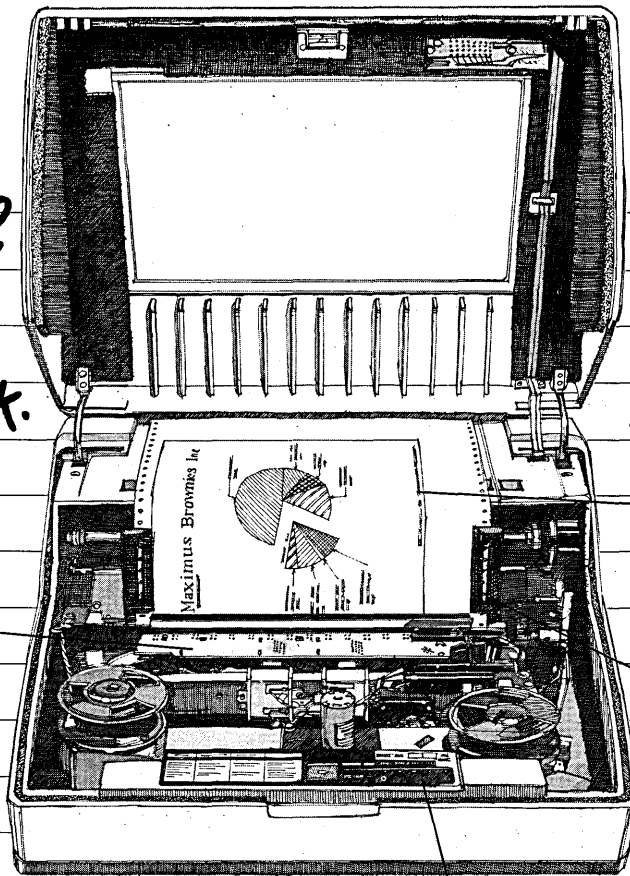
In short, the aim has been to change corporate information services from a department principally concerned with meeting the batch needs of the corporate office to one that provides information processing development, maintenance, and support services to all its divisions on a nationwide basis. Users are given responsibility they couldn't have in the past because of resource, cost, and technology constraints; they look after their own operational systems while corporate information services concerns itself with control and planning. The goal is to have the operating level systems distributed throughout the network, while control and planning systems are assigned according to the type of functions served. Table I shows some of the different types of application systems installed or planned.

Over a longer term, a restructuring of most of our corporate systems will permit the company to clearly redefine many key corporate and division responsibilities. Fig. 1 shows how some data element responsibilities are divided between corporate and division systems. A clear delineation of authority is essential for effectively interfacing critical data elements with mainline application systems.

Bird & Son decided to develop all of its business applications software in COBOL, using one master source library customized as necessary for each different location via a library preprocessor. This limits the number of similar programs that have to be maintained. Since all software data definitions are kept on a separate copy library by an information support specialist, every effort is made to keep all program code within a 64K byte ceiling (for ease of maintenance) fully supported by a series of in-house developed routines for table generation, document number assignment, error and transaction logging, etc. Program development and maintenance are accomplished with a purchased software development aid comprised of a shorthand COBOL, a code formatter, a macro library handler, and a customized COBOL editor. This permits our MIS development people to concentrate their energies on new program modules, while providing all of their common program users with the opportunity to share in any code enhancements/modifications that may be implemented for any one of the other network users. In short, the MIS department can keep a tight rein on development and support costs while allowing users to help plan changes. These measures are similar to those a manufacturing organization takes when it stresses standardization for the sake of controlling costs.

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currently consists of three major operating systems on four local and three remote division computers, all connected via Digital Equipment Corp.'s DECnet DDMCP protocol. In 1976 at the outset of our on-line programming development efforts, we had 10 terminal users. By the end of 1982 we expect to have 150, and 300 or more by 1984. With another three or more computers planned for our remote network in the next two years, we're reaching the point where we are able to move our applications from one location to another whenever we wish. Support has now begun to take on a complexion never envisioned earlier. With portable terminals at their homes, our corporate support specialists are able to provide continuous service to all of our remote users. In fact, we have now reached the stage where our support people are able to use the virtual terminal facilities in DECnet to move from one computer to another automatically. This is indeed a powerful feature for flexible data handling and problem analysis. Such powerful facilities now make it possible for us to begin to think of our seven computers as one large computer system but without the downtime vulnerability of one computer. Our experiences in time-sharing leave little doubt that well-planned equipment redundancy is essential to the level of service that will be expected of information processing departments in the years to come.

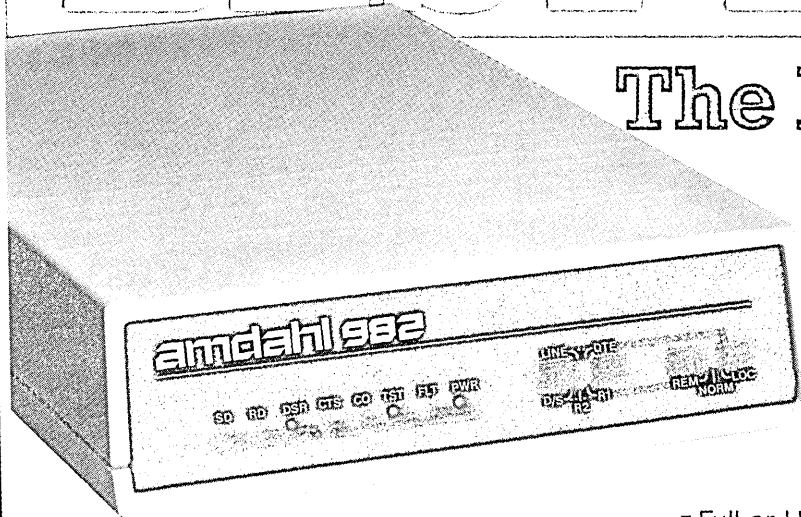
It's rather unlikely that anyone will ever develop the ideal systems environment—one where total software and hardware compatibility and redundancy will permit complete flexibility between the corporate and decentralized information processing locations. Certainly file sizes, transaction rates, communication processing volumes, the need for reliable system response, etc., all will have a bearing on the design of one's system and network. Regardless of such requirements, however, it remains essential for us to standardize as much of our application software as possible. The success of information processing ultimately rests upon how well we standardize and integrate systems.

We are convinced that data communications has now completely overhauled the old question of whether a company should have a centralized or decentralized information processing strategy. The question is now one of using hardware and software compatibility, communications capabilities, and standardization to maintain adequate controls over costs and provide the greatest returns to all served. *

Robert H. Richard has been employed at Bird & Son Inc. for more than 10 years as the director of management information services. He was previously employed at Honeywell as the manager of manufacturing applications systems in its Industry Marketing Department. Before joining Honeywell, he spent many years in dp and manufacturing-related duties in various line departments of a high-technology firm in Connecticut.

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RESTRICTED VISION

by **W.C. Kimmerly**

The environment in which systems analysts work has been changing in recent years, and a deficiency in the discipline has rendered it incapable of adjusting effectively. The changes are the result of several emerging influences that will continue to have significant implications for systems analysis in the future. The functions to which information theory is applied are being expanded. Management is recognizing that the development strategy for information systems must be integrated with the organization's development strategy; systems are therefore increasingly concerned with the total functioning of the organization rather than with individual applications. Yet the analyst is required—by technical, organizational, and social factors—to look at information systems from the individual viewpoints of many different groupings within the organization.

More is expected out of the analyst. As computing technology becomes more modular, powerful, cost effective, and flexible, increased emphasis is placed on the management of data rather than on the computing technology by which the data are processed. The elements of hardware, software, and communications technology are being combined in ways that will eliminate the need for many traditional, highly technical dp skills.

None of these factors are inherently insurmountable, so why do managers feel that they are not getting an acceptable return on their investment in computing resources? Why do many systems analysts share an uneasy feeling that their discipline is not keeping pace with hardware and communications technology? Current practices in systems analysis have a major deficiency: they place excessive emphasis on technical details and structured and mechanistic methods, and show a corresponding failure to give due regard to aesthetics, imagery, and creativity in the process of systems analysis.

Evidence of the discipline's inability to adapt to a changing climate can be seen in the widespread failure to design and imple-

ment systems that take not only technical considerations into account, but the unique social, cultural, political, managerial, psychological, and intellectual characteristics of the organization as well. As a result, systems continue to be implemented which meet technical specifications elegantly and efficiently, but which are not really useful; they don't fully satisfy an organizational need because certain critical organizational intangibles have been overlooked.

The result is an ever-widening gulf between analysts, who tend to see systems in terms of technical elegance and efficiency, and users, who must view systems in terms of their actual usefulness. And managers are becoming increasingly intolerant of what they perceive to be the expensive yet often ineffective services being provided by today's systems analysts.

This growing intolerance is being intensified by the continuing improvement in the price/performance characteristics of computing technology, particularly in microcomputers, and the improved quality and flexibility of interactive and special-purpose software packages. Sensing the potential for improved management and perhaps significant cost savings, managers increasingly want these resources available and under their control even though they are often not sure what they want to do with them. Moreover, based upon their experiences with the centralized dp function within their own organization, many are convinced that systems analysts would be of limited value in helping them find appropriate applications.

Indeed, managers now believe that a more effective approach to the solution of their data processing problems might simply be to add systems analysis and programming skills to the inventory of skills required of their own functional or technical specialists; alternatively, they could "hand the bulk of programming functions to less skilled and lower paid workers in an environment closer to that of a typical factory" (*Computerworld*, Aug. 4, 1980).

If this trend continues, the systems

analysis function could eventually be absorbed by more established disciplines and cease to exist as a separate identifiable entity, or simply be reduced to a collection of clerical activities. Most likely, however, there will continue to be systems analysts, but they will become far fewer in number; many of those now classified as systems analysts or programmer/analysts will eventually assume the less glorious role of paraprofessional, providing limited technical assistance to both users and systems analysts.

LITTLE PROGRESS MADE

Although many analysts have been aware of these problems for some time, little progress has been made in bringing about necessary improvements. This lack of progress has not been caused by the absence of adequate technology; the hardware developments are in place that should allow us to design information systems that are fully integrated with the structure, strategy, and personality of the organization, and, in general, provide a more natural use of information processing. Yet we are not taking advantage of these developments.

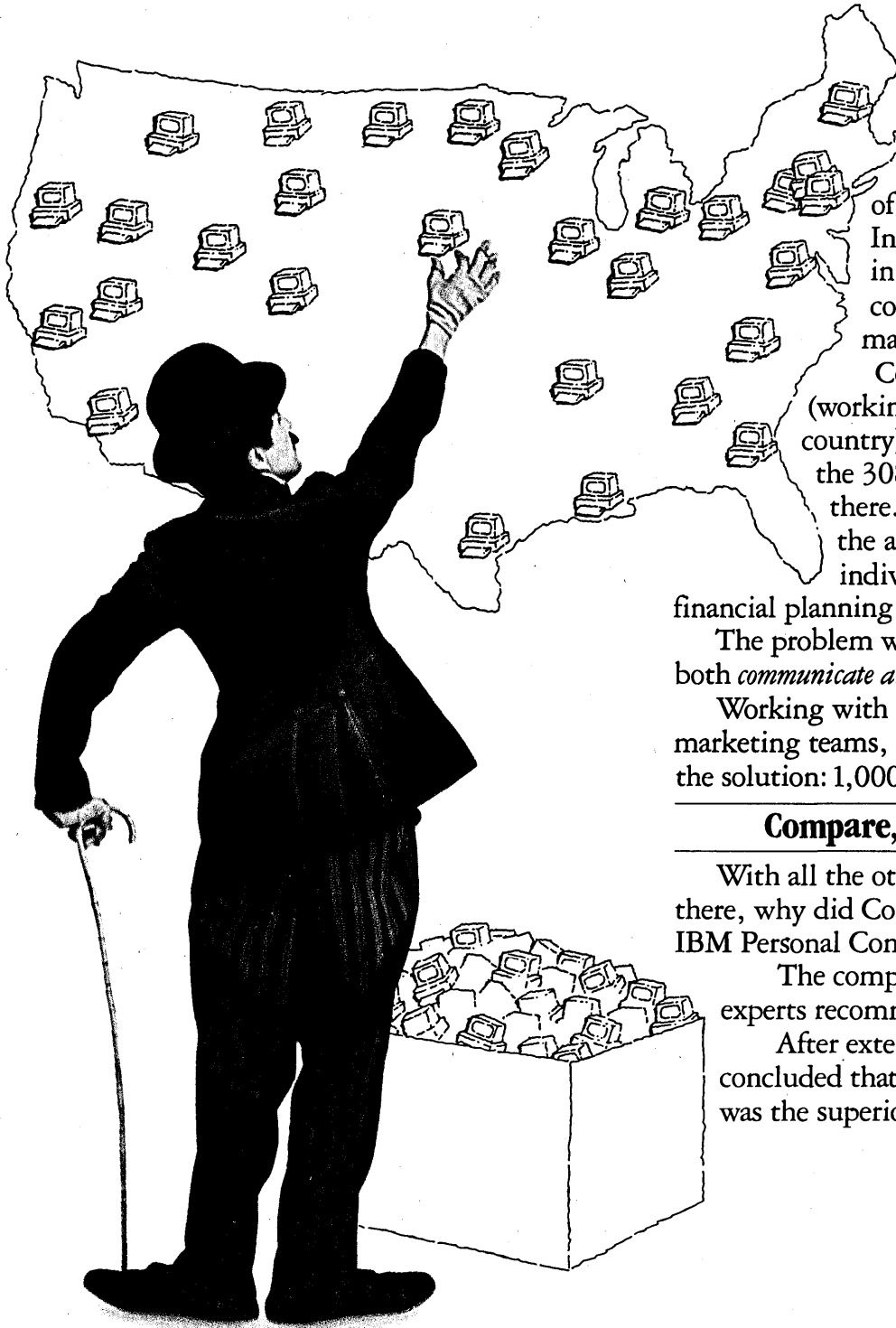
Our inability to match hardware advances lies, at least partially, in the failure of both practicing systems analysts and computer science academicians to stress adequately the importance of aesthetics, imagery, and other precursors of creativity in the methodology of the discipline, particularly with respect to the definition of problems and the conceptualization of solutions. As a result, a significant imbalance now exists between the emphasis being placed on high levels of structure on the one hand and creativity on the other.

Due in part to the legacy of the various "structured revolutions," creativity has not only been comprehensively deemphasized, but has come to be regarded as something to be avoided altogether. Moreover, this emphasis on structure has not been limited to its more appropriate place in the implementation of solutions, but has overflowed

PHOTOGRAPH BY JAMES JOERN



Hello,



The corporate headquarters of the Connecticut Mutual Life Insurance Company is located in Hartford. So is its central computer, an IBM 3081 mainframe.

Connecticut Mutual's agents (working in offices all across the country) need to communicate with the 3081 to access the data stored there. To serve their clients better, the agents also need their own individual computers for jobs like financial planning and sales proposals.

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The differences were substantial (see the box at right), and the choice was clear.

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Today, Connecticut Mutual's agents take advantage of their IBM Personal Computers in many ways.

For a more efficient approach to financial analyses and planning, they use the program called VisiCalc*.

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Auxiliary Memory 2 optional internal diskette drives, 5¼", 160K bytes or 320K bytes per diskette	Languages BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL	<i>Graphics mode:</i> 4-color resolution: 320h x 200v* Black & white resolution: 640h x 200v* Simultaneous graphics & text capability*
Keyboard 83 keys, 6 ft. cord attaches to system unit*	Printer Bidirectional* 80 characters/second 12 character styles, up to 132 characters/line* 9 x 9 character matrix*	Communications RS-232-C Interface Asynchronous (start/stop) protocol Up to 9600 bits per second
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Diagnostics Power-on self testing* Parity checking*		

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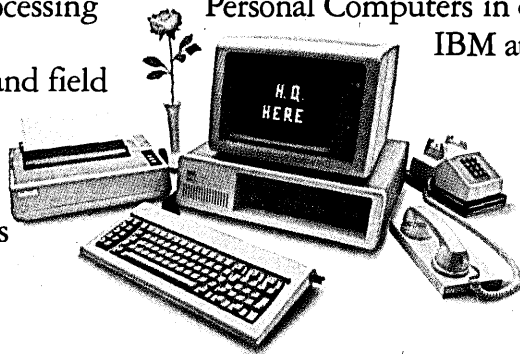
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“Most programs are presented in a way fit for mechanical execution but . . . totally unfit for human appreciation.”

into virtually all systems analysis activities, including what should ordinarily be the freely creative conceptualization processes. In effect, our preoccupation with the microscopic has resulted in a confused and often shallow perspective with respect to the macroscopic; All too often, we have been extremely sophisticated and efficient in implementing the wrong systems.

By structured systems design procedures and mechanistic processes, I am referring to any of a number of widely used methodologies having as their purpose the standardization of activities associated with a systems development project. These methodologies attempt to ensure such things as appropriate task sequencing, the systematic identification and evaluation of all relevant system variables, timely agreement and sign-off on specifications, systematic control procedures, milestone monitoring, performance checklists, and so on. These are not bad in themselves; they are in fact quite useful. The problem that can and often does arise is that these procedures gradually tend to dominate the project, to become a substitute for ongoing, rigorous aesthetic contemplation. It is too easy to find comfort in the methodology and assume that if the procedures were carefully followed, the final product would reflect precisely what everyone had in mind all along. This is simply not the case.

Other professions have a more realistic view of the appropriate place in their disciplines for highly structured and mechanistic procedures and processes. Like systems analysis, other disciplines are based upon a systematically organized body of knowledge consisting of a collection of assumptions, definitions, accepted principles, and other agreed-upon standards, each of which might be organized in a highly structured way. Moreover, a number of these standards may be combined into modules or procedures according to precise, predefined relationships. These modules or procedures are then often applicable to a wide variety of circumstances.

This structured network of standards and procedural modules is essential for professional activities in that it frees the professional to concentrate on the identification and definition of problems and the conceptualization of solutions, both of which are creative processes that make heavy use of theoretical analysis. Unlike systems analysis, however, rigid structure is isolated within the body of knowledge used by these professionals in their creative processes; the creative processes themselves are not and can not be structured. This subtle distinction—a capacity for creativity versus strict theoretical analysis—separates the professional from the technician.

Since systems analysis is increasingly regarded as being more nearly a technical

craft than an art or a profession, one can argue that such seemingly artistic concepts as aesthetics and imagery may simply not be relevant. If it can be shown, however, that such concepts are essential not only for achievement in the arts, but for achievement in such disciplines as physics, mathematics, and basic scientific research as well, then they would certainly seem to be essential for achievement in a discipline such as systems analysis.

MERGING ART AND SCIENCE

Arthur Miller, a physics professor at Lowell University, has described the need for an aesthetic perspective in both the arts and the sciences. In a 1978 paper he argues, “There is a domain of thinking where distinctions between conceptions in art and science become meaningless. For here is manifest the efficacy of visual thinking, and a criterion for selection between alternatives that resists reduction to logic and is best referred to as aesthetics.” The selection among alternatives in the processes of systems analysis should be no less susceptible to aesthetic discernment than in other disciplines.

Similarly, Cyril Smith, institute professor emeritus at MIT, has said, “I have come slowly to realize that the analytical quantitative approach that I had been taught to regard as the only respectable one for a scientist is insufficient. One must still acknowledge that the richest aspects of any large and complicated system arise in factors that cannot be measured easily, if at all. For these, the artist’s approach, uncertain though it inevitably is, seems to find and convey more meaning.”

The same must be true for systems analysis. Indeed, even Edgar Dijkstra—a person linked closely to the ideas of structured programming—has observed, “Programs can have a compelling and deep logical beauty, yet most programs are presented in a way fit for mechanical execution but, even if of any beauty at all, totally unfit for human appreciation.”

Where aesthetics is relevant and needed, so is imagery. Imagistic thinking provides sustenance for the aesthetic processes, and, like aesthetics, imagery can be shown to be appropriate for both the arts and the sciences. By using the term imagery, however, I mean not a mystical nor metaphysical concept, but simply a physiological phenomenon, a method of thinking which is centered in the right hemisphere of the brain, and which—due to emphasis in education and elsewhere on sequential, linear thinking—has been inhibited in many people.

Verbal-linear thinking, centered in the brain’s left hemisphere, is predominantly used by systems analysts today. The process

is sequential; that is, one specific thing is thought of, followed by another, and so on. By comparison, in imagistic thinking there is a patterning of ideas and images gathered up in a simultaneous constellational picture.

The potential advantages of imagistic thinking are enormous. According to Jean Houston, a leading researcher in this area, imagistic thinking is far faster than verbal thinking. “The so-called ‘creative breakthrough’ might then be seen as the manipulation of these larger patterns of information which are part of the imaginal, symbolic process. When we look at the phenomenology of high-level creativity, we note so often minds engaged in imagistic thinking racing over many alternatives, picking, choosing, discarding, synthesizing, sometimes doing the work of several months in a few minutes.”

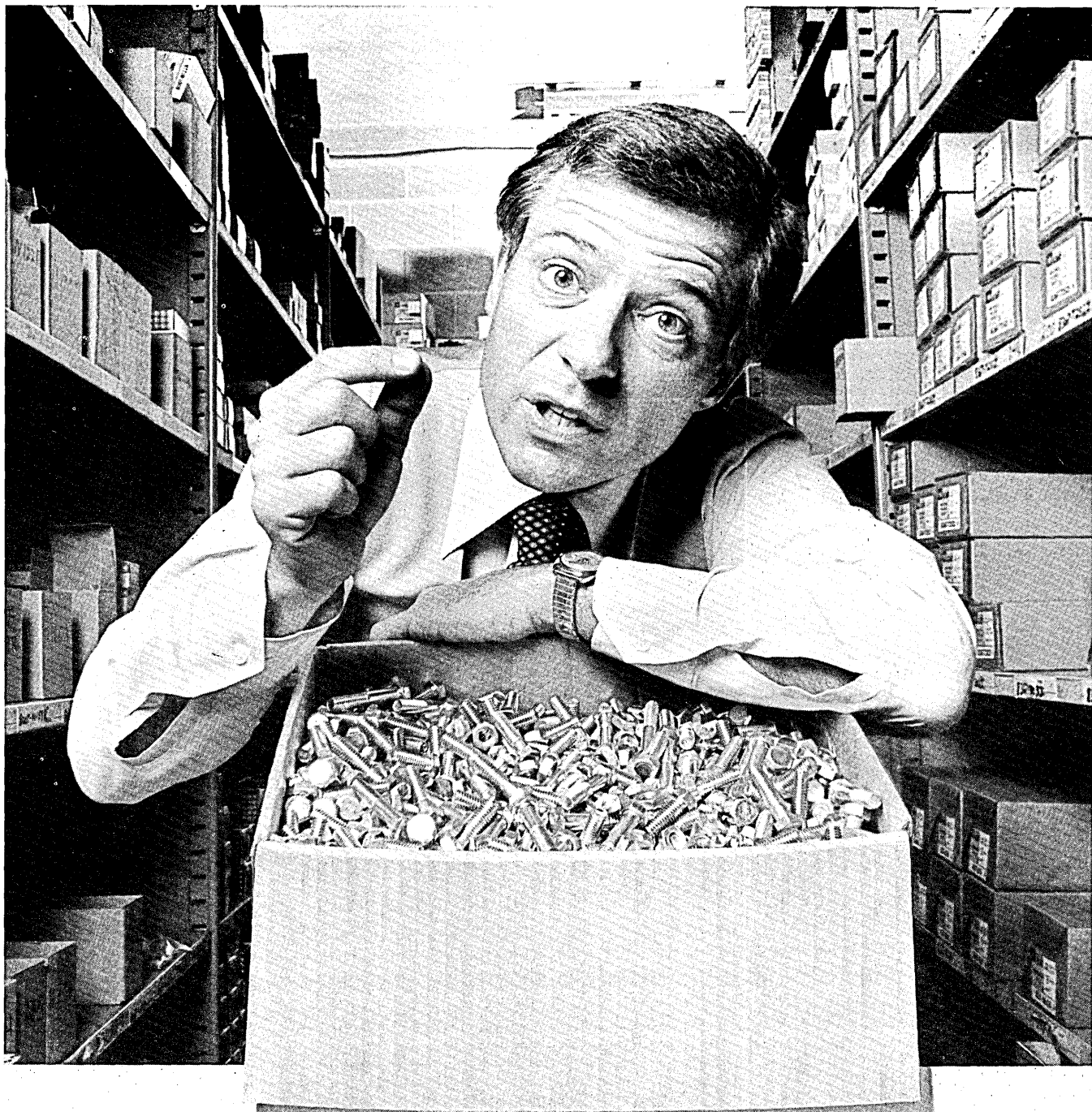
This kind of thinking is especially predominant in certain classes of creative people such as artists, poets, and architects. Albert Einstein once described himself as one in whom imagistic thinking was predominant. Curiously enough, this phenomenon is also prevalent among children. For all his brilliance, Einstein was often regarded as having many seemingly childlike qualities, particularly a propensity to daydream.

The capacity for imagistic thinking appears to be an ability most of us have as children, but gradually lose as our schooling and life experience inhibit it. In effect, we unlearn the ability. Although there are individuals whose mental characteristics or sheer intelligence allow them to transcend this learning process, most of us are controlled by the serial, linear thought processes associated with left hemisphere dominance. Fortunately, the ability for imagistic thinking can, with practice, be redeveloped even in those in whom it has long been inhibited.

There are numerous reasons why it is so important for systems analysts to redevelop this ability. For example, in order to adapt a system to the environment in which it is to be placed, systems analysts must be able to perceive the changes that are continually taking place with respect to critical organizational influences; they must then be able to translate these changes into system modifications. Imagistic thinking by professional systems analysts should be the linkage between changes in organizational resonances and the evolution of a system.

VALUES OF IMAGISTIC THINKING

Organizational influences are often quite subtle, but also quite important. For example, according to Sherry Terkle, an MIT professor specializing in the sociopsychological aspect of computing, even the different ways in which the people in an organization view computers, how to use them, and what they are good for,



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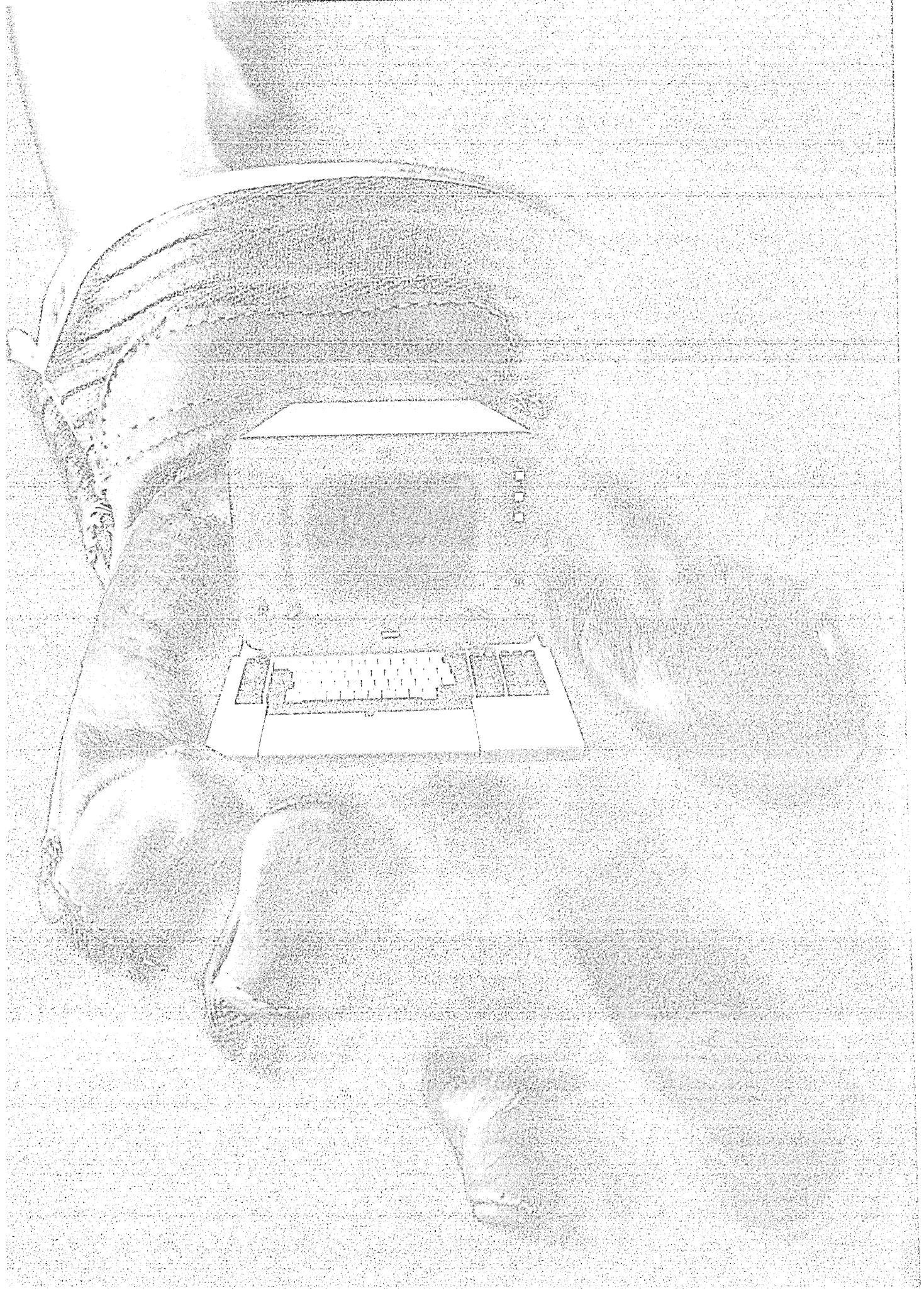
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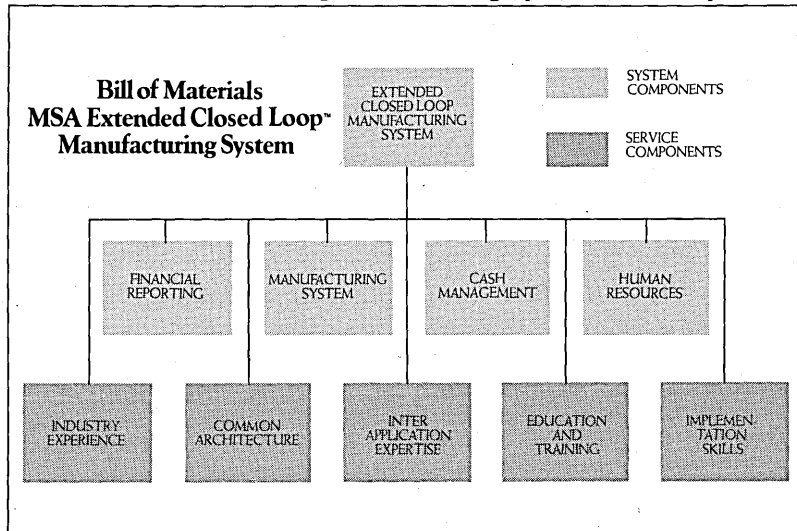
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The emergence of software environments will relieve analysts of much drudgery and free them for more creative and intellectual activity.

result in a structure of value systems whose implications extend far beyond the technical. The delicate process of relating a pattern of value systems to the design and precise calibration of an automated system would greatly be facilitated through imagistic thinking.

Clearly, aesthetics and imagery have their places in the tossing about of ideas on how to approach a problem. But in the execution phases of a system's development, some analysts would argue, there should be an emphasis on control and accepted procedures, not creativity. Although true to a certain extent, excessive reliance on this perspective would, in effect, preclude the adaptation of a system to subtle changes in circumstances once the system is in or beyond the design phase. Aesthetics and imagery are not limited in importance to the more theoretical aspects of either systems analysis or the physical sciences, but are also integral to their more practical aspects.

Consider, as an analogy, mathematics. As Seymour Papert, an MIT math professor, has observed, "Mathematical work does not proceed along the narrow logical path of truth to truth to truth, but bravely and gropingly follows deviations through the surrounding marshland of propositions which are neither simply and wholly true nor simply and wholly false." Guidance through this marshland is provided by an aesthetic sensitivity which allows the mathematician to work with propositions that are false to various degrees without having to consider any that offend a personal sense of mathematical beauty.

Similarly, the aesthetic judgment of the analyst must be allowed to override mechanical processes and rigorous procedure when it is appropriate to do so. It is doubtful that any standard systems design or development methodology could be flexible enough or have a sufficient number of checkpoints or review mechanisms to substitute for human aesthetic sensitivity in providing for the continuing evaluation of the large number of potential influences that might affect a system throughout its life cycle.

Just as the sudden discovery of new evidence or the uncovering of an important precedent might cause an attorney to change the entire approach being taken in a matter of litigation, so must the implementation of a system be capable of changing if the professional systems analyst deems change necessary. It may sound counterintuitive, but this flexibility and implied "lack of control" would not only not involve inordinate expense, but would actually be cost effective. In the long run, after all, which is more expensive: to develop and implement systems that meet all time and budgetary constraints but that in the final analysis are not useful, or to develop and implement systems that might

be more expensive initially but that are of enduring usefulness?

There is an even larger issue here, one that is becoming increasingly important as automation begins to seep into the higher-level management processes of many organizations. Unlike the large batch clerical-replacement systems of a decade ago that were easily assessable in terms of cost effectiveness, systems of the future will often provide intangible benefits that will be difficult to quantify in terms of cost effectiveness. Users or clients will have to trust the analyst as a professional much as they now trust other professionals, such as physicians and lawyers. We will have to earn enough professional respect for users to feel comfortable with us and believe that the systems we deliver will be the result of professional competence. This competence must be based largely on a highly developed, carefully focused aesthetic sensitivity; only that can result in a system that works and is also useful.

What then must we do to infuse the appropriate level of creativity into our activities, to make our discipline more progressive and responsive to the needs of users? Perhaps we need to conduct an in-depth study of the entire discipline, including an examination of the need for professional standards and certification. But short of that, there are some specific initial steps we can take.

PROPOSALS FOR CHANGE

First, we in the discipline must realize that being well grounded in computer technology is only a starting point in the development of an effective systems analyst. An attorney, for example, is presumed to have a certain level of competence in such areas as court procedure and rules of evidence, but this does not guarantee that the attorney is a top-flight legal professional. Similarly, in addition to a basic level of computing expertise, the analyst must be able to develop a perspective that views systems analysis not as a collection of artifacts, however sophisticated and complex, but as a system of activities and functions whose social, cultural, intellectual, managerial, psychological, and political components are seen as being integral to it. The analyst must be continually aware of the changing, often contentious, nature of these components and their potential influence on the effectiveness of systems.

Second, because of the potential significant influence of these factors, mere awareness of them will be insufficient. Depending upon the relevant environment, the analyst will often be required to be proficient in disciplines other than systems analysis. Returning to the legal analogy, there are attorneys specializing in medical cases whose knowledge of medicine—particularly in spe-

cific areas—rivals that of physicians. And if the managerial component or perspective of an organizational system appeared to be especially important, an analyst working in that organization might be required to be proficient in such diverse disciplines as management science, decision theory, or perhaps even personnel management. This would be necessary in order for the analyst to develop a perspective and level of expertise or application consciousness allowing equal participation with users both in the definition of problems and in the formulation of solutions.

Third, in order to make available the time necessary to contemplate problems and imagine solutions, we must become more efficient in many of our current activities. One area of exciting promise in this regard is the development of software environments—collections of integrated software development tools that can provide strong, close support for the entire software development cycle. The UNIX and Interlisp programming environments are examples of this emerging concept. The objective is, of course, to deliver better systems in a shorter period of time; but these will still only be tools. The real benefits will be to a large extent indirect; these tools will simply relieve analysts of much drudgery and free them for more creative and intellectual activity. Taking advantage of the freedom to develop innovative systems is the real challenge.

Finally, we must develop an awareness of the critical need for aesthetics and imagery in the methods of systems analysis. A highly developed and focused aesthetic sensitivity, coupled with a capacity for imagistic thinking, would allow the analyst to develop innovative systems, systems that are the result of subjecting a large number of potential solutions to theoretical analysis. This capacity would allow the analyst to use structure as a means rather than an end, and would encourage the periodic backing away from the technical core of a potential problem in order to ensure that the proposed system continues to be compatible with changing organizational characteristics. Only by inexorably probing and searching for the absolute truth and the explanation of things—attainable only through an aesthetic sensitivity—can analysts provide the level of service expected of them. *

W. C. Kimmerly has over 15 years' experience as a systems analyst in government and private industry. Presently he is a staff analyst engaged in planning and administration for the Computer Sciences component of Union Carbide Corp.'s Nuclear Division. He received an MBA from the University of Tennessee and is presently working on his DBA.

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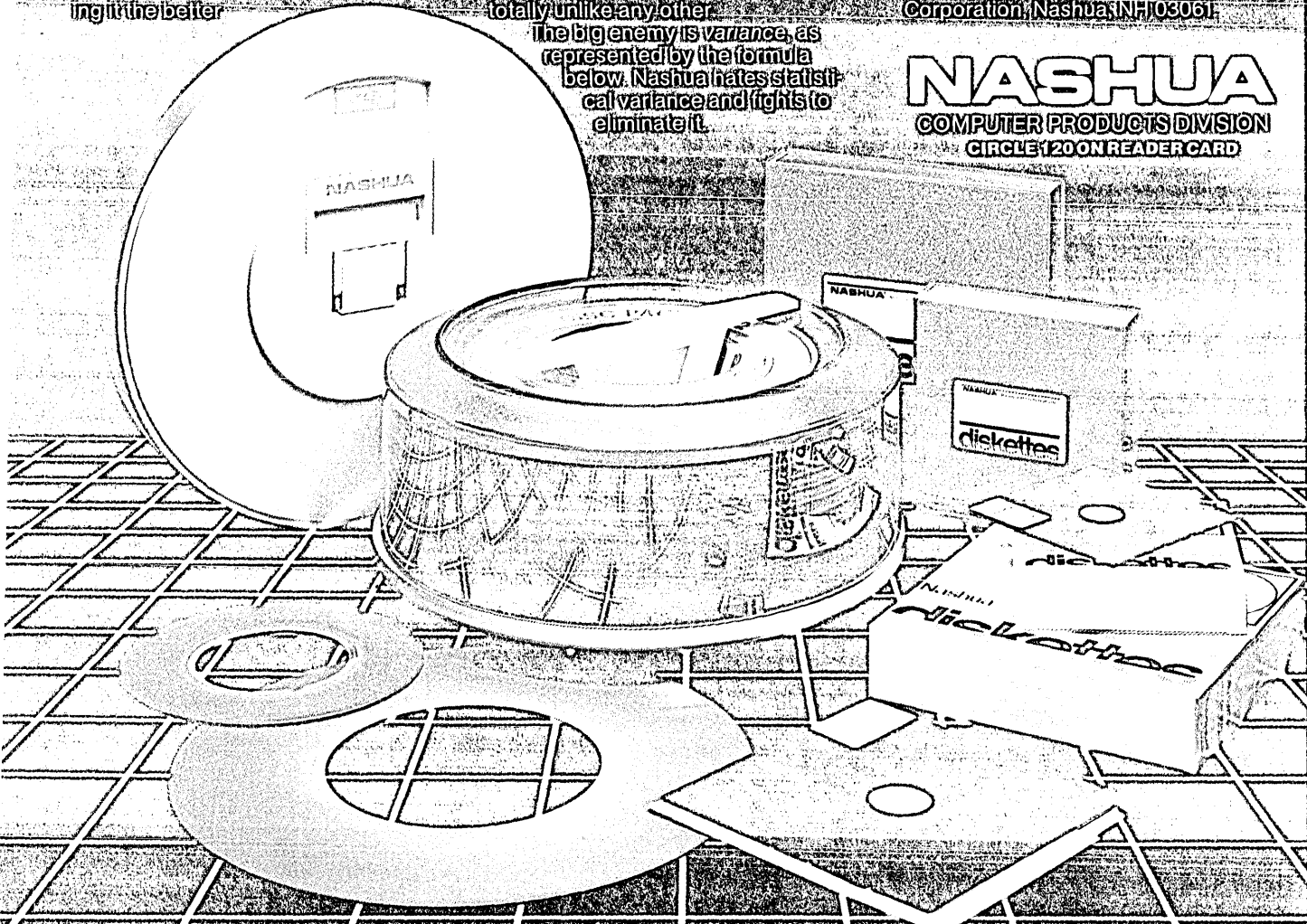
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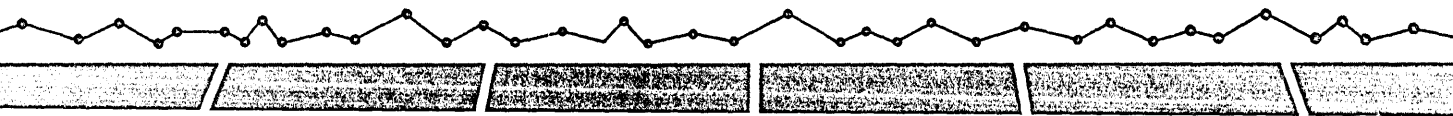
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Variance:

$$\begin{aligned}
 V(Y|X) &= V\left(\sum_{j=1}^k \beta_j X_j + e\right) = V\left(\sum_{j=1}^k \beta_j X_j\right) + \sigma^2 \\
 &= \sum_{j=1}^k X_j^2 V(\beta_j) + \sum_{j=1}^k \sum_{l=1}^k X_j X_l \text{cov}(\beta_j, \beta_l) + \sigma^2
 \end{aligned}$$



Proper lighting and seating are the easy part of user-friendly systems. Here are some practical steps for facilitating the intellectual aspects of a worker's job.

NINE PRINCIPLES FOR ERGONOMIC SOFTWARE

by Louis Fried

Ergonomics can be defined as the science of adapting the work environment to the characteristics of the workers. As applied to computer systems, it means the consideration of human factors in the design of systems to make them more attractive and easier to learn and use.

Over the past decade, human-factors experts have used psychology and work measurement techniques to try to improve work environments ranging from the factory floor to the office to the home. Motivations for these efforts have varied. In the design of tools and appliances for the home, the aim is usually to increase sales by making products more attractive and easier to use. In factories and offices, on the other hand, the goal is generally an increase in the profitability of the organization. At a time when the largest percentage of a product's cost comes from labor, increasing attention has been directed toward the productivity of workers. The assumption has been that making tools easier to use and reducing the psychological pressures on workers will both increase the number of units produced and reduce absenteeism and costly employee turnover.

From the standpoint of the workers and labor organizations, the motivation has been to protect the worker from both physical and mental abuse.

Attention was first directed toward physical hazards and long-term detrimental factors such as inadequate lighting or strained work postures. Similarly, in the data processing field, attention was first focused on hardware ergonomics, for example, the suppression of noise from punched card equipment and later in the design of video terminals.

It was anticipated that ergonomic design of terminals would reduce the strain resulting from hours spent at a terminal keyboard and thus increase productivity (although the greatest pressure for design changes initially came from labor organizations). With these combined incentives for ergonomic design, it is apparent that we're now dealing with a new view of what constitutes productivity.

In the past, productivity has been defined as the units of product delivered divided by the cost. As we move into a post-industrial era, however, in which larger segments of the working population are devoted to providing service or information and in which human values and life styles are rapidly changing, this definition is no longer appropriate. A new definition might be that productivity is the value of goods, services, or human and social benefits produced divided by the cost in money, irreplaceable resources, and negative impact on human beings.

While this new definition is not readily amenable to traditional accounting techniques, we must learn to keep our books this way if society and the organizations within it are to prosper. Whether or not there is unequivocal evidence that ergonomic principles applied to the work environment result in increased productivity in traditional terms, there is a very high probability that ergonomic design will satisfy the requirements of the new definition. In fact, even using traditional productivity measures, there is a high probability that ergonomic design will improve productivity. A discussion of these ideas in a context of purpose—the information processing industry—should help to substantiate them.

THREE WORKER ROLES

Information processing workers are people directly involved in the use of information, the creation of information, or the development of applications that process information. While these workers may do other work as well (such as a factory worker who uses a terminal to record or obtain job information), the concern here is with their occasional roles as information processors. As such, they can be said to play at least one of three roles:

System developers: those who define and develop information processing tools for use by other workers. This class would include those who design and develop computers and systems software as well as those who perform requirements analyses and design and develop applications.

System controllers: those who per-

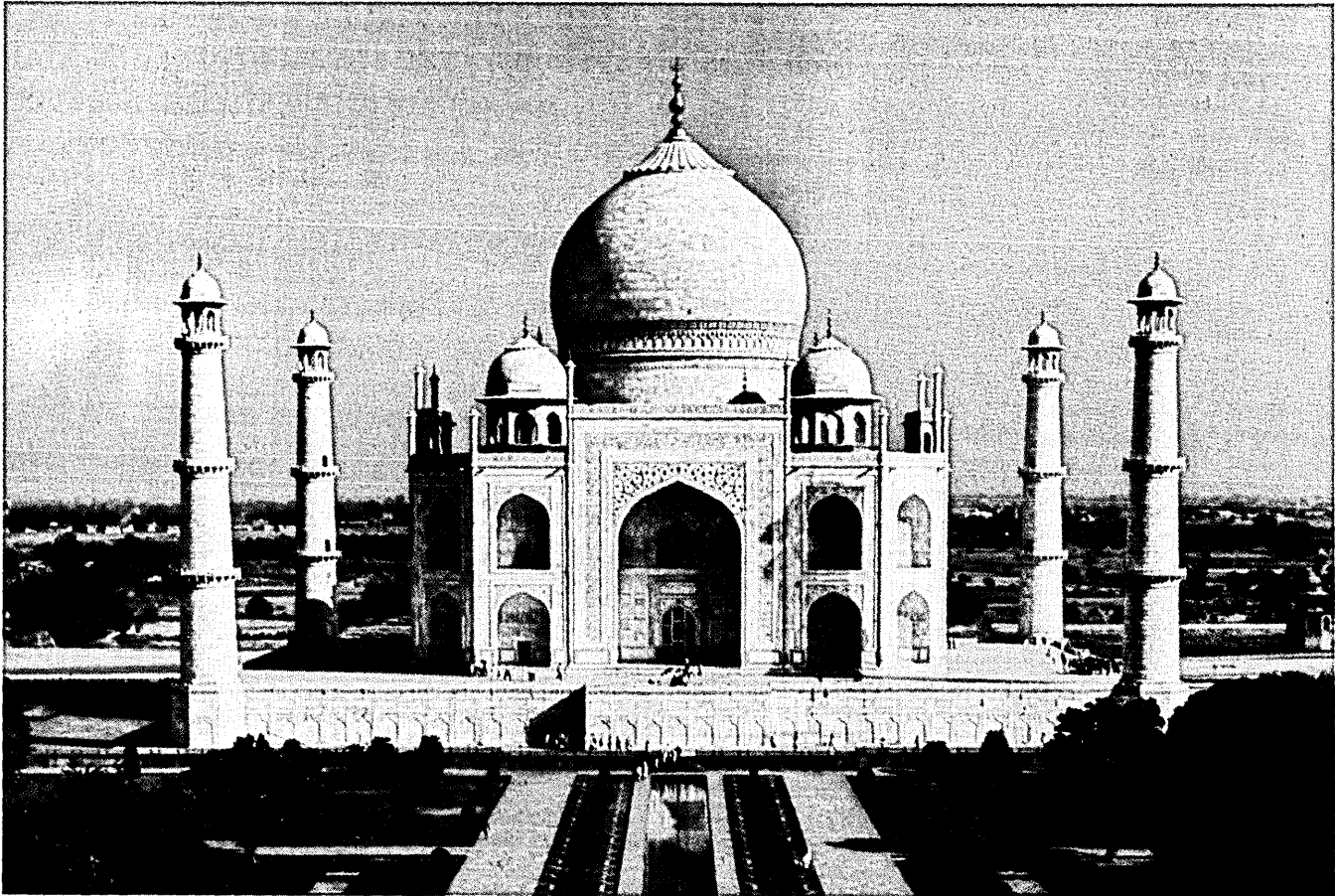
form system-related functions that would not be required if a computer were not used. For example, the traditional roles of computer operator, systems programmer, and database administrator would fall into this class. The distinguishing feature of this class is that it represents an "overhead" function that in most cases does not directly contribute to the goods or services being produced by the organization.

End users: those whose information processing function consists of inputting, manipulating, or retrieving information. These end users may include the previously mentioned factory worker, the office worker, the professional (engineer, doctor, researcher, accountant, et al.) and the manager or executive.

While these people appear to perform disparate functions, as information processing workers they all must interface with the hardware and software that make up computer systems. The application of ergonomics to hardware is fairly well advanced and is progressing further as developments continue in such areas as voice input and output. In the hardware area the range of human form and functionality is bound by physical constraints that set limits on the practical variety of what may be accomplished.

On the other hand, the application of ergonomics to software is bound only by the limits of imagination, since software and resultant data manipulation are the products of intellectual activity. From the software standpoint it may therefore appear that the disparate functions of the different roles of information processing workers lead to an infinite range of opportunities to apply ergonomics. How then is this relatively new field to accomplish anything practical?

The cost of hardware was for many years the primary consideration in designing computer systems. As is well known, though, the cost of hardware, relative to the cost of workers, has been continually declining. In addition, the speed and capacity of computers for processing and storage and retrieval of information have been continually improving. During the 1970s it became apparent that computers were rapidly reaching a

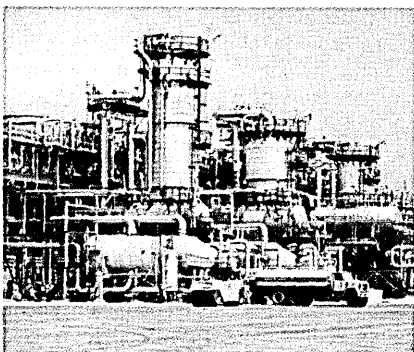


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The industry is burdened with billions of dollars' worth of software that cannot easily be replaced.

point where the machine load represented by systems software such as operating systems, database management systems, library management systems, telecommunications monitors, etc. often exceeded the load represented by user applications. This overhead was primarily intended to improve the efficiency with which the computer performed multiple concurrent tasks. Secondly, this overhead was directed toward improving the performance of system controllers. Finally, it facilitated the tasks of system developers.

For a while, it appeared as if the industry had reached a point where additional computer "horsepower" would be rapidly consumed by systems software with proportionately little room left for applications. But hardware engineers have once again come to the rescue. Increased processing power in smaller and cheaper packages has enabled us to add even more overhead to the system—and this time, with a difference. That overhead can now be used to make the task of the information processing worker easier.

EARLY ERGONOMIC DESIGN

The application of ergonomic principles appeared first in the design of early office automation systems such as word processors. When end users began to see the potential for ergonomic design in such systems, they logically questioned whether or not it could be applied to traditional data processing applications. Application developers saw that office automation tools could be applied to their tasks very early. For example, in the *Bell System Technical Journal* (July-Aug. 1978), the article "The Programmer's Workbench," by Messrs. Dolotta, Haight, and Mashey stated, "All the tasks that make up the program-development process and that are carried out by computers are nothing more than (sometimes very arcane) forms of text processing and text manipulation." Creative people in all areas of information processing recognized that there were ways to make work easier.

On the other side of the picture, although hardware obstacles are disappearing, the industry is burdened with billions of dollars' worth of existing software that cannot readily be replaced without substantial reinvestment. Justifying that investment (excluding clearly obsolete systems or the introduction of new products) presents a major problem. This is especially true when justification is based upon the traditional productivity formula. Despite this situation, the potential exists to gradually implement ergonomic principles in the software of the future, beginning now. We have only to determine what these principles are.

The state of research in software ergonomics leaves much to be desired. The cost of conducting valid experiments is pro-

hibitive for most users. A valid experiment requires comparison of the effects on at least two subject groups, may mean the development of two or more different versions of the software, and must be conducted in a manner in which the variables are controlled. A few university experiments have been conducted, but in general, there is little hard evidence to support the idea that ease of use leads to improved (traditional) productivity, or that specific ease-of-use characteristics truly make software easier to use for a majority of users. For example, there is little evidence that the highly touted nonprocedural techniques are easier to use or more productive than procedural languages for all, or even a majority of users.

Given all these caveats, how does one proceed to design software with some assurance that ergonomic considerations have been addressed? Initially, this must be done by establishing certain fundamental principles on the basis of experience and common sense. The following nine principles and examples of their application were generated in such a way. They are drawn from observation of the operation and use of a large variety of computer systems belonging to numerous clients of SRI International.

THE ERGONOMIC BASICS

Where appropriate, the system developer, system controller, or end-user roles are specifically identified. It should be noted that much of the material applies in common to all workers.

1. *Minimum worker effort.* A worker should be required to perform only that work which is absolutely essential and cannot be performed by the system. Not performing a function is preferable to performing a func-

tion if the task may still be accomplished.

Work done in the past should not be repeated. Data should not have to be entered more than once, program code should be reusable, as should query or command routines, file and data definitions, and so forth. Nonproductive (overhead) work should be eliminated. Today's date should not be entered but supplied by the system; file recovery and transaction recovery in the event of system failure should be automatic.

The worker should not be required to search for system information. Documentation should be available on-line in the form of HELP routines; hardcopy documentation should be complete but address only the information required for the worker's task. Information presented by the system to the worker should provide specific instructions for action (as in error reporting) and not require the worker to interpret the response (add numbers together, decipher a code).

Duplication of work should be eliminated. All work should be capable of being performed through the use of the system (on-line) with no intervening paperwork stages that must be repeated. This is true for system developers as well as end users.

2. *Minimal worker memory.* Workers should be required to memorize as little as possible. The system should be designed so that learning the system is an incrementally extensible and hierarchical process. The worker should not be required to learn anything not necessary to his or her task. Learning a relatively small part of the system should reward the worker with the ability to perform some limited amount of real work.

The worker should not be required to learn non-task-related terminology. System generated instructions or communications should always be in task-related natural language. Terminology should be consistent throughout all software with which a worker



Systems should respond to the human tendency to form both long- and short-term patterns of action.

will interface. Commands used by the worker should be in natural syntax form and should be simple rather than complex or compound.

3. *Minimum worker frustration.* Systems should spare the worker frustrations that may arise from a delay in the accomplishment of a task. If menus, prompting, or other guidance techniques are used, the system should permit the experienced user to bypass them.

If a worker is interrupted in the performance of a related series of actions, the system should (upon request) provide a summary of the actions performed prior to the interruption. Guidance techniques should be hierarchically organized so that the worker does not have to perform or explicitly bypass unnecessary steps. Guidance or HELP should be available to the worker in a consistent fashion throughout all of the system.

CHOICE OF ACTIVITY

The worker should be able to interrupt or terminate any activity at any point and select another activity.

After completion of the second activity, the system should permit resumption of the interrupted activity at the point of interruption by a simple action such as one keystroke (or the equivalent).

Installation of hardware or system software should be supported by self-configuration and self-verification techniques. These techniques should be automatically applied so that the system is completely usable at startup. Feedback should be provided for any action for which the results are not immediately obvious.

4. *Maximizing use of habit patterns.* Systems should respond to the human tendency to form both long- and short-term patterns of action. Systems should take advantage of "muscle memory" by consistently using certain function keys for specific functions, by consistently placing similar information on screens in the same position, by consistent design of screen formats, and so forth. Information returned on a screen to a worker as a result of a worker action should be positioned at the point where the worker expects the response—usually on the next following line.

The worker should be able to accomplish tasks using a single consistent approach and terminology for all functions. In the case of system developers, this would imply a single language for development that includes all command language, application language, and data manipulation language in one consistently structured language with a common syntax and terminology.

The performance of office functions on a computer-based system should require as little retraining as possible. For example, typing a letter on a text processing system should be designed to be as close as possible

to performing the same activity on an office typewriter.

5. *Maximum tolerance for human differences.* Systems should be designed to accommodate the fact that people think differently, just as terminals are being designed to tilt and swivel to adjust to human size differences. Systems should store profiles of the way in which an individual worker prefers to perform tasks. These profiles should condition the system to the worker's use pattern when the worker signs on.

The system should provide both visual and audible attention-getting methods, selectable by the worker. These may include highlighting or blinking signals on a screen, a light signal separate from the screen, a buzzer or bell, etc. In guidance techniques or in complex use such as query development, the system should support both procedural and nonprocedural approaches.

6. *Maximum tolerance for environmental change.* The system should support, with minimal worker effort, change of the hardware/software environment or changes to applications as a result of new functional requirements. With the exception of hardware critical to the continued operation of the system (such as the cpu or the disk drive on which the system software is resident), the system should automatically reconfigure itself for the addition or deletion of devices. Application programs should not require recompilation for changes in database content, access methods, or file residence that do not change the processing logic of the application program. Application programs should be compatible and transportable among different models of computers. Space allocation for files should be automatic and not require worker intervention or specification.

7. *Prompt problem notification.* The worker should be notified of a problem as soon as it can be detected and be notified of potential problems in advance of their occurrence.

WORKER APPROVAL OF CHANGE

Before making a permanent change to stored information, the system should show the results of that change and require worker approval. Syntax and terminology for commands should be interactively edited with immediate response designating the error and the corrective action required.

The worker should be notified by the system when file capacity has become filled to within a substantial percentage (such as 80%) of total system capacity so that the worker can take appropriate action. Interactive editing of worker input should detect and report error conditions immediately and provide for immediate correction or guidance. At the conclusion of the worker's correction

of the error condition, the system should return the activity to the point at which it was interrupted.

8. *Maximum worker control of tasks.* The worker should control the flow and sequence of work to the extent possible where there are no sequence-dependent activities. The worker should be able to modify the priorities of processing to be performed by the computer (as in changing the sequence in which letters or reports will be printed). The worker should be able to establish his or her own terminology for functions, commands, or data, and have this idiosyncratic terminology "remembered" by the system for future use.

The worker should be able to define "default" options for given tasks and have these default options remembered by the system for future use. The worker should be able to store and retrieve information (or files, as in text) in a consistent manner, with the residence of the information being transparent to the worker.

9. *Maximum task support.* The system should provide complete support of tasks for the worker so that the worker is not required to use other resources for task performance. Worker task documentation should be available on-line in a hierarchically structured and well-indexed mode. He or she should be able to communicate with other workers through system facilities and should be able to use both preplanned and ad hoc methods to access or process information related to the task.

In the preceding list of examples, a few are repeated to show that they satisfy more than one principle. Some of the examples may appear idealistic when one considers the software presently operating in the industry; however, instances of almost all of them can be found in various software products in existence today. It is also apparent that the examples can be expanded into literally hundreds of criteria for the ergonomic design of software.

Furthermore, it is very likely that the principles themselves will undergo revision, and that more will be added to the list. For all of us, there is a clear recognition that the key issue of the 1980s is productivity, and that ergonomic considerations will play a key role in achieving the improvement required. *

Louis Fried is program director of the Advanced Computer Systems Department at SRI International, Menlo Park, Calif., which performs research and consulting in the computer field for clients throughout the world. During more than 23 years in the industry, Mr. Fried has authored many papers and articles and the book *Practical Data Processing Management*.

PEOPLE

NUMBER ONE

Do not mention second, third, or fourth to Dick Bernacchi. He is unfamiliar with such subject matter.

For the last 25 years, he has been first in one thing, then another. Number one in his high school class. Valedictorian at college. Leading man and editor in chief of the law review at law school. President of The Computer Law Assn. Pioneer in computer law theory and the first practitioner thereof in Los Angeles.

Where will it end? Not even Bernacchi knows for sure.

"It certainly does seem to be a pattern," admits Bernacchi, a partner in the Los Angeles firm of Irell & Manella. (Naturally, his address is Avenue of the Stars). "I wouldn't say it's an obsession though. It just seems to have worked out that way. I've been number one for as long as I can remember."

Also, as long as he can remember he wanted to be a lawyer. When he was telling it like it was and verbally trouncing those in his Los Angeles neighborhood who engaged him in discussions, intellectual and otherwise, folks began hinting that his facile tongue made him a prime candidate for the legal profession. By the age of 12, he knew lawyering was his life.

"It's something I always thought about," Bernacchi says. "I tended to be outspoken and articulate. I think all those people commenting that I ought to be a lawyer just stuck over time. It seemed the natural course to take. I never thought about anything else. And I never analyzed or second-guessed myself."

Of course not. The man doesn't know from second anything. He topped his class at San Gabriel Mission High School, then repeated the feat four years later at the University of Santa Clara. He began undergraduate life as a political science major,



DICK BERNACCHI: "Like in any organization, if you perform and do a good job you tend to rise to the top."

assuming it most appropriate for his chosen profession. When he found it completely irrelevant to commercial private practice, not to mention incredibly boring, he switched to accounting. In the back of his head he thought he might eventually get into tax practice.

Stanford, Santa Clara, and the University of Southern California law schools all liked what they found in the front of his head. Naturally, he was accepted by each. Unnaturally, he chose USC, a quality school not nearly as renowned as Stanford.

"I didn't want to go East and I was fairly certain I wanted to practice in Southern California," Bernacchi says. "USC has a good reputation and a vast alumni network in Los Angeles. I thought as long as I was going to practice there I ought to go to school there."

"I liked it much better than undergraduate life. That was merely a means to an end. Law was my chosen profession, and I really enjoyed school. I found discussing issues and the repartee in class a real challenge and source of pleasure. I was in my element and loving it."

Life was rendered infinitely more pleasurable by the absence of the usual cut-throat law school competition. No one stole books from the library or ripped pages from reserve readings. Sharing notes and study groups were in; aggressiveness and hostility were out.

"I didn't kill myself to be number one, either," Bernacchi confesses. "I worked hard, but I wasn't burning the midnight oil every night to make sure I finished first. When I was first at the end of my first year, I had a tremendous sense of exhilaration at having achieved my goal and knowing I could do it, even though I hadn't graduated yet. The last year [1964] I just sort of coasted."

After removing his cap and gown and giving the obligatory speech, he waltzed into Irell & Manella, where he had been working part-time since the fall of his second year. Four months later, he was in the Army. When he returned in 1966, he resumed his place in the firm. He was mainly a tax man, then gradually switched to corporate work, such as mergers and acquisitions. Bernacchi couldn't have told you the first or last thing about the computer industry.

Then Unicorn Systems Co., a nascent software developer, came calling in 1968. The company needed general representation, and president Jerry Larson wanted somebody to write "the best damn contracts in the world." He and Bernacchi struck a deal. Larson would tell Bernacchi everything he knew about computers and Bernacchi would put out the contracts.

Unicorn was Bernacchi's sole client for a year. He and Larson would spend hours dissecting the industry and each other's brains. When Irell & Manella partner Lou Brown, an adjunct professor at USC, walked in on one rap session, he suggested they teach a course in USC's advanced professional program. Voilà! In the 1972 class listing there appeared a new entry, "Data Processing Contracts." Bernacchi and Larson offered a second helping in 1978, then Bernacchi and a partner from the firm dished out thirds last year.

PEOPLE

Not wanting to waste all those words, Bernacchi and Larson decided to put them on paper. They prepared four chapters and sent an outline of proposed others to publishers. "The response was overwhelming. I couldn't believe it." Bernacchi says. One publisher returned a signed contract. The rookie authors suddenly were in the enviable position of taking their pick. They gave Little, Brown & Co. the honor and in 1974 *Data Processing Contracts and the Law* appeared at fine bookstores everywhere.

Long before publication, word had gotten out around Los Angeles. When those in the computer industry heard there was a lawyer who could do the necessary legal work and speak computerese without a translator, Bernacchi's phone rang incessantly. After all, he was the one and only. There was no one else available. Software houses, companies acquiring products and services, and other vendors and buyers sought Bernacchi's expertise. By the mid-'70s his tax practice was history and he merged and acquired infrequently. Eighty percent of his business involved—and still involves—computer-related matters.

Somewhere between the course and the book, he attended a Computer Law Assn. meeting. The CLA, now numbering 650, was born in 1972 out of desperation. Lawyers in the fledgling field had nowhere

to commiserate, so they turned to each other. Leaders such as Roy Freed, Bob Bigelow, Herb Marks, and Fred Lafer launched the group with an intent to educate and inform themselves and their colleagues. To join, one had to be a lawyer or law student interested in the legal aspects of computers. Dues still range from \$25 for those out of law school five years or more to \$5 for law students—hardly an exclusive club.

Bernacchi became a member by accident. At his first meeting he talked at length to Freed about industry problems, e.g., whether trade secret, copyright, or patent law applies to software protection. Freed, then president, must have liked what he heard. He dumped a scheduled speaker for an upcoming American Law Institute-American Bar Assn. conference and offered the slot to Bernacchi. By 1975 Bernacchi was a director. Seven years later, he's in his accustomed position.

"Like in any organization, if you perform and do a good job you tend to rise to the top," Bernacchi says. Being president wasn't really a goal. It wasn't that important. I don't think I would even have campaigned for it. I'm happy that I got it, but I wouldn't have been disappointed if I didn't.

"Being president and a director has enabled me to make sure topics I'm concerned about get aired. It's easier to get

things moving in the direction I'd like to see them go."

And what might that be?

"We've got to work harder to convey our message and make sure we have the maximum impact on the profession," Bernacchi says. "We're still the best bargain in town—the low rates, dearth of bureaucracy, infinitesimal dues, and casual philosophy can't be beat. We've got to give the benefit of the association to as many people as we can.

"Personally, I'm going to continue to be as creative as I can, deal with new problems well, and come up with new and creative solutions without waiting for someone else. I was propounding the trade secret theory for software protection before 1974, and it's since been confirmed by several cases. I've pioneered other legal concepts, too, and I hope to keep doing that."

Regrets? He hasn't had a few. He's had none.

"I've had a lot of opportunities presented to me," Bernacchi admits. The evidence indicates beyond a reasonable doubt that he has seized each one. "I don't know what's next. Something will come along down the road. I'm not looking for it right now. But there'll be another challenge."

Guess where he'll finish when he finds it.

—Willie Schatz

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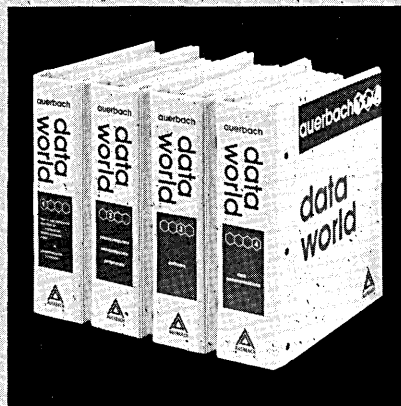
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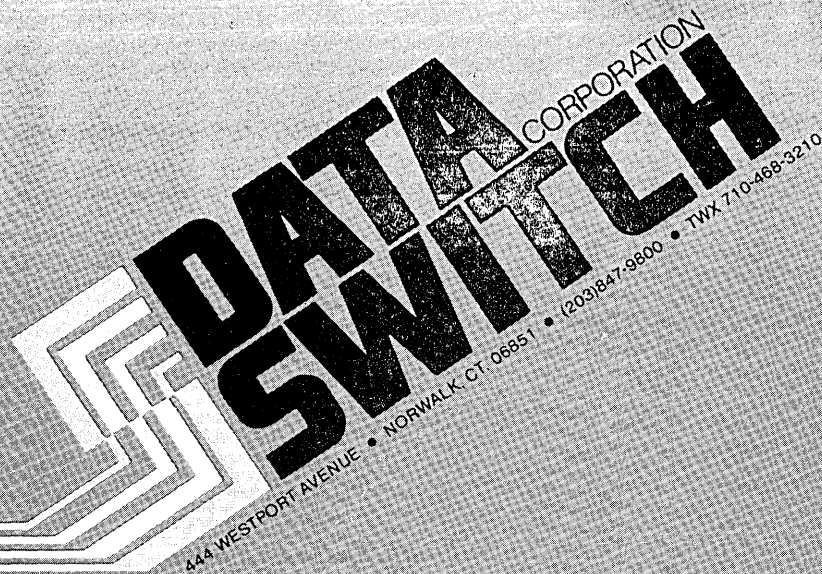
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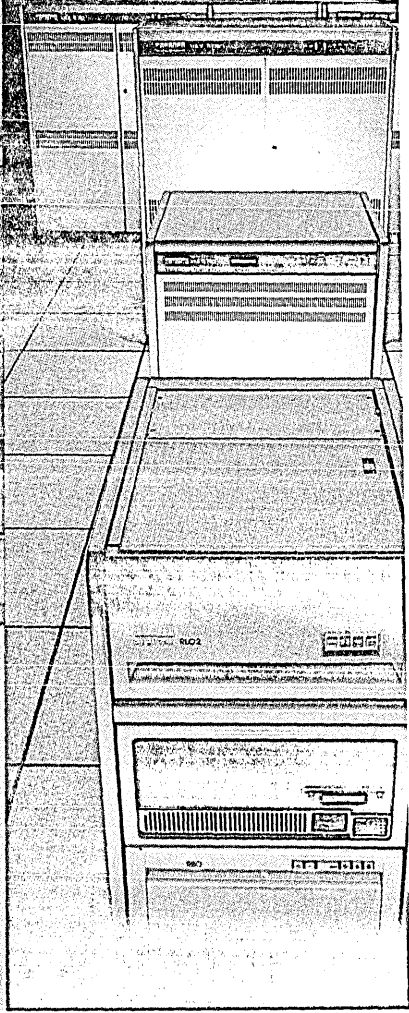
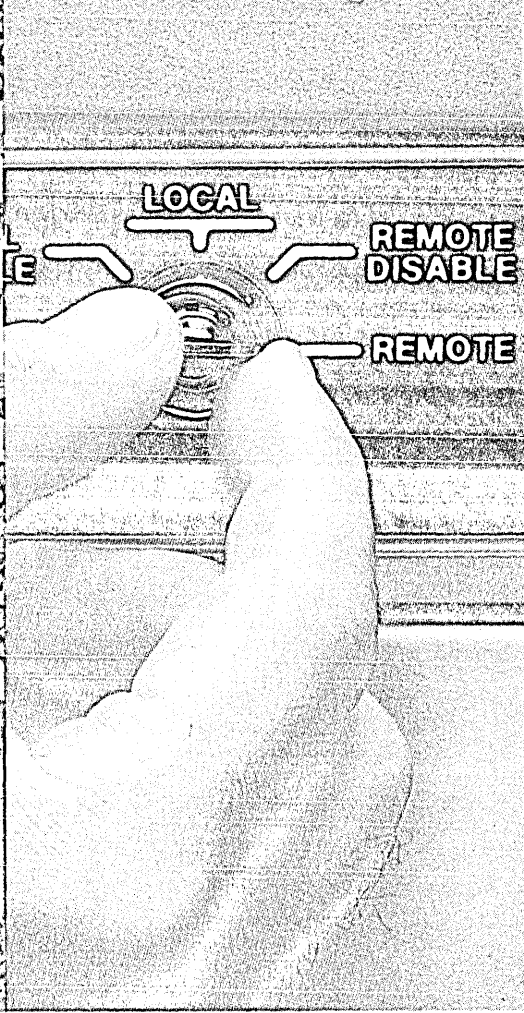
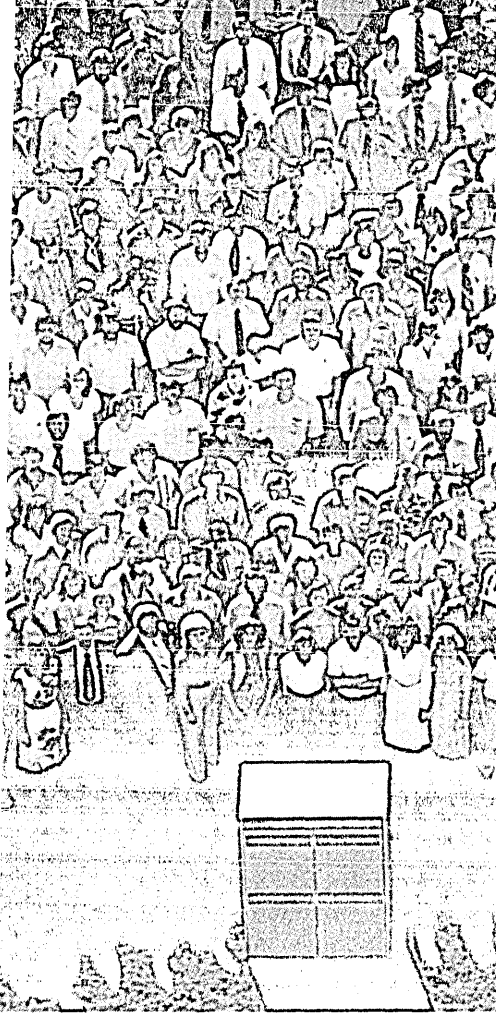
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HARDWARE

OFF-LINE

After six years of research, Memorex Corp. has begun producing thin film heads for disk drives in quantity. The 3680 records data at 800 tracks per inch and 15,000 bits per inch, or a total of 12 million bits per square inch. The maximum recording density with ferrite heads is said to be some 9,000 bpi. Memorex is producing the IBM 3380-compatible heads at the rate of 400,000 a year.

Also out with new drives is Amdahl Corp. The pcm has announced its 6000 series of storage systems. The 6280 disk system features 10½-inch platters, a rotary actuator, a direct drive motor, and a sealed data enclosure. Four of the units provide 5 gigabytes of storage. The 6880 control unit includes two directors and four-channel switching. In a typical configuration, a 6880 and four 6280s would cost \$292,000.

The IBM Personal Computer is a little easier to talk to now. Recent enhancements include SNA 3270 emulation and RJE support, which permit the P.C. to act as a terminal that can communicate with a host system. Also coming is 3103 display terminal emulation and a synchronous data-link control adaptor, which will allow the P.C. to attach to leased or switched line networks. All three will be available in January.

Look for the Graphmate II four-pen plotter at Comdex. Yokogawa's portable machine, which weighs less than 20 pounds, uses the same chassis as the PL-2000, but includes a programmable keyboard. The 4KB memory includes menu-driven firmware that calculates percentages from keyed-in data and formats the chart or graph. Some editing capability is included. An RS232 interface is planned for early 1983.

ARRAY PROCESSOR

The S-810 array processor system is billed as the world's fastest supercomputer. The model 20 can execute 630 million floating-point operations per second with 256MB main storage, while the lower-end S-810/10 is rated at 315 MFLOPS with 128MB maximum main storage. Both models have between eight and 32 channels, in eight-channel increments.

The S-810 uses a control program based on the vendor's VOS3 operating system. It is able to provide TSS and resource management and to use peripheral and terminal equipment for M-series machines. The S-810 can be connected to an M-series processor to realize a multiprocessor arrangement.

In place of a conventional external memory, such as disks, the S-810 uses Hitachi's Extended Storage Type II or Type I. The larger, Type II, has a maximum capacity of 1,024MB and a maximum transfer rate of 1,000MB per second, while the Type I offers half those amounts. These extended storage memories are directly connected to the main memory, substantially reducing access time. For example, the Type II storage device can transfer 8MB of data in 8 milliseconds, less than 1/300th the time required by the vendor's newest magnetic disk drive.

The model 20 processor rents for about \$280,000 a month, and the model 10 for \$200,000. Extended Storage Types I and II start at \$32,000. HITACHI AMERICA, LTD., New York, N.Y.

FOR DATA CIRCLE 301 ON READER CARD

GRAPHICS SYSTEM

The Phoenix 1024 is a color graphics computer system intended for both business and CAD/CAM applications. The raster scan display offers a 1,024 × 1,024 pixel resolution, with either four or eight bit planes of memory, pixel addressable. Up to 256 colors can be displayed from a palette of 16.8 million colors. The system writes at 800 nsec per pixel and offers zoom up to 16:1 magnification.

Designed in conjunction with the 8086/87 microprocessors, the system includes 16K addressable memory and 128K system memory. For off-line storage, the system supports 1MB floppy disk drives and 10 to 40MB Winchester disk drives. Standard input devices are keyboard and joystick, but light pen, trackball, and data tablet are available as options. Display is on a 19-inch high-resolution color monitor. Also available are printer, plotter, and video color camera for output. Standard communications mode is RS232C at 110 to 9600 baud, and is SNA/3270 compatible.

The 1024 uses the CP/M-86 operating system with BASIC, FORTRAN, and Pascal languages. Megatek's Template and Graphics Computer Systems's GSS-Core are standard software packages. Other software includes the Phoenix Computer Graphics Language (PCGL) and Plot-10 compatibility, as well as pan, screen partition, anti-aliasing mode, and interactive mode. Depending on configuration, the 1024 costs from \$20,000 to \$30,000, with leasing possible. PHOENIX COMPUTER GRAPHICS, INC., Lafayette, La.

FOR DATA CIRCLE 302 ON READER CARD

HIGH CAPACITY DISK DRIVE

The Ibis 5000, 2500, and 1250 disk drives are plug-compatible with IBM's mainframes and 3380 disk drive, as well as the SMD interface, but offer up to twice the storage capacity of the 3380. The model 5000 holds 5 gigabytes, the 2500 half that number, and the 1250 one fourth. The drives can transfer data at 3 megabytes per second per channel using modular head/disk assemblies.

The vendor uses a proprietary mix of thin-film materials—nickel, cobalt, and phosphorous—in its disks. These thin-film media, along with the unit's ferrite heads, allow bit densities to equal those of the 3380, with up to 60% higher density in the future, the vendor says.

The 5800 disk controller, also compatible with IBM systems, contains either two or four independent storage directors and can support up to 16 model 5000

HARDWARE

drives, with a maximum subsystem storage of 80 gigabytes. Both the drives and the controller will be ready for delivery in early 1983. The subsystems cost about the same per gigabyte as the IBM 3380. IBIS SYSTEMS, INC., Duarte, Calif.

FOR DATA CIRCLE 303 ON READER CARD

32-BIT MINICOMPUTER

The Prime 2250 supermini can address 4Mb of main memory with 316Mb of on-line disk storage in a single desk-height unit. The 2250, designed to act as a node in a distributed processing network or as a system for dedicated applications in smaller multi-user environments, supports up to 32 terminals interactively and handles up to 128 processes simultaneously. The system is compatible with the vendor's other computers through Primenet software. It supports most of the vendor's software products, as well as additional memory and other peripherals.

The 2250 uses the Primos operating system for interactive and batch processing. The basic system includes a two-board cpu, a communications controller with eight asynchronous and one synchronous communications lines, one 68Mb disk and one cartridge tape unit with a multifunctional disk/tape controller, 512Kb main memory, and a diagnostic processor that also acts as a system console interface. Additional Winchester drives are available to boost the memory capacity. The 2250 starts at \$40,000, and runs into the \$50,000 range with more memory.

The PST100 terminal, Prime's first,

includes 24 × 80 display on a 15-inch screen, with a 25th line for prompts and messages. Line drawing and block graphics capabilities and French and German character sets are also available on the terminal. It also includes communications and diagnostics capabilities, at a price of \$1,600. PRIME COMPUTER, INC., Natick, Mass.

FOR DATA CIRCLE 304 ON READER CARD

DRUM PLOTTER

The servo drive system incorporated into the CPS-19 drum plotter offers users faster acceleration and better line quality than previous plotters made by the vendor. The four-pen plotter, with a 34.5-inch plotting surface, has a resolution of 0.001 inch and an accuracy of 0.002 inch for any given pen.

The front panel controls permit the user to window, calibrate, and rotate plots as well as position pen and paper manually. The CPS-19 is capable of plotting on paper, vellum, and polyester film with a wide selection of pen types. The CPS-19 controller offers the user a switch-selectable choice of using PTC-6, PTC-5, or Tek 4014 languages to drive the plotter. Firmware capabilities include character generation, dash-line generation, rectangle generation, arc and circle generation, windowing, vector multistroking, speed control, and other functions.

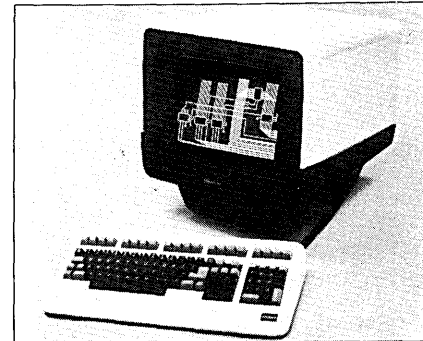
The CPS-19 starts at \$13,950, with deliveries 90 to 120 days ARO. BAUSCH & LOMB INSTRUMENTS & SYSTEMS DIVISION, Austin, Texas.

FOR DATA CIRCLE 305 ON READER CARD

GRAPHICS TERMINAL

Designed for high-precision, engineering, CAD/CAM, and scientific applications, the AutoGraph XK1 graphics display terminal emulates the Tektronix 4014. It provides the same 1,024 × 780 viewing window on a 15-inch, long-persistence, P-39 green phosphor tube with interlaced scan. The terminal's 1,024 × 1,024 image memory format provides "square" pixel spacing for "scratch pad" output on matrix printers. Users can choose between green-on-black and black-on-green displays.

The XK1 features on-board intelligence for drawing circles, arcs, ellipses, and area fills. Other graphics functions in-



clude integer zoom, pan, bidirectional scrolling, and multiple character signs. In text mode, the terminal has an 80-character × 24-line display, with 96 ASCII characters. The terminal communicates in 15 baud rates, full or half duplex, through two RS232C serial ports, and integrates into remote or on-site graphics systems. It is downward compatible with the TeleVideo 925 and other AutoGraph terminals.

Delivery on the XK1 is slated for late this fall. Suggested end-user price is under \$5,000. DATA-TYPE, INC., Mountain View, Calif.

FOR DATA CIRCLE 306 ON READER CARD

HIGH-SPEED DATA DISTRIBUTOR

The 2300 series of local area data distributors operates at speeds from 56Kb to 2.5Mb per second over metallic circuits or coaxial cables with a variety of digital interfaces. The 2335M, 2349M, and 2303M (for CCITT V.35, RS449/442, and Bell 301/303 interfaces respectively) are designed for low-speed transmission, from 56Kb to 460.8Kb. The 2335H and 2349H are offered for the V.35 and RS449 interfaces at speeds from 461Kb to 2.5Mb. Each unit is available with up to four switch-selectable data rates within the specified range.

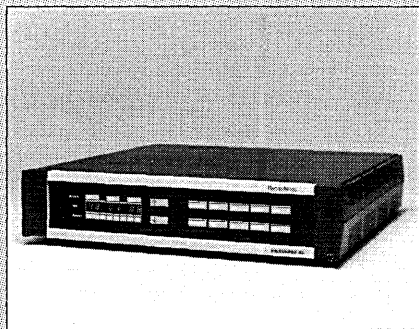
At the high data rate specification, the 2300 series units can act as a direct replacement for the Bell 306 modem on TI digital links with a DSX-I compatible interface. The 2300 series can operate at up to 200Kbps faster than the Bell units. The units are designed to work primarily as a point-to-point link between individual de-

HARDWARE SPOTLIGHT

PROGRAMMABLE MODEM

The Omnimode 48 is the first in a series of 4800 bps modems offering front panel diagnostics and control for network management. Firmware allows the modem to be programmed for CCITT V.54, MPS 4827, or MPS 48 compatibility for domestic or international networks. The modem can be used with up to four ports sharing the 4800 bps bandwidth.

The eight-character display provides information on port configuration, current data rate through each port, receive level in dbm, signal quality, and current strapping configuration. In addition, it can



act as an interface monitor, reporting the same information about other modems in the network. A variety of tests can be run from the front panel, including self and end-to-end error and polling diagnostics. Strapping is firmware controlled and can be modified from the front panel; seven pre-programmed configurations and an eighth user-definable configuration are available. The modem can also be used to send coded calls to users at other nodes in the network.

A remote control option allows the central modem to control other modems in the network; alarms are sent for power failures, streaming, or receive line faults at any modem. The remote control option costs an additional \$800 over the \$3,600 price tag for the modem.

The Omnimode technology is based on LSI chips custom designed by the vendor. The complete modem is contained on one printed circuit card, and each of the major options is on a second card. A network management system for more comprehensive network control can be added without any hardware or software changes to the modems. RACAL-MILGO, Miami, Fla.

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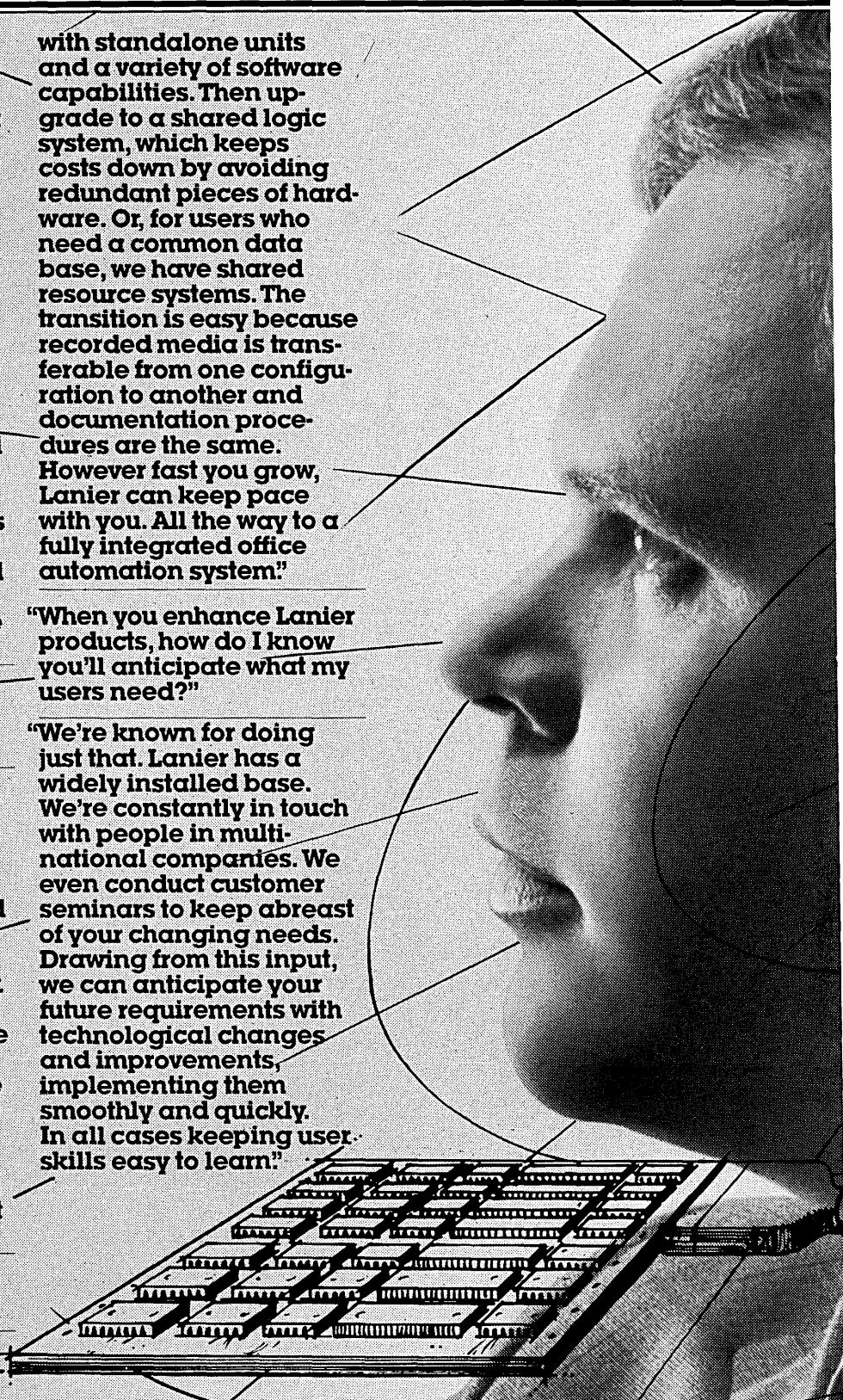
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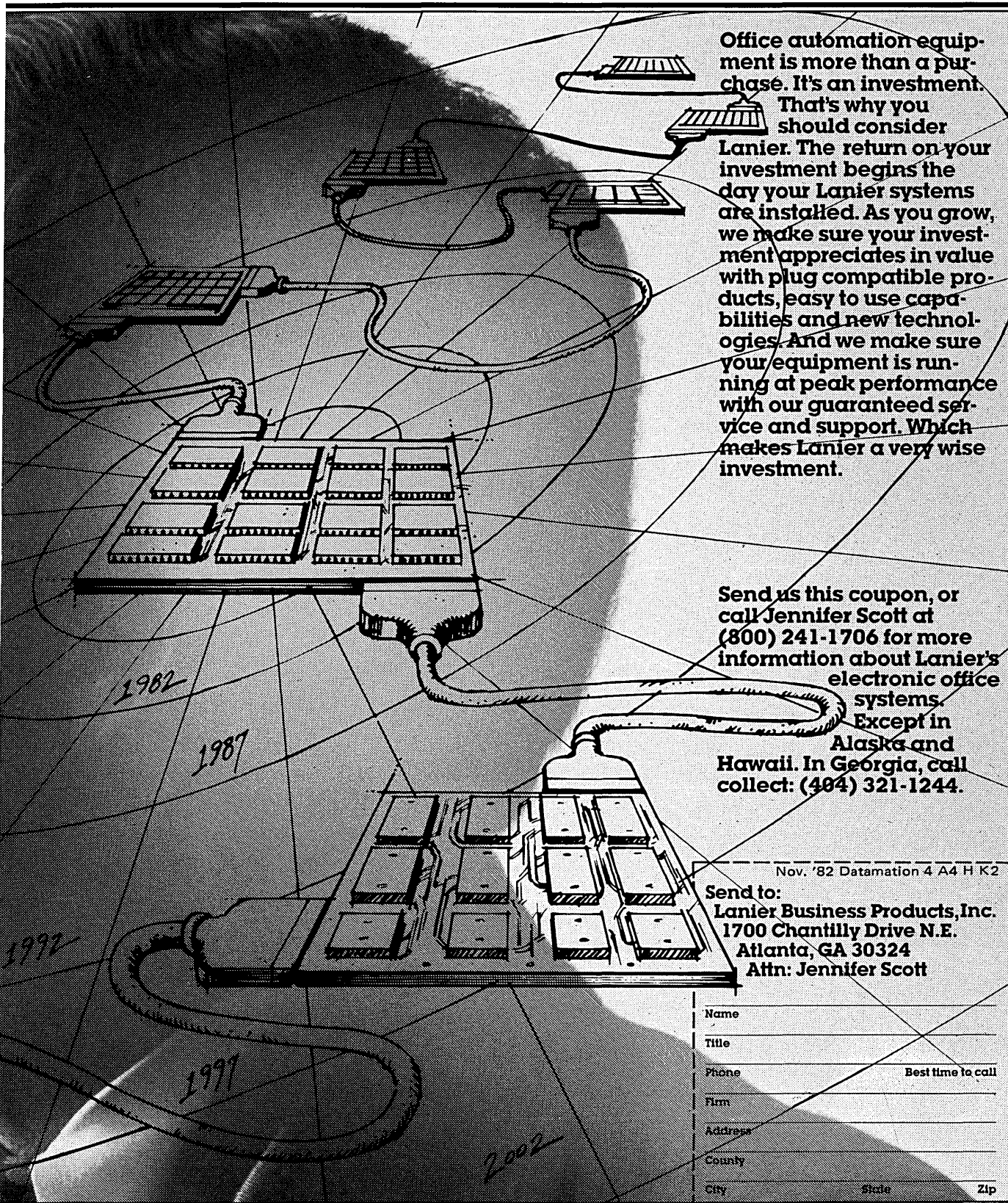
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CIRCLE 126 ON READER CARD

HARDWARE

vices, such as terminal equipment and cpus, but they are also available with an optional multipoint capability to eliminate the need for protocol-driven local area networks.

The units include local analog and remote digital loopback diagnostics. Front panel indicators provide information on test status and the test initiating station. The 2300 has error rate performance of 10^{-9} . For ease of use, the vendor has included switches to equalize for distance, wire gauge, and data transmission rate. Price runs from \$1,800 to \$2,025. AVANTI COMMUNICATIONS CORP., Newport, R.I.

FOR DATA CIRCLE 307 ON READER CARD

COBOL PROGRAMMER'S WORKSTATION

With the model 1116 workstation, a user can program, edit, compile, test, debug, and document COBOL off-line, freeing up TSO time on an IBM mainframe for other uses. The workstation, driven by a 32-bit cpu, includes a high-density crt with pixel mapping, 500KB main memory, 10MB Winchester disk drive, 1MB floppy disk drive, full ASCII keyboard with numeric keypad and function keys, and an RS232C communications port.

Software in the \$35,000 system includes the high intermediate NSI-74 COBOL compiler with IBM extensions; the compiler can be user-set to halt on error and invoke the full-file editor for immediate correction. A source file comparator compares revisions of a program to capture the history of a program's development. A profiler counts the number of times a given line of code is executed to determine where to optimize code, and a cross-referencer traces every occurrence of each variable in a program. The test bed executes modules or programs under user-definable halt conditions and requires definition of calls to a database or nonresident program module at run time. SOLOSYSTEMS, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 308 ON READER CARD

PERSONAL COMPUTER NETWORK

The PCnet system is a local area network with almost 1Mbps transmission up to 7,000 feet and system software support. Address space up to 64,000 nodes eliminates expansion problems. With the PCnet, a group of IBM Personal Computers can share one or more hard disk units and other peripherals inexpensively. Files can be shared and transferred between users, and a protection system ensures that only the file's owner can erase it.

For more advanced multi-P.C. applications, such as accounting or inventory control systems, PCnet also provides simultaneous file access interlock and a general purpose network semaphore system to lock records within a file. All system software is DOS 1.1 compatible.

The main component of the PCnet is

its adapter board, which occupies a single expansion slot in each P.C. on the network. Standard 75 ohm CATV cable is used, with passive taps at each P.C. in a shared bus topology. The system costs \$700 per PCnet adapter board. ORCHID TECHNOLOGY, INC., Cleveland Heights, Ohio.

FOR DATA CIRCLE 309 ON READER CARD

MAINFRAME PROCESSOR

The four central processing units in the 3084, IBM's top-of-the-line mainframe, can operate as a tightly coupled multiprocessor or as two independent dyadic configurations. Either way, it offers 32 million, 48 million, or 64 million characters of main storage and 48 channels. Operating as a multiprocessor in commercial or scientific MVS/XA batch environments, the four cpus appear to the user as a single system running nearly twice as fast as the 3081 model K. The expanded 3082 model Q processor controller employs one controller to manage the 3084 and has a second for backup. All other key hardware devices associated with the 3084 are duplicated, including the 3087 coolant distribution unit, the 3278 model 2A consoles for hardware control, and the 3089 power distribution unit.

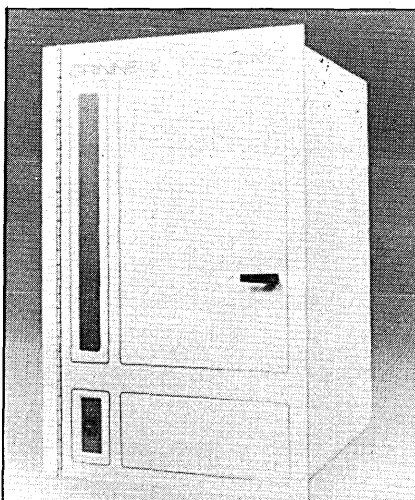
When the system is operating as two dyadic processors, each side is controlled by a single 3082 model Q and is supported by MVS/SP, VM/SP HPO, or MVS/XA. As dyadic processors, the 3084 operates roughly as fast as two 3081Ks.

The 3084 is available only as an upgrade from the 3081K and is scheduled to be delivered in the fourth quarter of 1983. Including the 3081K, it costs \$8,700,000, or can be leased for \$318,860 a month or rented for \$398,570 a month. IBM CORP., Town of Rye, N.Y.

FOR DATA CIRCLE 310 ON READER CARD

GRAPHICS DISPLAY SYSTEM

The GMR 27-68 graphics display system has $1,024 \times 1,024$ resolution, vector generation at 200 ns/pixel, and full alphanumeric capabilities. The system consists of a display generator and power supply; eight bits



of refresh memory; the vector generator; and alphanumeric, rectangle, and image generators. The standard system, which costs under \$24,000, also includes pan and zoom capabilities and a combined 10×12 lookup table/video card. A DEC DR11w Unibus interface is available as an option.

The graphics display is 30Hz interlaced color or black and white. Up to 16 colors, or eight colors with blink, can be displayed from a palette of 4,096 colors. Zoom and pan capability includes zoom factors of 1, 2, 4, and 8, pixel by pixel panning, and a zoom cursor. The system generates standard RS343 compatible video signals to drive black and white or color video monitors.

Software options for the GMR 27-68 include a FORTRAN-callable subroutine package, DEC RT, RSX, and VMS device drivers, and an extended graphics subroutine package with circle generator and area fill. Hardware options include joystick or trackball controls, a quad independent cursor, and two $1,024 \times 1,024$ overlay memory planes.

The system is housed in a prewired and pretested chassis so that options can be added in the field by plugging in log cards. Delivery is 60 days ARO. GRINNELL SYSTEMS CORP., San Jose, Calif.

FOR DATA CIRCLE 322 ON READER CARD

PRINTER FOR TIMEX-SINCLAIR PC

Billed as the first American printer for the Timex-Sinclair TS 1000 personal computer, the MW-100 is a dot matrix printer that uses standard 1 $\frac{1}{4}$ -inch adding machine paper tape and ribbon cartridges. It generates a 16-character line, half of the TS 1000's 32-character screen, and can be operated in any of three modes.

For displays that are fewer than 16 characters wide, the printer will reproduce the contents of the screen line for line. For wider displays, the MW-100 can either print consecutive half-lines, or output both sides of the screen separately (the hardcopy would then be aligned by the user to show the full display). The \$120 item is scheduled to be available in electronics, office equipment, and other retail outlets. MINDWARE, INC., Wayland, Mass.

FOR DATA CIRCLE 311 ON READER CARD

SLIDE RECORDER

The TTS system is designed to produce professional quality slides at low cost. The desktop system, driven by a minicomputer with two disk drives, includes a digitizing tablet, a 640×480 color monitor, monochrome terminal, slide recorder, and software. The slide camera records images generated directly from the system computer, instead of tapping off the video monitor feed, resulting in $2,048 \times 1,366$ slide resolution. The vendor says that the recorder's high resolution and \$89,900 price tag are

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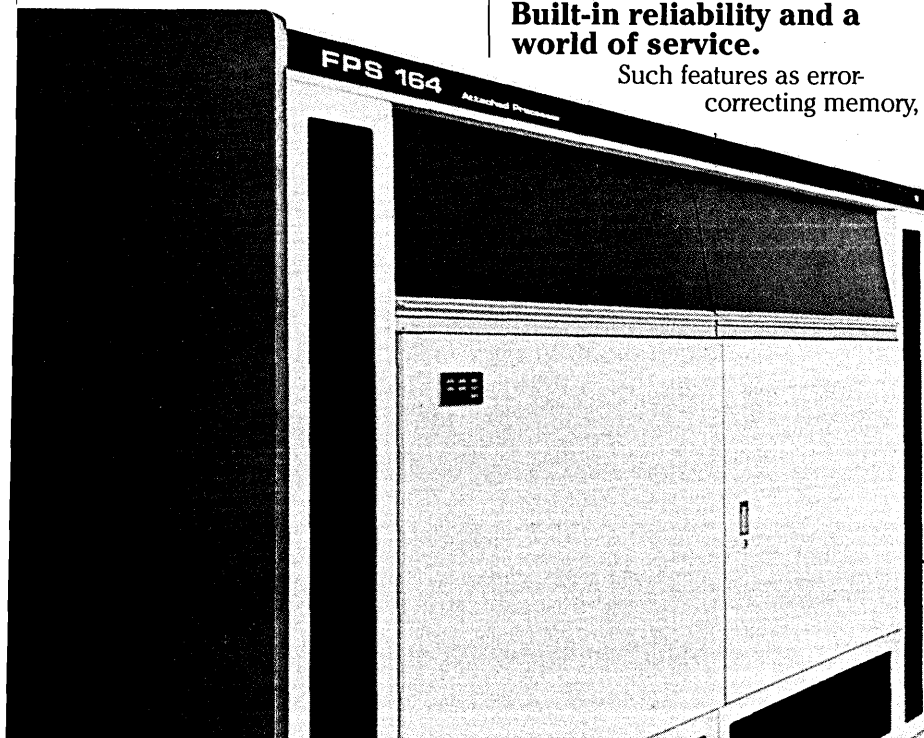
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CIRCLE 127 ON READER CARD

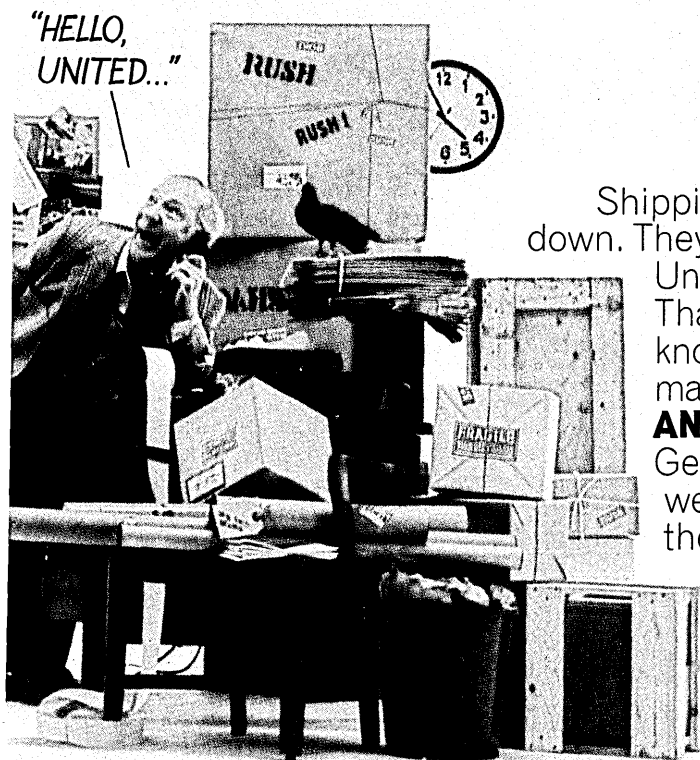


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MARTIN MARIETTA

HARDWARE

has the ability to create graphs and charts through the Quickchart software package. For output, users can choose from 32,000 colors and a wide variety of type fonts. The machine can produce 20 slides an hour. MANAGEMENT GRAPHICS, INC., Minneapolis, Minn.

FOR DATA CIRCLE 313 ON READER CARD

COMPUTER SWITCH

The 3690 line of computer switches is intended to supplement the existing 3900 line of switches. The new units are designed especially for customers who are looking to future expansion of their computer systems, but who may want to limit such expansion to single input channel or single output port increments. Expansion can be continued up to 384 crosspoints, to make 380 different matrix sizes.

The 3690's standard 8 × 8 channel matrix occupies 36 × 29 inches of floor space, which the vendor says is less than any comparable switch on the market. It is field-expandable to 16 × 24 in single-channel increments, and can start as low as 2 × 4. The \$69,400 switch is designed for IBM S/370 compatible channels and controllers, including byte, block, and data streaming. Its hard-contact crosspoints are totally passive and bidirectional.

Channel activity indicators are provided for every channel, and direct access is

provided to interfaces through latched LED indication and instrument output for troubleshooting and diagnostics. Operator protected switching prevents disconnection of an active device even with command in data chaining, and the switch maintains its configuration during power loss. The switch includes a local crt display and remote crt control and display, using the RS232 control interface. T-BAR, INC., Wilton, Conn.

FOR DATA CIRCLE 314 ON READER CARD

IBM P.C. EXPANDER

IBM Personal Computer users who feel hampered by the limit of five expansion cards may find relief in the Quadboard, an add-in board that incorporates four commonly added functions in a single board. The functions would ordinarily occupy a board each, leaving only one slot for expansion; the Quadboard leaves four slots for expansion.

The four functions are a serial RS232C asynchronous communications port, a Centronics parallel printer port, up to 256K of RAM in 64K increments, and a real-time clock-calendar. In addition, software with diagnostics is included.

The RAM is composed of four rows of 64K chips. Each row has a switch for enabling or disabling the specific row, providing an ability to switch memory banks independently. The clock-calendar uses a crystal controlled integrated circuit

with a rechargeable battery. The two ports are functionally identical to their IBM counterparts.

The Quadboard ranges in price from \$595 with 64K RAM to \$995 with 256K RAM. It is available in local retail computer stores. QUADRAM CORP., Norcross, Ga.

FOR DATA CIRCLE 315 ON READER CARD

WORD PROCESSING TERMINAL

The Ergo 4000 is a full-page word processing terminal that displays 66 lines × 80 characters. Compatible with the DEC VT100 in both ANSI and VT52 modes, the terminal can be user-reprogrammed to emulate other terminals by assigning different control codes and escape sequences for normal terminal functions.

Standard features include bidirectional pass through printer port, 15 user-programmable function keys, savable setup mode, and alternate character generator. Also included in the terminal are diagonal cursor movement, user-definable margin and tabs, screen saver, and transparency mode.

The \$1,695 terminal's green non-glare screen tilts 25 degrees, while the detached keyboard contains an integrated palm rest, numeric keypad, and screen brightness control. MICRO-TERM, INC., St. Louis, Mo.

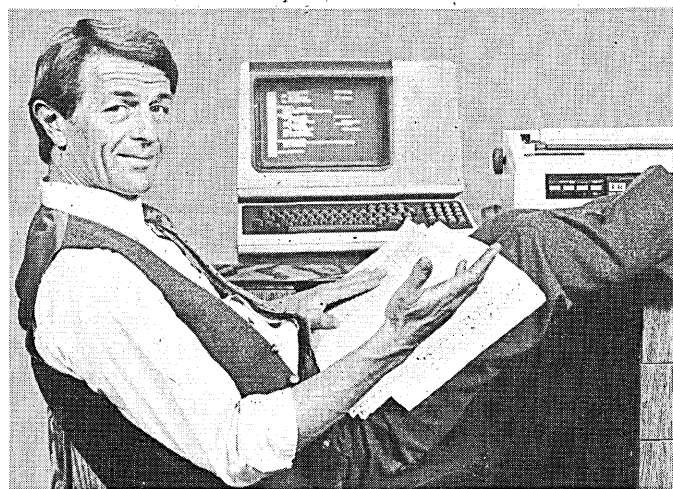
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CIRCLE 130 ON READER CARD

HARDWARE

tached keyboard contains an integrated palm rest, numeric keypad, and screen brightness control. MICRO-TERM, INC., St. Louis, Mo.

FOR DATA CIRCLE 316 ON READER CARD

BRITISH DISPLAY TERMINAL

The 42 line × 80 character display of the Alpha terminal can be split up to 10 ways to reflect partitions of the display memory, which can hold more than 30,000 characters. The dimensions and operating mode of each partition can be tailored to perform a

separate function, such as text editing, status display, tty conversation, form filling, form design, or monitoring control code sequences. Any combination of five video enhancements can be selected for any character; characters can be selected from four character sets, two of which are user programmable.

In graphics mode, the screen provides an 800 × 396 pixel resolution. Each dot on the screen corresponds to a bit in display memory, to improve control and flexibility. The terminal—which is driven by a 16-bit microprocessor—can emulate

the Tektronix 4000 series display and scale its screen accordingly. LYNWOOD SCIENTIFIC DEVELOPMENTS, LTD, Alton, Hampshire, England.

FOR DATA CIRCLE 318 ON READER CARD

LINE PRINTER

The HP 2611A is a horizontal font, 600 lines-per-minute line printer for medium usage levels. The chain-train printer, compatible with the HP 1000 and HP 3000 series computers, includes 132-column printing, 12-channel vertical format unit, long-line interface (up to 500 feet), and enclosed stand.

Dual power paper tractors, above and below the feed, move independently to improve print quality. A paper puller, in addition to the usual paper feed mechanism, reduces the chance of paper jams. The printer uses a 64 ASCII character set. The unit costs \$18,110, but is discountable for volume end users on HP purchase agreements. A 96 ASCII character set, running at 430 lines per minute, is optional for \$1,420, also discountable. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 317 ON READER CARD

GRAPHICS ADAPTER

The Colorplus adapter can produce multi-color graphics for the IBM Personal Computer. Its biplanar technology enables 640 × 200 pixel, four-color 80-character graphics or 320 × 200 pixel, 16-color 40-character graphics. By comparison, the IBM P.C. is capable of monochrome 80-character graphics or four-color 40-character graphics. Colorplus also offers the ability to debug program listings by writing over displayed graphic images.

The Colorplus system is built into a memory plane, which can be merged with the basic memory plane in the IBM P.C. for the composite and color displays. It requires one expansion slot, but it is not slot sensitive. An integrated parallel printer port is included, saving an expansion slot for other uses. Colorplus is compatible with all IBM software and requires some changes in the P.C. to take advantage of the extended features. The \$995 price tag includes full documentation and startup software. PLANTRONICS/FREDERICK ELECTRONICS, Frederick, Md.

FOR DATA CIRCLE 321 ON READER CARD

MINIATURE MODEM

Measuring 1 × 2 × 4 inches and weighing 2 ounces, the DS507 dataset is a self-contained unit that supports asynchronous speeds from 300 bps to 19,200 bps. It can be plugged into the back of a terminal or directly into a computer port, replacing a standard modem and the power and data cables associated with modems.

The DS507 uses a patent pending power conversion technique developed by this vendor, by which standard EIA data and

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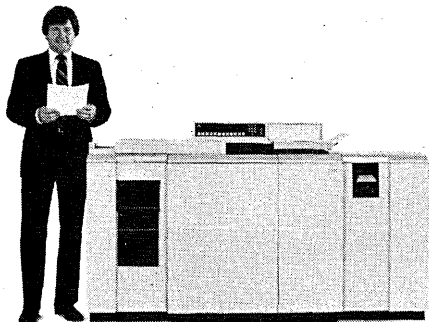
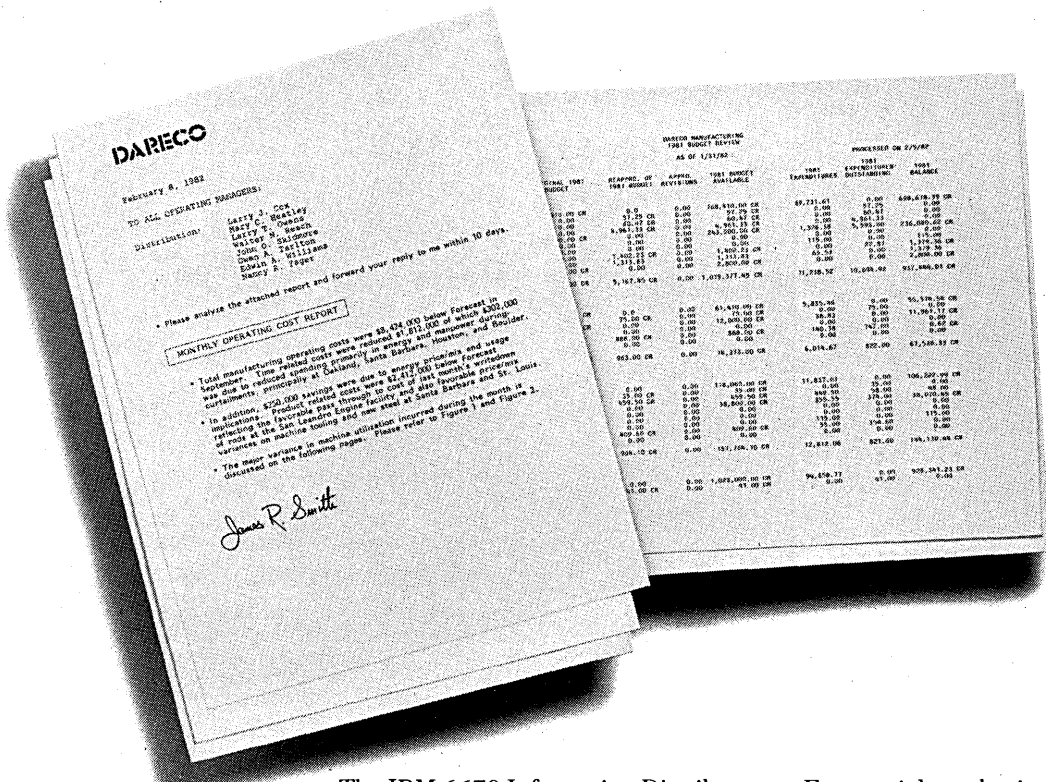
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CIRCLE 132 ON READER CARD

HARDWARE

control signals power the unit. No batteries, AC, or EIA test voltages are needed.

The unit sells individually for \$99 or in quantities of 1,000 for \$58. Each unit carries a two-year warranty. DEVELCON ELECTRONICS, LTD. Saskatoon, Saskatchewan.

FOR DATA CIRCLE 319 ON READER CARD

PRINTING TERMINAL

The DTC 383 KSR terminal is intended to be used in a data communication office environment as an interactive keyboard printer terminal. The daisywheel printer runs at up to 37 characters per second. Characters are printed as soon as they are received, and an 8K character buffer allows input to be faster than the terminal can print. Switch-selectable data transmission speeds range from 110 to 19,200 baud in full or half duplex mode.

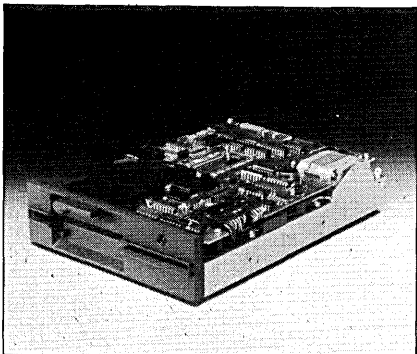
Features included in the terminal are fully formed descenders, audio and visual "out of paper" signals, bidirectional printing, APL and foreign character sets, internal line diagnostics, 128 ASCII character set, interchangeable metal and plastic print wheels, RS232C serial printer interface, and user-definable answer-back message. The unit also can operate as a word processor, with automatic underlining, centering, double striking, shadow printing, and right margin justification. Other options and accessories are available. The unit costs \$3,595. DATA TERMINALS & COMMUNICATIONS, Campbell, Calif.

FOR DATA CIRCLE 312 ON READER CARD

HALF-HEIGHT 5¼-INCH DRIVE

The YD-380T 5¼-inch floppy disk drive performs as if it were a double sided, double density 8-inch drive, its manufacturer claims. The drive, which requires one eighth the volume of conventional 8-inch drives and half the height of 5¼-inch drives, has 1.6MB unformatted storage capacity. The drive uses an 8-inch drive controller and is fully compatible with 8-inch double sided formats. The unit has a 500Kbps transfer rate and 3ms track-to-track transfer rate. The drive's 154 usable tracks provide 96 tpi track density and up to 9,646 bpi recording density.

The 1.62 × 5.75 × 8-inch size of the unit was accomplished by its smaller



motor and head design. The brushless, direct drive motor uses a steel band and 8-pole stepper mechanism for accurate head positioning. To eliminate cross-talk between high density packed tracks, a tunnel erase head is used to trim the tracks. Read/write and erase gaps are set by azimuth to trace the tracks' curvature precisely and to define the border between recording and nonrecording areas of each track.

The unit's mean time between failures is 8,000 power-on hours; MTTR is 30 minutes. Shipments are scheduled to begin late this year on the drive, which is priced at \$350 in oem quantities. C. ITOH ELECTRONICS INC., Los Angeles, Calif.

FOR DATA CIRCLE 360 ON READER CARD

MAINFRAME SYSTEM

The Burroughs B4955 operates 1.5 times faster than the mainframe it replaces, the B4800. The system is available in either single or multiple cpu configurations; up to four processors can be connected through a Shared System Processor to share common disk data files, providing the increased power and higher availability.

The cpu contains 5MB of memory, with a field upgrade to 10MB expected in 1983. The pipeline architecture allows concurrent performance of many tasks, including program address and data address calculations, data fetch and manipulation, instruction execution, and I/O initiation and transfer.

Each input/output processor is connected to peripheral subsystems through up to 64 Data Link Processors; each DLP is an independent processor programmed for the subsystem it serves. The two I/O processors are capable of a cumulative bandpass of 16 MBps, twice that of the B4800.

The B4955 is designed to be used with the CP3680 front-end processor in communications networks. The CP3680 manages and operates the network, freeing the B4955 for more efficient data processing. The new MCP IX operating system, language compilers, a DBMS, and application programs and programming aids are all available with the system. Purchase prices for the system start at \$780,000, not including maintenance. One-, three-, and five-year leases are available, starting at \$32,119 per month. Deliveries are scheduled to begin in the third quarter of 1983. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 361 ON READER CARD

DATA ENTRY SYSTEM

The Tartan Terminal System was designed to be a data entry system with substantial data and word processing capabilities. The central system enclosure contains up to 16 independent device drivers, a single 40MB Winchester drive and controlling processor, a tape processor, a communications processor, and a 64Mbps bus.

Each device processor operates with

32KB memory at 1 MIPS, and runs its own independent operating system. Any terminal can operate with any of the device processors through the bus. The communications processor allows asynchronous or bi-synchronous rates of 1,200 to 9,600 bps and enables the system to expand into a network of unlimited size. Software utilities are available for 3780 and 3270 emulation.

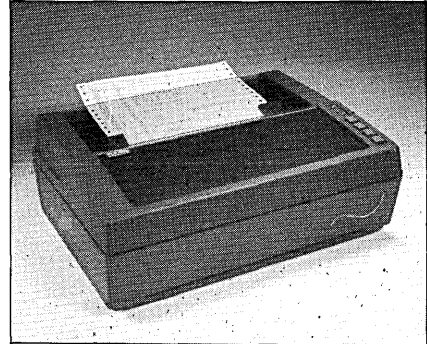
Each terminal on the system has its own display processor, operating system, and memory and can connect to the device processor in the system enclosure up to two miles away without using modems. The display processors offer enough intelligence to run word processing, electronic spreadsheet, and utility software, as well as compile and run programs in BASIC, COBOL, and FORTRAN.

A 300 lpm line printer, 5 × 7 dot matrix display printer, and letter-quality word processing system are available for the system. A typical configuration of system enclosure, printer, 10 terminals, and 768K extended memory costs about \$100,000. RECOGNITION EQUIPMENT CORP., Dallas, Texas.

FOR DATA CIRCLE 323 ON READER CARD

LISTING PRINTER

The Model 8-PLP printer is designed to be used by the software development engineer who dedicates his printer for listing and



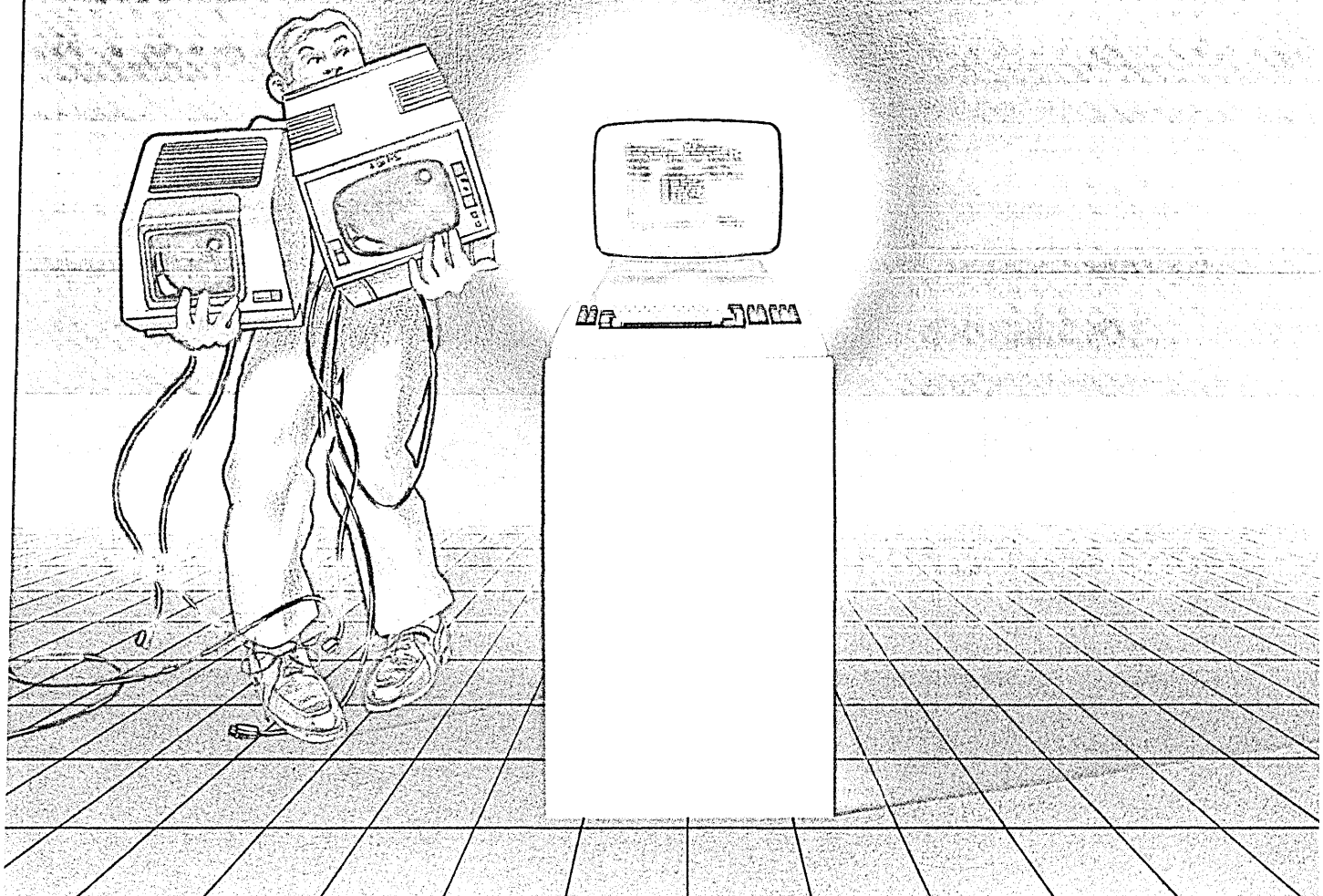
needs high throughput and durability. The 80-character 9 × 7 dot matrix unit prints at 250 characters per second and 10 characters per inch, with 25 ips bidirectional head travel. The snap-in cartridge ribbon lasts 6 million to 8 million characters.

The adjustable paper tractors operate at 5 inches per second, with six to eight lines per inch. Fanfold paper can be front or bottom fed. The Centronics parallel interface is standard for input, but RS232C and current loop inputs are available as options. Also available as an option is a 32KB buffer memory.

The printer is available eight weeks ARO, at \$675 for single unit purchases. Oem discounts are offered, and the vendor will tailor the unit's controller to various special jobs, such as order entry and sales, letter writing with NLQ fonts, etc. PRACTICAL AUTOMATION, Shelton, Conn.

FOR DATA CIRCLE 324 ON READER CARD

Why two when one will do?



Lee Data's universal terminal system design provides access to both 3270 and VT100 applications.

Now with Lee Data's new 3270/Async Communication System (Series 400) you can eliminate the cost and inconvenience of needing separate displays for access to 3270 and VT100 applications.

The Lee Data universal terminal system approach is another innovative Lee Data design that allows a single Lee Data display to access applications and data from an IBM CPU, a non-IBM system such as DEC, H-P or Prime, and timesharing services. And a simple command entered from the display keyboard is all that is required to switch from 3270 to VT100 operating mode and back again. What could be easier?

The Series 400 System incorporates a new hybrid approach to system operation that is simpler and more efficient than

protocol conversion. This approach allows a Lee Data controller to provide dedicated 3270 and VT100 processors for concurrent, but independent application access.

In addition, a single Lee Data controller provides you 3270 compatibility via either a remote BSC or SNA/SDLC or a local SNA or non-SNA interface, as well as 1 to 16 RS232C ports for your asynchronous application needs. Line speeds available are from 300 to 19,200 BPS.

The Series 400 System also provides you support for up to 32 devices, including Lee Data's unique All-In-One display that offers dynamic selection of 4 screen sizes—three 80-column and one 132-column. Lee Data's 3279-compatible color displays and a full line of printers are

also available as part of the 32-device complement.

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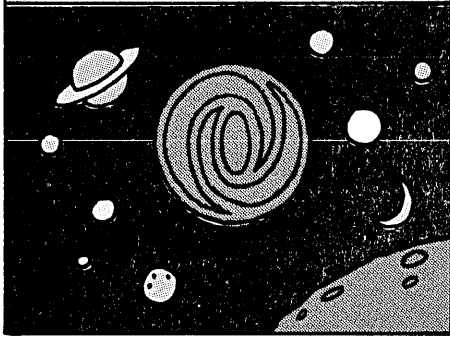
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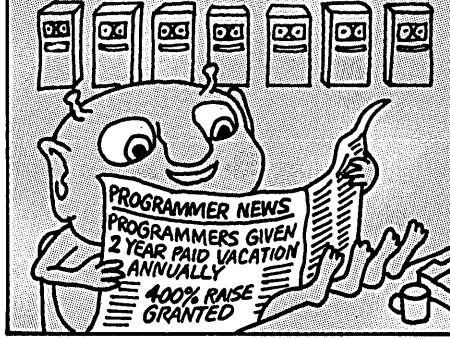
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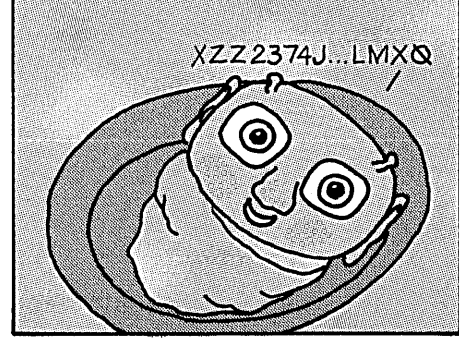
SOMEWHERE DEEP IN SPACE IS THE PLANET OXFORD...



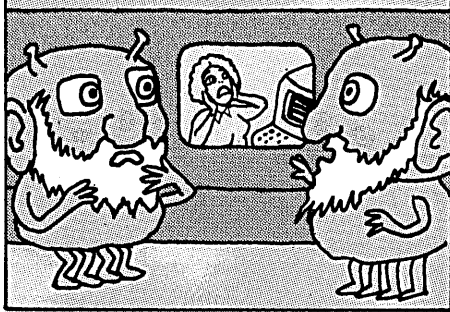
SO ADVANCED THAT THEIR COMPUTERS ACTUALLY WORK.



AND WHERE THE FIRST THING A NEW BABY SPEAKS IS COBOL.



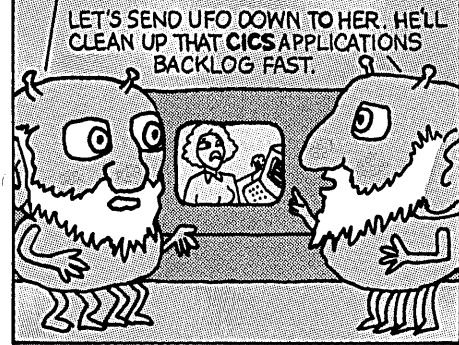
AS WE JOIN OUR STORY, THE ELDERS OF OXFORD ARE OBSERVING A DILEMMA ON THE PLANET EARTH.



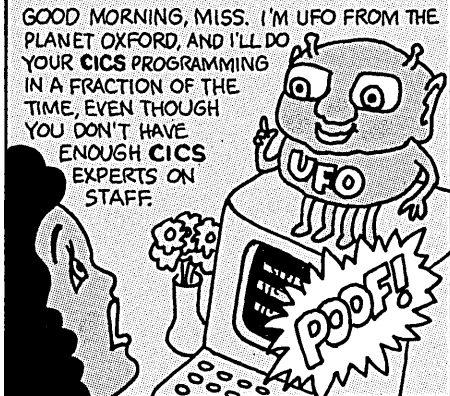
I DON'T KNOW HOW I'LL EVER GET THIS CICS APPLICATION WRITTEN; WE ALREADY HAVE A 312 YEAR PROGRAMMING BACKLOG... AND I HAVE A DATE TONIGHT.



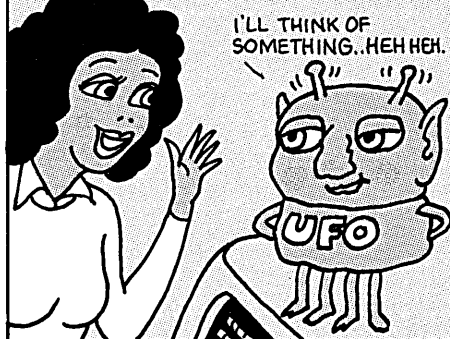
CAN'T WE HELP THAT EARTHLING? SHE LOOKS LIKE A SWEET KID.



GOOD MORNING, MISS. I'M UFO FROM THE PLANET OXFORD, AND I'LL DO YOUR CICS PROGRAMMING IN A FRACTION OF THE TIME, EVEN THOUGH YOU DON'T HAVE ENOUGH CICS EXPERTS ON STAFF.



OOH-UFO... HOW CAN I EVER REPAY YOU?



IF YOU NEED HELP WITH YOUR CICS APPLICATIONS BACKLOG, TOO... JUST DIRECT DIAL THE PLANET OXFORD AND ASK FOR UFO...

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SOFTWARE AND SERVICES

UPDATES

Cullinane's much heralded "most important breakthrough ever in software" doesn't quite live up to its billing. The key element, the IDMS database management system, is several years old; the breakthrough was integrating all applications through the database. Most important among the applications is the color graphics decision-support module, which allows top management to have direct access to graphics and the DBMS in the boardroom. That may make the system worth its hefty \$150,000 to \$400,000 price tag.

The future of word processing systems, under attack by microcomputers that offer similar capabilities as well as data processing functions, has been painted as rather bleak in some quarters. The impact of IBM's decision to license the UCSD p-System, with its extensive dp capabilities, on its Display-writer system has yet to be seen, but one would suspect that other manufacturers will follow suit so that their word processing systems won't lose market share.

The problem with most presentation graphics systems has always been that users had to key in the data manually; no interface to a database or user files was possible. This problem has been attacked by ISSCO's Data Connection software, which can read and extract data from files or printed reports in any format and use them for input to the Tell-A-Graph package.

Another interface of note links the Wang word processing system to a Xerox 5700 laser printer. The interface module permits Wang users to take advantage of most of the 5700's features, including insertion of logotypes and digitized signatures, use of multiple type fonts, and stapled sets.

RELATIONSHIP BANKING

The Relationship Banking System (RBS) is a service that links money market funds, brokerage transactions, debit cards, loans, checking accounts, NOW and DDA accounts, asset management, and other retail banking services. Banks using this system may select any or all of the available features of the system in keeping with their particular customer and market needs; customers of these banks can choose any or all of the features offered by the bank based on their personal banking needs.

The system operates on a remote processing basis, using terminal-printers and/or crts installed at each bank and linked to one of the vendor's data centers in Wayne, Pa., or Culver City, Calif. Each bank's installation includes a balance interface system that communicates to the vendor information about NOW and DDA accounts, debit cards, and ATM for RBS operations and reporting. This software is operating-system dependent, written for each bank's existing dp system.

The system is slated to be available to the vendor's installed client base by the end of the year and to new clients in the first quarter of 1983. On-site processing is also planned. SEI CORP., Wayne, Pa.

FOR DATA CIRCLE 326 ON READER CARD

CONCATENATOR

Traditionally, IBM system control programs have not allowed concatenation—linking in a chain—of unlike datasets. To attempt to do so during processing usually required special action by a programmer or operator or special modifications to the operating system. The Cupid package, which is available for MVS systems, allows users to combine unlike datasets residing on different types of storage devices—such as 3330-, 3350-, and 3380-type disk units, half-inch tape, and other mass storage devices—and process the datasets as though they had similar characteristics.

The package is designed to ease disk-to-disk conversions, migration or backup to tape, and generation data group

processing. The system is totally transparent to users.

Cupid is distributed as a set of standard files on magnetic tape. While installation does not require a total system generation, a programmer or analyst is needed who is familiar with the OPEN/CLOSE/EOV actions of the MVS system and line edit functions. It is priced at \$4,000, with maintenance offered at \$450 a year. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 327 ON READER CARD

MULTITASKING ON IBM PC

The Qunix operating system can simultaneously handle up to eight users and up to 250 tasking functions on an IBM Personal Computer. The system contains the full-screen text editor ED, which can be run either in monochrome or in color. It also contains the text-formatting program DOC.

Also included in the operating system are a hierarchical file structure that allows the user to file programmed material by topic; a 16-character file and directory name capability; built-in security that protects information stored on disk; communications capabilities; and printing, sorting, comparing, and backup utilities. Qunix is compatible with disk drives, modems, and printers that are IBM-compatible. It can also read disks written under the PC-DOS operating system to make the switch to Qunix easier.

Two versions of Qunix are available for general use and include program development tools in addition to the other features; three other versions are designed for business use, in which applications software is purchased separately. These versions range from \$350 to \$950. PC/SOFTWARE, INC., San Francisco, Calif.

FOR DATA CIRCLE 329 ON READER CARD

SALARY BUDGETING

Although the biggest chunk of a company's operating budget is spent on salaries, few companies have an analysis tool for projecting and managing salary costs. Fisc-01 is one such tool, available on the vendor's

SOFTWARE AND SERVICES

timesharing service.

Using the program, a company makes a forecast of each employee's next salary increase, based on existing pay scales and increase guidelines. This forecast can predict the company's salary expenditures for the next year and determine whether these expenditures are within the year's proposed budget. Companies using the system can also determine their competitive position in the marketplace and how much they must spend in salaries to keep up with the rest of the business community.

Fisc-01 can also project the salary budget for individual departments. Since across-the-board increases can leave some departments over budget and others under budget, the program divides the salary pie among departments based on performance standards, desired salary position of jobs within each department, and the external labor market.

Installation of the standard package typically takes a week to a week and a half. It is offered at a fixed rate of \$2 per employee to benefit small and large companies alike. COMSHARE, INC., Ann Arbor, Mich.
FOR DATA CIRCLE 328 ON READER CARD

TRADEMARK DATABASE

All of the U.S. trademarks processed in 1982 by the U.S. Patent and Trademark Office (PTO) are available through a weekly magnetic tape service. By the end of the year, some 56,000 new, renewed, and canceled U.S. trademarks will be included in the PTO's Trademark Data Base, and magnetic tapes for 1981 and 1980, now being compiled, will be available later.

The database consists of a full text description plus bibliographic information on all marks published for opposition in the *Trademark Official Gazette* or registered either on the Principal or Supplemental Reg-

ister. A mark that is published and then registered appears on file tapes that correspond to both the publication and issue dates. The second appearance includes any corrections or additions made after the publication.

The database, which leases for \$6,150 a year, includes bibliographic and status information for all marks that appear in any of the various *Official Gazette* listings. Included here are all marks that are renewed, canceled in whole or in part, amended, corrected, or limited by administrative or judicial order. Similar information is also available for marks republished under the Lanham Act and for those for which a new registration certificate has been issued. NATIONAL TECHNICAL INFORMATION SERVICE, Springfield, Va.
FOR DATA CIRCLE 330 ON READER CARD

LONG-RANGE PLANNING

The LRP (Long Range Planning) system generates financial planning systems based on information about a corporate organization. It is intended to help the financial or planning executive use the strategic plan for his corporation in defining the requirements for a computer-based planning system. LRP then uses those requirements to generate automatically the computer-based long-range planning system.

LRP supports a participative (bottom-up) approach to planning by allowing flexibility in the exact accounting and level of detail used from one strategic business unit to another within the corporation, while maintaining an essential level of logical consistency across the corporation as a whole. The system, designed for large organizations with 20 or more strategic business units, supports multiple simultaneous users while allowing access to secure data on a strict basis.

SOFTWARE SPOTLIGHT

PROJECT DEVELOPMENT ESTIMATOR

Estimacs is an interactive system that generates estimates of time, cost, staffing, hardware, and cumulative resource needs, as well as risks involved, for mainframe software system development projects. Using a model constructed from a series of industry databases, Estimacs allows the system developer and potential users to develop and analyze initial project estimates in less than an hour, based on answers to questions concerning the user organization and the general size, sophistication, and complexity of the target system. Estimates can be developed through successive refinement and analysis of design trade-offs using a series of "what if" questions.

The \$20,000 system, which is available on Apple and IBM personal computers, consists of four subsystems. The System Development Effort Estimator calculates

the total number of effort hours that will be needed to design a target software system and shows how that effort is divided among the various phases of the development cycle. It also indicates which input factors were the most important in calculating the estimate, to aid refinement of the system.

The Staffing and Cost Estimator calculates manpower needed at each skill level for each week of the development cycle. The Hardware Configuration Estimator projects hardware required to develop the target software system in terms of needed cpu power and I/O components.

The Portfolio Estimator calculates the cumulative resource needs, related costs, and relative risks of concurrent projects. Multiple iterations are possible to enable experimentation with workload balancing. MANAGEMENT AND COMPUTER SERVICES, INC., Valley Forge, Pa.
FOR DATA CIRCLE 325 ON READER CARD

The system includes a structural "what if" capability, which allows users to evaluate the effects of structural or organizational changes—such as mergers or acquisitions—without any programming. The LRP system is currently available on the vendor's APL*Plus timesharing service and is scheduled to be released as a software product next year. STSC, Rockville, Md.
FOR DATA CIRCLE 331 ON READER CARD

MICRO MARKETING SERVICE

Geared to the information needs of vendors and merchandisers of micro systems and related products, the Micro Systems Marketing Service (MSMS) is designed to assist micro systems vendors and resellers in marketing their products successfully. The first product in the service is *Channels of Distribution*, a two-volume reference and monthly newsletter. The first volume examines each major existing distribution channel with emphasis on selection criteria, expected support, competitive strategies, and in-depth channel profiles. The second volume will analyze current and emerging vendors in the market, highlighting their distribution strategies and channel relationships.

MSMS clients also receive bulletins, the monthly newsletter, an annual census and five-year forecast of the desktop computer market, complementary attendance at the vendor's two-day conference in February in San Francisco, and direct access to the vendor's market experts in the micro systems area.

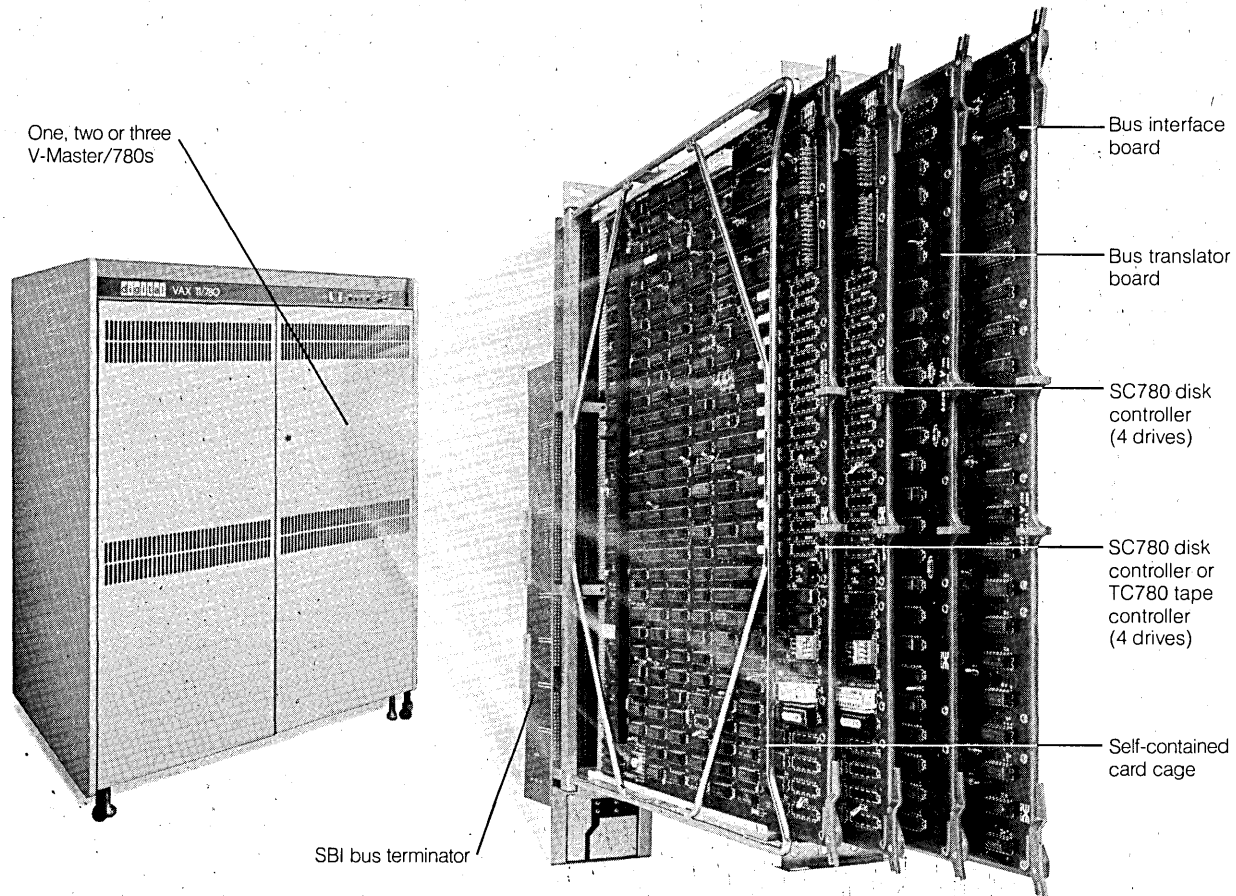
Future products in the MSMS series include *Advertising and Promotion*, *Pricing*, and *Vertical Marketing*, as well as others that will be announced later this year. A charter subscription to *Channels of Distribution* is available for \$9,000 through the end of the year. INTERNATIONAL DATA CORP., Framingham, Mass.
FOR DATA CIRCLE 332 ON READER CARD

ELECTRONIC MAIL

In addition to including all the functions usually associated with electronic mail, the Exectronic Mail system also includes what its maker calls "administrative and communications aids." Messages are automatically separated into In, Pending, and Out baskets. The system lets the originator know his message has been delivered accurately; a built-in "nudge" facility allows the executive to find out what has happened to his orders as well as take measures to get full compliance.

The system is routing-slip oriented. The user can send text, graphics, video, binary programs, or any other material in his files by filling out a short routing slip and attaching it to the file. A communication series of any number of original messages and responses, including nudges, can be maintained within available disk space (typically up to 1,000 messages). The series is maintained in date order.

Emulex takes the inside track on VAX-11/780* mass storage.



Announcing V-Master/780. A whole new packaging concept in software transparent mass storage adapters for VAX-11/780.

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CIRCLE 135 ON READER CARD

Introducing a small wonder in decision support systems: **MICRO-FORESIGHTSM**

**Save time. Save money. Learn how easy-to-use
MICRO-FORESIGHT completes the micro to mini
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MICRO-FORESIGHT is an English language, user-friendly system that can be used effectively by business decision makers. You don't have to be a computer expert to put MICRO-FORESIGHT to work in your business.

Productivity of your staff is increased dramatically with the MICRO-FORESIGHT business support system. It gives them immediate access to a computing system used for data acquisition, model-building analysis, display and report generation.

**Micros cut
your costs.**

MICRO-FORESIGHT brings mainframe computing power into the office without host computer costs. Complex business decisions can be analyzed in an interactive environment.

One other important feature: MICRO-FORESIGHT lets users store models on the host computer if desired. The models can then be used from any location in the world.

**MICRO-FORESIGHT
helps increase
your profits.**

With MICRO-FORESIGHT, you gain easy access to information that's accurate and complete. Information that will help you profit by allowing you to get to the business of improving your business.



**MICRO-FORESIGHT
gives you portability**

MICRO-FORESIGHT is totally compatible with FORESIGHT[®] on your host computer. Commands are identical. With "THE FORESIGHT CONNECTION," models may be easily interchange between main-frame, mini and microcomputers via MICRO-FORESIGHT's unique

telecommunications link. Portability saves money. Because modifications and updates can be done on MICRO-FORESIGHT before connection with the mainframe or mini, telephone connect costs are reduced.

**We back MICRO-
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Just look at all that we offer: regional and national user meetings, regional seminars, on-site training, a telephone "Hotline" and user-directed enhancements. They're all part of the MICRO-FORESIGHT business decision support system.

Feature for feature. Dollar for dollar.

Here are a few of the important capabilities of MICRO-FORESIGHT that can help you improve your business:

- 1. Sophisticated Modeling**
Performs "WHAT IF" analysis to assess alternative business plans.
- 2. Forecasting/Statistics**
Helps you succeed by analyzing past performance data. Predicts future performance based on the past.
- 3. Backward Modeling**
Lets you determine how input variables must change to meet defined business objectives.
- 4. Sensitivity Analysis**
Lets you assess the impact of changes in input variables such as the cost of raw materials on profitability.
- 5. Report Generation**
Allows you to produce reports in a variety of formats. In the form that's best for you and your company.
- 6. Consolidations**
Now you can consolidate information from different divisions into a single report.
- 7. Graphics**
Permits complex financial information to be communicated in graphic forms that are quickly understood.

Applications? Look at some of the ways you can use MICRO-FORESIGHT to make better business decisions:

1. Budget planning and control
2. Corporate modeling
3. Financial reporting
 - Balance sheets
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PLUS:
5. Merger and acquisition analysis
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8. Investment evaluation

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CIRCLE 136 ON READER CARD

SOFTWARE AND SERVICES

Up to 65,535 users can participate in the same network, and a message can be sent to any subset of users, subject to available disk space. Each message requires a 512-byte disk block plus storage for text; each copy requires one additional disk block. The program, including the CT*OS word processing system, occupies 24KB for the first user and 6KB for each additional user, and is available on most DEC computers. Prices range from \$18,000 for a simple installation on a PDP-11 to \$50,000 for a VAX installation including DECnet; the number of users has little effect on the price. EXECUTIVE SOFTWARE, INC., Los Angeles, Calif.

FOR DATA CIRCLE 333 ON READER CARD

DAISYWHEEL GRAPHICS

Daisy-Aids generates complete line, bar, scatter, pie, and block charts for daisywheel or thimble impact printers. The system is menu-driven, supporting data entry and editing features, automatic data scaling, and easy selection between line, bar, or scattergram plots. Other features include changing graph size or location, optional grid lines, and various tic-mark formats.

The line/bar/scatter, pie, and block chart programs are loaded and executed from a Daisy-Aids main program menu. The main menu for each program supports creating, editing, deleting, and renaming graph files, and includes file maintenance features. The line/bar/scatter program can plot up to six lines on the same graph, with special hashing, two-color ribbons, and different plotting resolutions and characters. The pie chart generates single or comparison charts with diameters of from 2 to 6 inches. Legends can be placed inside or outside each slice. Organizational charts and HIPOs are possible through the block chart program. A maximum of eight levels with 16 boxes per level is possible.

Installation is menu-driven for the \$275 package. The software requires an 8080 or Z80 based microcomputer with CP/M and 64K memory. Most Xerox and Diablo printers are supported, along with some Qume and Anderson Jacobson models and the NEC Spinwriter. ESCAPE COMPUTER SOFTWARE, INC., Roswell, Ga.

FOR DATA CIRCLE 334 ON READER CARD

DOCUMENTATION SERVICE

Intended to combat the proliferation of inadequately developed and poorly maintained software documentation, this service provides dp staff and users with software documentation while programmers are free to keep up production. Since documentation is said to take up at least 10% of programmers' time, cost savings could be significant.

The service coordinates with dp management from the beginning of a software project and customizes the documentation to the needs of the client. The levels

of detail in the documentation can vary from the identification level (e.g., an inventory of system components) to a published level for outside review. Typical products include operation manuals, user guides, system development specifications, data entry manuals, and program maintenance manuals. The service includes development and maintenance of these manuals.

The analysis and data gathering is performed by a team located at the client site. Drafts of the documentation are edited, proofread, and checked for accuracy. A finished copy is kept on disk for further revisions during maintenance; the revised pages are sent to the client to keep the information current. UNIVERSAL SOFTWARE ASSOCIATES, INC., Boston, Mass.

FOR DATA CIRCLE 335 ON READER CARD

INVENTORY CONTROL

The CA-Prisms inventory control and distribution management package was designed and written by distribution professionals with experience in both distribution and manufacturing management. It is fully adaptable for use by manufacturers, wholesalers, retailers, or other organizations with finished goods inventories.

The system, which operates on IBM mainframes, is designed to cut operating and inventory costs to a minimum while improving cash flow and customer service. Its integrated on-line modules include order processing, mail-order processing, inventory control, purchasing, bill of materials, sales analysis, accounts receivable, accounts payable, general ledger, management inquiry and reporting, security access, and a user report generator. The package also has help screens to guide operators through the system.

Documentation and on-site user training is provided with each installation. Customer support and enhancements are available as well. Now available only in the New York metropolitan area for an \$85,000 perpetual license or a 12- to 36- month lease, the package is slated to be sold nationally early next year. COMPUTER ASSOCIATES INTERNATIONAL, INC., Jericho, N.Y.

FOR DATA CIRCLE 336 ON READER CARD

MOLECULAR MODELING

The Drwmol software module allows users to draw any molecule containing up to 256 atoms directly onto the screen of a graphics terminal. The user selects the options that are to be incorporated into the structure—bonds, atoms, charges, isotope notation, and stereochemistry—from a list displayed next to the drawing space on the crt. Input is via light pen, keyboard controlled cursor, or drawing tablet. There is no need to learn structure codes to operate the program. The Drwmol package automatically corrects bond lengths, angles, and proportions in the drawn structure to produce a picture of textbook quality.

All drawn structures can be stored in a standard Molfile, which serves as the interface to transfer to other programs. The vendor's 3-D modeling and analysis programs can read structures directly from the Molfile with no adaptation, while programs from other vendors can be modified to read Molfile data. The package costs \$9,500. MOLECULAR DESIGN, LTD., Hayward, Calif.

FOR DATA CIRCLE 337 ON READER CARD

PABX COST ACCOUNTING

The Call Collector is a cost accounting option for the Focus family of PABXs that prices all outgoing telephone services on a per-call basis. The software is completely integrated into the PABX system, unlike other packages in which the call pricing is offered as add-on peripheral equipment.

The package allows property management to establish its own pricing scheme for recovery of telephone costs, including a flexible markup or discount capability. The software applies base prices for each type of outgoing call, including local, intrastate and interstate toll, and international numbers in the North American dialing plan. Pricing can be based either on the rate structure used by the local utilities or can be modified to reflect individualized rate structures. The package is compatible with the vendor's automatic route-selection feature to provide more effective routing of calls than is offered by DDD or operator-assisted networks.

The Call Collector package has an end-user price of \$5,000 to \$8,000 depending on installation size. It can be retrofitted into any existing Focus system. Deliveries are scheduled to begin next month. AMERICAN TELECOM, Anaheim, Calif.

FOR DATA CIRCLE 338 ON READER CARD

DBMS INDEX SYSTEM

The Relational Index System (RIS) dynamically balances free index space in a database without the need for traditional bit maps or block chains. These techniques, currently available on release 7.3 of the Databcom/DB DBMS, permit more efficient free-space management.

Beta test results of the DBMS show that the RIS has reduced cpu requirements and I/O events by one third to one half. The database, which is designed for IBM OS/VS and DOS/VS(E) environments, is intended to fulfill the needs of very large databases, but it can also accommodate personal databases for information center processing. RIS will fully support the development of distributed databases and nonstop database applications, the vendor says.

RIS responds to index searches predictably and consistently, regardless of the data being retrieved. It provides continuous operation with no need to reorganize, and allows flexible definitions of new indices and keys without requiring an unload or reload of the data area. Storage space re-

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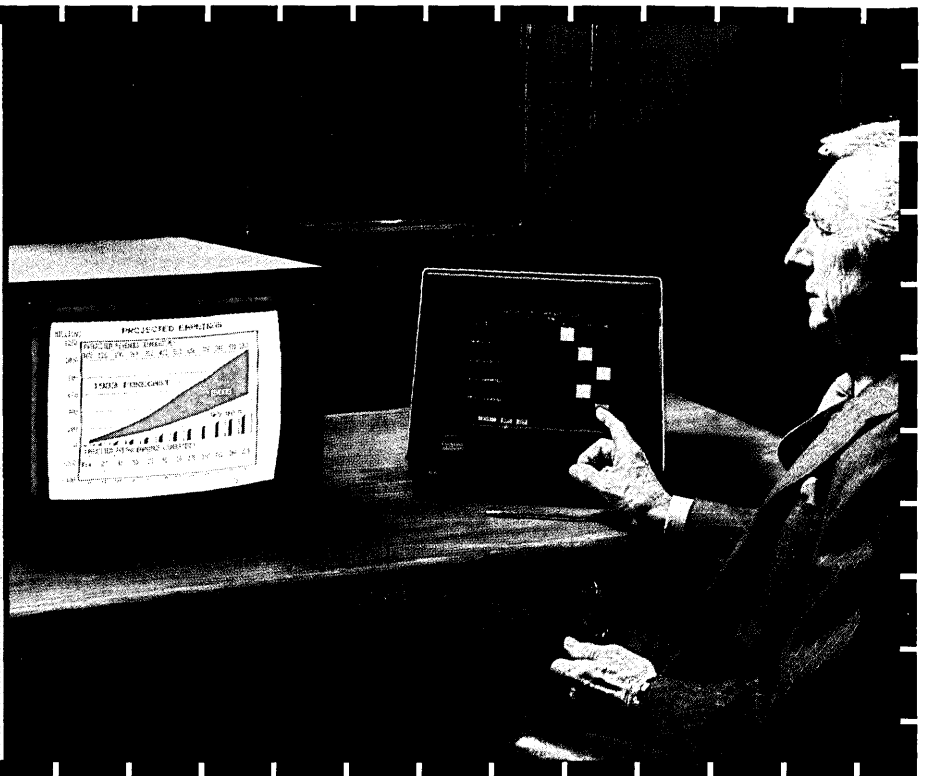
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Using IFPS you can build and analyze business and financial models. You can project cash flow, balance sheets and income statements, prepare and evaluate comparative budgets, and perform risk analysis to quantify the level of uncertainty. "What if" questions can be asked of the model at any time without affecting the actual model. Then – at the touch of a button – the numerical analyses are transferred directly from the mainframe to the Trend-Spotter system, which automatically converts

the information into full color graphic summaries. Further analyses can be performed on the Trend-Spotter System using more than 30 built-in statistical functions. And all of these graphic analyses can be instantly reviewed by company management using a touch screen.

This fully integrated system combines the efficiency and computing power of the mainframe with the speed and cost effectiveness of microprocessing. Together they form a tool for company management to visualize decision support information in a way that was never before possible.

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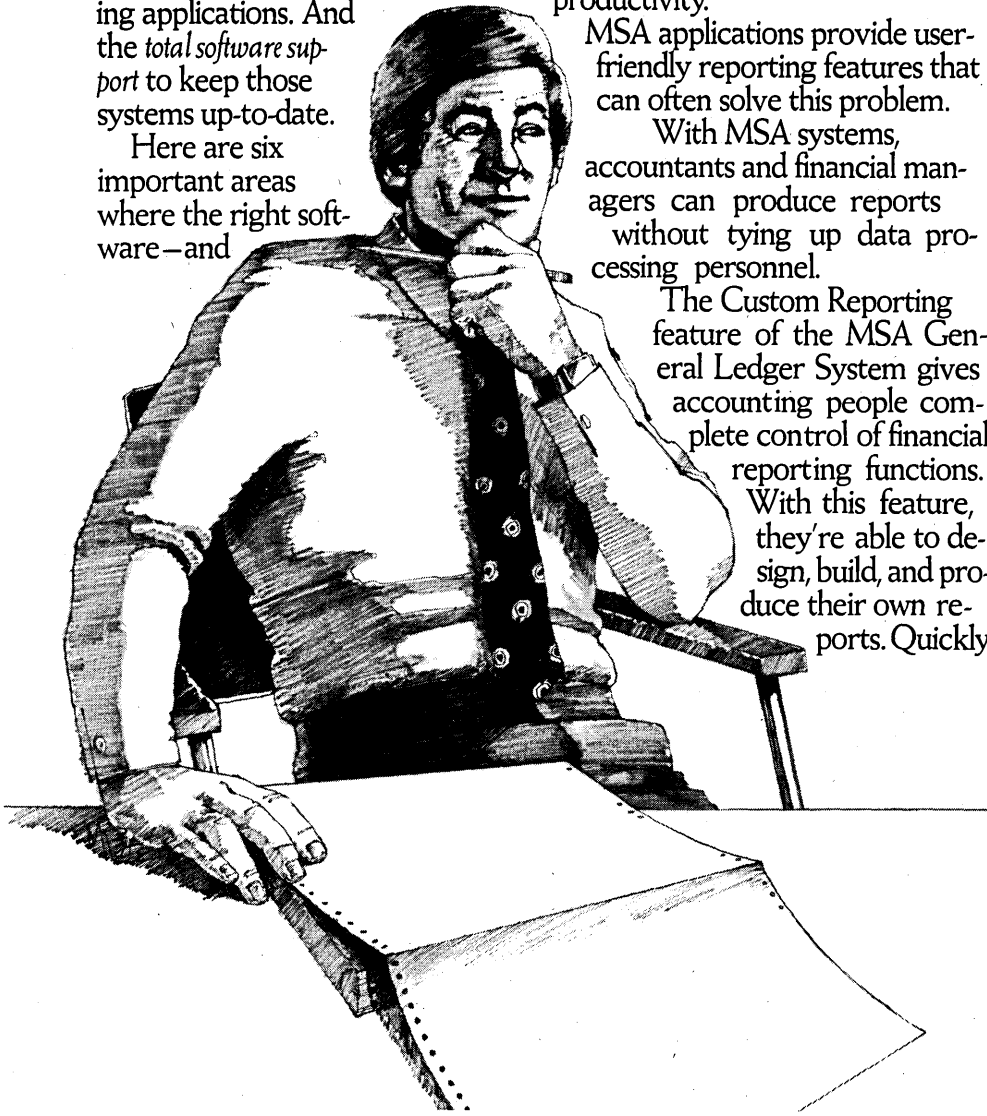
CIRCLE 137 ON READER CARD

Read how MSA has already solved your 6 toughest software problems...and relax

At MSA, we specialize in ready-to-install application systems designed to solve real-world problems—now and into the future.

We offer a complete line of financial, cash management, human resource, and manufacturing applications. And the *total software support* to keep those systems up-to-date.

Here are six important areas where the right software—and



The Software Company—can help.

1. Meeting the demand for management information

For many DP shops, backlogged requests for management reports can cause delays and decrease productivity.

MSA applications provide user-friendly reporting features that can often solve this problem.

With MSA systems, accountants and financial managers can produce reports without tying up data processing personnel.

The Custom Reporting feature of the MSA General Ledger System gives accounting people complete control of financial reporting functions.

With this feature, they're able to design, build, and produce their own reports. Quickly,

and without programmer assistance.

Online capabilities such as EASY-SCREEN™ and EASY-AUDIT™ let accountants design their own screens. Other MSA products give end-users direct access to powerful forecasting and modeling capabilities.

MSA applications help free you data processing staff from routine reporting functions. And increase your overall productivity.

2. The search for integrated systems

MSA is the only software supplier to offer a complete line of integrated business applications.

System interfaces are provided for all MSA applications. These provide pathways that automatically channel information between systems.

By combining MSA systems, you dramatically reduce manual entry operations. And redundant data storage is eliminated.

Most importantly, your integrated MSA applications function interactively to support high-level decision-making.

3. Keeping software up-to-date

Software maintenance costs can amount to more than fifty percent of your total data processing budget.

But with your MSA application package, you get a full year of

support services *at no charge*. (After that, you can take advantage of our surprisingly affordable support options.)

Our customer support organization is the largest in the industry.

We keep track of government regulations, accounting and personnel procedures, and new data processing techniques.

And when new developments affect your system, we provide update bulletins promptly.

We also respond to customer needs and suggestions with timely enhancements and new releases for your system.

At MSA, we keep you *and* your systems up-to-date.

4. Training your people

The MSA Customer Education Program is the most thorough in the industry.

In 1982, for example, we are conducting more than



90,000 student-hours of training.

A broad selection of courses are available, ranging from advanced training for data processing personnel to basic system orientation for end-users.

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5. Reducing implementation time

MSA Implementation Teams have installed more than 7400 software

systems worldwide. And we put that experience to work for you beginning with the very first meeting.

We help you work out an implementation schedule that tells you what will happen, when it will happen, and who will be responsible.

Your system is installed by specialists who are experienced with the type of computer hardware your company uses. And they work with you until the system is installed, tested, and operating smoothly.

We even help you handle important details like new business forms, including new check stock, invoices, and so on.

6. What about microcomputers?

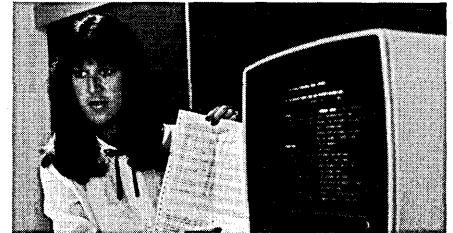
For many office productivity and business applications, microcomputers are a practical adjunct to mainframe computing.

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CIRCLE 138 ON READER CARD

"A distributed data base from micros to mainframes?"



Now you can have a relational data base for your microcomputer that's transportable to minis and large scale computers right up to the IBM 370 and Cray mainframes. MicroRIM Data Base Management

Software makes it unnecessary to re-define the data base files when transferring them from one computer to another. So, instead of working on programming details, users are free to concentrate on the data itself.

With MicroRIM, you can extract and analyze selected data from a large data base. The Report Writer lets you arrange reports in any format you need. MicroRIM runs on the IBM personal computer and CP/M systems.

MicroRIM evolved from the mainframe version of RIM, first used in the NASA Space Shuttle Program.

Today, it is being used extensively for business, industry, and research. To learn more, write MicroRIM, P.O. Box 585, Bellevue, Wa. 98009, or call (206) 453-6017. We'll show you how easy it is to get more from your microcomputers.



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MicroRIM[®]
Data Base
Management
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SOFTWARE AND SERVICES

quirements and I/O events are kept low by dynamically balancing access paths, supporting large synonym populations, and using very dense compressed indices.

A Datacom/DB license starts at \$66,200 for OS environments, \$54,600 for DOS environments, and \$41,000 for operating systems for IBM models 4321, 4331, 370/115, 370/125, and 370/135. Leasing arrangements are also possible. APPLIED DATA RESEARCH, Princeton, N.J.

FOR DATA CIRCLE 339 ON READER CARD

APT FOR MICRO

The uP/APT-1 NC Part Programming System is the first product that includes a version of the APT part programming language on a microcomputer, the vendor says. The in-house system is intended for milling machines, wire-feed EDMs, punch presses, machining centers, and other NC machine tools. The APT-like symbolic language simplifies the preparation of instructions for creating and editing tapes, and can be used to assist with manual programming or CNC. The system will handle 2-axis circular, 3-axis linear, and 4-axis positioning design, absolute or incremental positioning, and EIA/ASCII conversion.

The system includes a 64K IBM PC with two 320K disk drives, an Epson MX-80FT printer, an HP 7470A plotter, a Data Specialties tape punch, documentation, and postprocessor. Additional custom programming and a communications port are also available on the \$24,000 system. Most of the features of mainframe versions of APT are included in this menu-driven system, including geometric definitions, nesting, looping, transformation, and tool-path logic, for point-to-point and contour programming. A multiview interactive plotting routine makes tool-path verification immediate. MSD, Wilmette, Ill.

FOR DATA CIRCLE 340 ON READER CARD

BUSINESS GRAPHICS

Fast, low-cost color graphic slides, overheads, and other hardcopy visuals can be generated through the IBM Personal Computer using the Management Briefing Graphics System (MBGS). The offering allows management to input data and create visuals in 10 minutes or less. The package consists of proprietary software, a color display generator, and a choice of hardcopy options for 35mm, 8 x 10 transparencies, or printouts. Protocols available on the PC allow dialog with larger IBM mainframes.

Studies by the vendor show that slides can be generated for \$5 apiece, based on 10 slides a day. The graphics generated can contain as many as eight colors from a palette of 16, all selected for maximum audience reception. Flexibility is offered in bar chart, pie chart, graph, and title generation. The vendor says that it takes only three minutes to update a visual from an existing dataset, or 10 minutes to create a new one.

The system starts at \$26,000, with leasing available. CENTEC CORP., Reston, Va.

FOR DATA CIRCLE 341 ON READER CARD

CP/M INTO TELEX

The MicroTLX package is designed to let users turn any CP/M computer system into a full-featured telex machine. In addition to having a direct connection to TWX, telex, and international telex services, users can send and receive telex and TWX messages for less money than it would ordinarily cost. The program supports unattended operation and automatic dialing/retry, and is capable of sending mailgrams, telegrams, and overseas cables. Users also have immediate access to news, sports, weather, current stock and bond prices (updated hourly), and current commodities prices (updated twice daily).

MicroTLX comes with full documentation for ease of use. The package retails for \$150, with multicopy discounts available. ADVANCED MICRO TECHNIQUES, Foster City, Calif.

FOR DATA CIRCLE 342 ON READER CARD

MULTI-USER ADA

Up to eight users can simultaneously run TeleSoft-Ada on the vendor's 68000-based IN/7000 series multiprocessor computer family through the Multi System Executive (IN/MSX). Version I of IN/MSX supports up to 1.25 megabytes of main memory in a single cpu configuration. Version II will support up to 8 megabytes of memory and multiple processors.

The product allocates an equal amount of available memory to each user at startup, at which point each user has his own "private" copy of the TeleSoft-Ada Programming Support Environment. IN/MSX automatically manages the physical machine resources, including segmented memory management, clock interrupts and processors, Winchester and floppy disk controllers, and all serial I/O ports. The multilevel lockout facility guarantees each user exclusive access to system resources, through lockouts that can be invoked at the device, volume, file, and record levels.

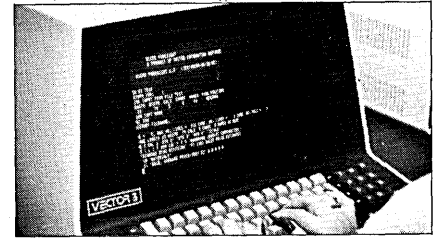
At any time during the system operations, each user may selectively drop back into the virtual monitor from the Ada environment. In the virtual monitor mode, the system control or master user can display the status of the other users or each terminal's input queue, stop/continue any user, restart any user who has locked out his terminal, and perform system reloads. In addition, IN/MSX acts as a printer and serial I/O spooler/despooler.

The IN/MSX package is available for \$1,000 plus the TeleSoft-Ada Programming Support Environment licensing fee. Upgrades to Version II, expected late this year, will be furnished at no charge. INTEL-LIMAC, INC., Rockville, Md.

FOR DATA CIRCLE 345 ON READER CARD

MAINFRAME MODELING ON MICROS

The Micro-Foresight package provides mainframe-based financial analysis capabilities for use on microcomputers. Arithmetic capabilities, built-in financial routines, "what-if" analysis, and reporting ca-



capabilities are bundled into the system. The software also includes complex additional testing, goal seeking, risk analysis, and graphics capabilities.

The package is based on the vendor's Foresight financial analysis software for mainframes and minicomputers, released in 1979. Basic source code is identical to the mainframe version, although the overlay structure has been modified to permit microcomputer operation. Initial beta test users have reported substantial improvements in remote financial analysis, reductions in telephone charges to mainframe centers and in mainframe overhead, fast conversion to a distributed dp environment, and an increased ability to offload mainframe financial modeling requirements.

A communications package included in Micro-Foresight allows the software to be fully compatible with the mainframe and minicomputer versions of Foresight. Models can be uploaded or downloaded to and from the mainframe, and micro to micro communications through asynchronous protocols is possible. Initial issues of Micro-Foresight are currently available on the IBM and Vector Graphics personal computers; versions are scheduled to be released soon for the CP/M, MS DOS and UCSD-P operating systems. UNITED INFORMATION SERVICES, INC., San Diego, Calif.

FOR DATA CIRCLE 343 ON READER CARD

STRATEGIC PLANNING SERVICE

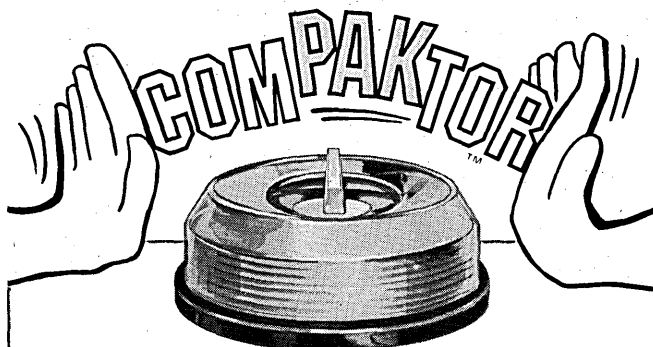
The Compass Data Base Service is designed to aid companies in the electronics market with their strategic planning. It analyzes over 200 products in four major market segments: processors, storage, input/output, and terminals. Each quarterly report will provide an in-depth analysis of one market segment as well as a general database update.

The service predicts which products and market segments will have the strongest success in the near future. It also analyzes areas threatened by imports and tracks market size and growth.

Compass consists of quarterly reports that include a management summary, an analysis of the economic and industry

INNOVATION DATA PROCESSING

**Free Space Fragmentation.
Poor Data Set Placement.
Over Allocated Data Sets.
Multi-Extent Data Sets.
Inaccurate VTOC's.**



COMPAKTOR is a Disk Management Utility Program which can reorganize Direct Access Volumes.

Free Space Consolidation

COMPAKTOR, in most cases, will consolidate all of the free space into one or two large free space extents.

Data Set Consolidation

COMPAKTOR will merge multi-extent data sets into one extent.

Reclaim Space

COMPAKTOR permits the user, with the release option, to free up the allocated but unused portion of a data set. Temporary and any user-specified data sets can also be scratched.

VTOC Management

COMPAKTOR has the ability to move and expand the VTOC. A complete analysis of VTOC is performed by COMPAKTOR.

Data Set Placement

Flexible user-specified data set placement. Data sets can be positioned to a relative or absolute position either singly, as a group, or in sequence.

Reports

COMPAKTOR's "simulation" function provides track maps of a volume both before and after reorganization. Comprehensive volume, data sets, and VTOC reports are provided.

3000 Users

COMPAKTOR, available since 1978, has a proven record of reliability and efficiency.

Free 60 Day Trial

COMPAKTOR is available for OS, VS and MVS operating systems. COMPAKTOR is available as an option to FDR.

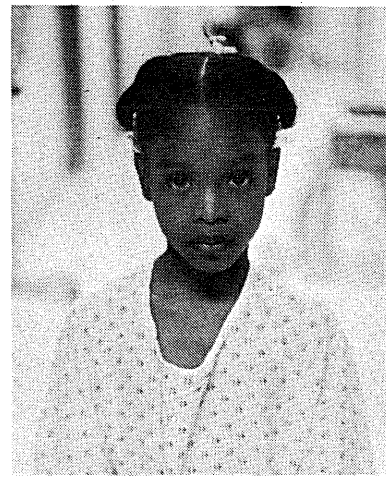
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CIRCLE 140 ON READER CARD

**How many
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had open
heart surgery?
Meet another.**



She's not 50 or 60. She's only 8. And this is her third operation. The open heart surgery will help her lead a normal life. Each year, 25,000 children are born with heart defects which can disable them for life.

The American Heart Association is fighting to reduce early death and disability from heart disease and stroke with research, professional and public education, and community service programs.

But more needs to be done.

You can help us save young lives by sending your dollars today to your local Heart Association, listed in your telephone directory.

**Put your
money where
your Heart is.**



**American
Heart
Association**

WE'RE FIGHTING FOR YOUR LIFE

SOFTWARE AND SERVICES



outlook, an appraisal of trends in products and markets, and an update of the industry database. Major comprehensive updates of each major segment of the database are issued annually. Compass subscribers have telephone inquiry privileges with the service's staff for discussion or clarification of topics of special interest.

To collect information for Compass, the staff interviews vendors and manufacturers of equipment and services, distributors, key end users, new technology developers, and new venture companies. Data are also collected from selected technical, government, industry, and vendor publications, as well as from information maintained in a census file of 100,000 computer sites. The annual fee for the service begins at \$15,000. GNOSTIC CONCEPTS, Menlo Park, Calif.

FOR DATA CIRCLE 346 ON READER CARD

CONTOUR PLOTTING

The CPS-1/G interactive contour plotting system is designed for energy resource firms, geologists, geophysicists, engineers, architects, cartographers, oceanographers, and others engaged in interpreting and displaying seismic, geological, and other spatial information. It operates in conjunction with a variety of batch contouring systems, including the vendor's CPS-1.

Users of the system can display raw data (control points), grids, base maps, and contours. They can edit control points by changing control point locations, adding or deleting control points, or changing their Z-values. They can edit grid values by changing a single grid node, applying a smoothing filter to nodes within a polygonal region to fit the surrounding surface, or adding control points and regridding them within a polygonal area.

CPS-1/G also allows users to do real-time contouring of the displayed or edited grid, interactive computation of statistical information, interactive gridding with faults, and contour editing. The system is coded in FORTRAN IV and uses Precision Visuals's Core-based DI-3000 package to ensure device and machine independence.

The system is available immediately, at \$25,000 for users who do not have DI-3000 and at \$20,000 for users who have DI-3000. Additional copies can be licensed at half-price. RADIAN CORP., Austin, Texas.

FOR DATA CIRCLE 347 ON READER CARD

SAT STUDY AIDS

Computer SAT is a software/textbook package for the Apple II and Apple II Plus that leads the high school student step by step through the process of preparing for the Scholastic Aptitude Test. The package consists of a 470-page textbook, two double-sided floppy diskettes, and a user's manual.

The textbook contains four practice SAT exams. The student takes one or more of these, entering his responses into the computer. The program scores the tests, analyzes the student's overall performance, diagnoses the student's strengths and weaknesses, and creates a personalized, prioritized study program. The computer presents explanations of answers to help students learn strategies for success, and times the student's performance to help develop speed as well as accuracy.

The student receives detailed study assignments that include specific reading material in the text, specific problems to be solved, and specially designed computer exercises. The exercises contain 540 math and verbal items. They feature "vocabulary flash cards," a program that provides drill and practice on 1,000 key vocabulary words. The computer keeps track of the student's performance and concentrates its presentation on the words the student needs to review.

The package is currently available for \$70 in retail stores. A version for the TRS-80 computer is expected to follow. An Educator's Edition supplies multiple copies of the software and texts for classroom use, and costs \$395. HARCOURT BRACE JOVANO-VICH INC., San Diego, Calif.

FOR DATA CIRCLE 348 ON READER CARD

TAPE BACKUP UTILITY

StreamSave is a streaming tape backup/restore utility program for DEC PDP-11 and LSI-11 computers. Scheduled to be announced at Dexpo West next month, the utility is standalone, operating-system-independent software that provides fast transfer of data to support streaming tape operation. The program automatically performs multiple-disk-unit, multiple-tape-reel backups and restores, handles recoverable I/O errors, and provides an optional verification pass on each tape reel.

The product views a disk as a collection of cylinders, tracks, and sectors, without regard to any file structure. Users can specify the locations and extents of disk data to be saved. Data may be restored to disk units other than those from which it was saved if desired.

StreamSave provides a system console dialog that guides the user through the save or restore process. Defaults, changeable by patching at installation time, are provided to make the program easier to use and to minimize the possibility of errors. Once the program has been configured to the user's installation, a routine disk backup

requires the operator to press "return" at each prompt to select the default response. For nonroutine use, a "help" function is available at each prompt to explain the options available.

The utility is designed for RM02/03/05, RP02, RP06, RL01/02, or RK06/07 compatible disks, and TM11 or TS11 compatible tape interfaces. It should be available at Dexpo, the vendor says, for \$450. SOFTWARE SUPPLY, Long Beach, Calif.

FOR DATA CIRCLE 371 ON READER CARD

GRAPHICS TERMINAL EMULATOR

The VDTE (Video Display Terminal Emulator) is a terminal emulator and file transfer system for the IBM Personal Computer that communicates with any remote or in-house computer. It emulates HP26xx and VT52-type terminals. In HP26xx mode, high-resolution HP26xx vector graphics plotting sequences are supported. The menu-driven system provides a full 25 × 80 character display in alphanumeric mode and 640 × 200 grid in graphics mode.

The VDTE program is written in assembly language. Ten data rates range from 300 to 9,600 baud. The system uploads and downloads files, optionally logs terminal sessions, and can send predefined sequences. The communications setup need be entered only once. On-line and off-line processing can be intermixed. The system requires the color graphics card from IBM to plot vector graphics.

The system costs \$50, postpaid, and comes with a 36-page user's manual. INNER LOOP SOFTWARE, Los Angeles, Calif.

FOR DATA CIRCLE 349 ON READER CARD

APPLE SCRABBLE

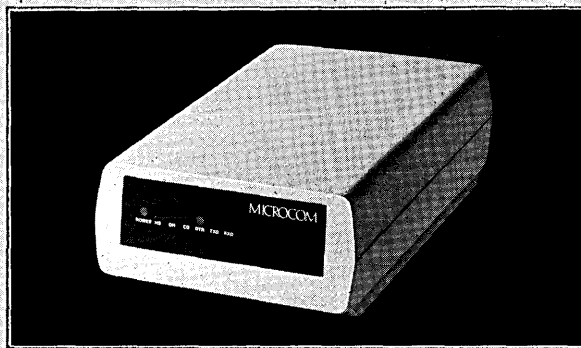
This computerized version of Scrabble is, the vendor says, exactly like the popular board game in every way except that it includes the challenge of playing against a very knowledgeable player—the computer itself. Computerized Scrabble runs on a 48K Apple II computer with disk drive and color monitor or television. (A black and white version is available.) The game can be played by up to four players, any number of whom can be the computer.

The computerized game includes an extensive dictionary and can be programmed to four levels of difficulty. At the highest level, the computer will average 300 points a game if the users let the computer play. All scoring is kept automatically on the screen.

The game grew out of a PhD thesis on word structures and analysis; its author was advised in its development by a former British National Scrabble Champion. An advanced version for the Apple and versions for other computers are planned. Currently, the game is available only in the United Kingdom. LITTLE GENIUS, London, England.

FOR DATA CIRCLE 370 ON READER CARD

FOR \$895. YOU CAN ACHIEVE PERFECTION.



THE RX/1200 ERROR-CORRECTING MODEM.

The new RX/1200 from MICROCOM™ is the only intelligent, Bell compatible 212A modem that implements an error detection and retransmission protocol. That means for the first time you can transfer data between any terminal, mini or micro. Reliably. No matter what mix of brands you use.

It's the most useful modem ever developed. With its SDLC-like protocol you can even transfer software programs over ordinary telephone lines error-free. And the RX/1200 has an auto dial feature and lets you store up to five frequently called numbers.

MICROCOM's RX/1200 can operate with your terminal at up to 9600 baud, with built-in flow control, and even includes a second printer port for simultaneous printing. You can also get the RX/300 error-correcting modem for \$595. It's Bell 103 compatible and easily upgraded to the RX/1200.

The RX/1200 or the RX/300. It's more than a good solution for your personal computer, mini or terminal communications. It's perfect.

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BOOKS

THE NEW ALCHEMISTS: SILICON VALLEY AND THE MICROELECTRONICS REVOLUTION by Dirk Hanson

Dirk Hanson has written a sprawling history of what is known as the microelectronics revolution. Beginning briefly with the efforts of Abbé Nollet and Michael Faraday, continuing with the adventures of Thomas Edison and Nikola Tesla, *The New Alchemists* finishes with a prolonged discourse on the role of the microprocessor in society today.

Since the author claims that these new alchemists (who transmute silicon to digital information) affect social changes "as profound as those which followed the discovery of the wheel, the steam engine, and the automobile," this work represents no leisurely feat. Big changes demand profound analyses. Anything less would serve to undermine the author's assertion of revolutionary change.

But the new alchemists? Alchemy might serve as a poor choice for a title. Antoine Lavoisier had pretty much finished off alchemy in the 18th century, when the hermetic art had sunk into charlatanry. To those abracadabrists, finding the elixir vitae was secondary to goldmaking. Such quacks and empirics compose our modern perception of alchemy, which has little to do with what Hanson had intended. The new alchemists—Robert Noyce, Ted Hoff, Charles Sporck, among others—are the engineers and inventors of the integrated circuit. The crucible of their new alchemic transmutation is, of course, Silicon Valley, where the pear orchards of Santa Clara county have given way to the new metropolis of the solid state. Hanson details the growth of Fair-

child Semiconductor and Intel, among others, while contemplating the effect of their new technologies.

Obviously, Hanson's scope is grand. He attempts to muster the cannons and evoke the tumult of actual revolutionary change. The reader expects cavemen and steamboat races, the storming of the Bastille and the Mighty Dynamo. We are led to anticipate the grand canvas, the Big Picture. Instead, we find out why Karl Malden urges tv viewers to hold on to their traveler's checks when their trip has ended (so that his sponsor may enjoy the float). We find out that Intel "measures" post-8 a.m. arrivals at its headquarters. Awaiting the Dantons and Robespierres of the VLSI circuit, the reader is disappointed by mere mortals, "high-octane investors" though they may be.

There are some pleasant moments to the book. Consider Hanson's citation of a 1966 meeting of the Institute of Electrical and Electronic Engineers in New York:

"Outside the Coliseum a shouting match took place between recruiters and IEEE officials who tried to move the recruiters away from the entrance to the show. In hotels nearby, engineers awoke to find job offers stuffed under their doors."

The war of the currents, waged between Edison (DC) and George Westinghouse (AC), is also worth reading. In order to convince the public that Westinghouse's rival current was hazardous, Edison electrocuted dogs, a horse, and finally, in a move intended to convince remaining doubters, an elephant. Edison even suggested a verb for future AC electrocutions: "to Westinghouse."

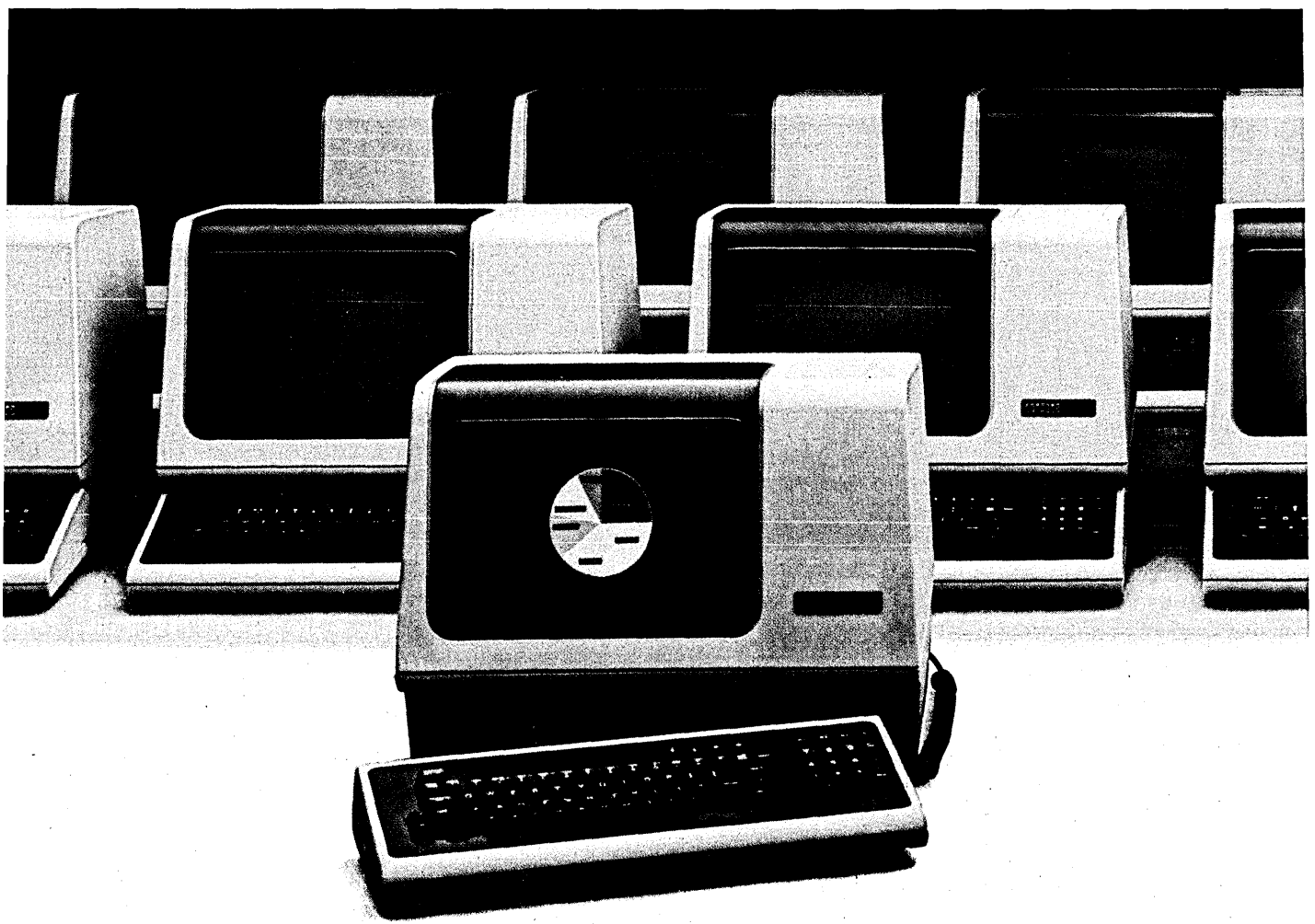
But there are mistakes in *The New Alchemists*. Charles Babbage finished, not began, work with his Difference Engine in 1822. Ada Lovelace, daughter of Lord Byron, was never married to Babbage. Her-

man Hollerith's tabulation of the 1890 federal census took six weeks, and not a month. Such admittedly minor errors detract from Hanson's credible efforts.

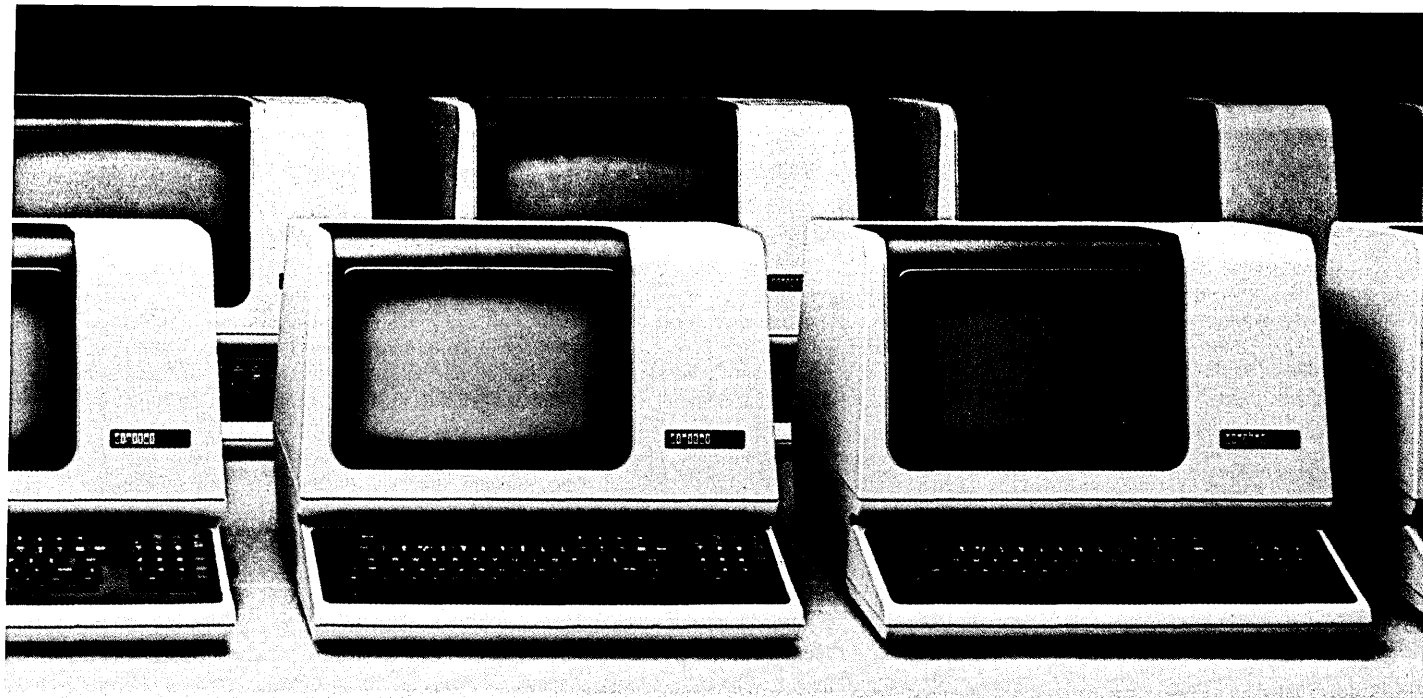
But the strongest complaint, the author's prolixity aside, derives from Hanson's ability to transmute an essentially exoteric topic (the growth of the microelectronics industry) into a hermetic art understandable only to a few. Is this book for the neophyte or for the acolyte? Why not supply some better documentation of facts? Why aren't there footnotes here? As it is, we are offered a general, four-page bibliography that is arranged alphabetically. What pertains to what?

The federal government, with defense contracts, has done much to transform California over the past 40 years. But Hanson has neglected to establish a sense of *place* for Silicon Valley. As he proceeds from vacuum tube to integrated circuit, little is done to present Silicon Valley as a habitat, a work place, a historical area in the process of change. There is too much fawning regard for Santa Clara and too little objective configuration. What is the connection between William Shockley and Lee De Forest? That they both lived in the same neighborhood? What is that neighborhood? What makes it different from, say, Oakland?

There seems to be no inclusive purpose for many sections of this book. The chapters on electromagnetic pulses, telecommunications, and consumer electronics aren't too bad when taken in reasonable doses. Even the perorations on the future of civilization, which are free of careening glorifications, should be considered relatively logical by themselves. It is the sheer accumulation of subjects that inundates and overwhelms the reader. The novice would grow weary of reading about all of the microelectronics field. And seasoned technol-



**Now you can get a terminal
as easy to use as a VT100 no matter
what kind of terminal you need.**



Up until now if you wanted VT100 quality in anything other than a VT100, you had two choices: Do without, or settle for something less.

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Affordable graphics for business and engineering.

It gives you what you'd expect in terms of durability and ease of use from a VT100. But what makes it an ideal graphics terminal is our new graphics instruction set called ReGIS (Remote Graphics Instruction Set).

With just a few simple lines of programming language, even an average programmer can run VT125 graphics off of your present minicomputer.

Then, with simple but powerful ReGIS commands, any operator can call up data and put it into graphic form with very little demand on the CPU.

The VT125 also writes text as well as it draws pictures, so what graphics fail to express, words can.

You can buy the VT125 as a complete terminal package. Or you can buy it as an option for the VT100 you already own.

Either way, it'll work like a charm on most systems supporting ASCII terminals. As will any other terminal in the VT100 family.

This next one, for instance.

The economical VT101.

It can display 80 or 132 columns of data with smooth scroll. You can select double-height and double-width characters. And you can personalize it right from the keyboard . . . so you'll feel comfortable working with it.

But because the VT101 was designed with less option space than the VT100, it costs less.

Thus it's perfect for people who want a terminal as easy to use as a VT100 but not as expensive.

The VT101, we think, fills a very practical niche between too much terminal and not enough.

But suppose you need even more features to start out with?

The VT131. A new, fully optioned terminal.

You get advanced video features to make an operator's life easier and more productive. The VT131 also comes with a printer port, five full and half duplex protocols and full modem control.

With the VT131 you can select block mode or character operation from the keyboard.

All of these features are designed in a terminal package that, like the VT101, has less option space than the VT100.

Thus the VT131 also represents an affordable choice in terminals.

Then, of course, there's the VT100 itself.

Some have called it the "perfect" terminal.

Perfect for OEMs developing demanding applications. Perfect for people who'll want its extra capacity power supply and card space for additional options later on.

There are options now that'll turn a VT100 into a personal computer for the office, or into a business graphics terminal. Easily and affordably.

Many have called the VT100 the best video terminal ever made.

Imagine what they'll say about a whole family of them.

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For printed copies, you can choose from the DECprinter III for exceptional throughput or the versatile DECwriter IV if your applications include graphics. One is probably perfect for you. Your Digital terminals dealer can help you decide.

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digital

SOURCE DATA

ogy buffs will find many of the explanatory passages irksome. There's almost too much here for the resident of Palo Alto to bear. Dirk Hanson should stick to one topic rather than attempt to exhaust them all. This would make writing a second book much easier, and would relieve the innocent reader of a Brobdingnagian effort. Little, Brown and Company, Boston, Mass. (1982, 384 pp., \$15.95).

—Leopold Froehlich

COMMUNICATION IN THE TWENTY-FIRST CENTURY

Edited by Robert W. Haigh, George Gerbner, and Richard B. Byrne

This book is a collection of papers delivered at a symposium sponsored by Philip Morris Inc., maker of cigarettes, soft drinks, beer, and fast food. The stated purpose of the spring 1981 meeting was not to propose solutions, "but to attempt to define issues as a first step toward devising communications strategies that will work toward the common good for us and those who follow."

The achievements of this project were clearly otherwise. Exploiting the machinery of public relations to reduce the scope of the issues, most authors strive to define and promote a tunnel-visioned structure of belief for the communications future. It is a future in which the computer and related devices can do little wrong.

As a result, most of the essays read like sermons. The editors have assembled a collection of sectarian tracts. Rhetorically, the essays range from the quiet reserve of science to the modem-thumping evangelical message: "Accommodate the new technologies or stand aside."

A few of the authors are cautious. They envision a problematic future. For example, Amory and Hunter Lovins, British energy policy analysts, believe the information explosion brought about by the new machines may get in the way of our thinking through major issues such as energy policy in a rational way. Elie Abel, former U.S. delegate to the UNESCO McBride Commission on the New World Information Order, accepts the coming of the communications system but fears that it will help create horizontal and vertical divisions in the social order: horizontal in the sense of creating information-rich and information-poor industrial societies, and vertical in the sense of fragmenting the body politic into competing interest groups. On the other hand, Elihu Katz, an Israeli professor, and Anne Branscomb, independent communications consultant, in different papers envision the new systems as infrastructures for new forms of community.

Some of the authors are titillating. Their images are the stuff of dreams and fantasies. Richard Munro, president of

Time Inc., promises a cornucopia of information that can be tailored precisely to individual needs. The picture of a home viewer-reader magically transformed by interactive technology into a viewer-editor is quite entertaining.

Bell Labs researcher Arno Penzias's description of intelligent machines is couched in a primitive, shamanistic language. He refers to a human-machine interface that would "... let us talk to the machine and have it understand and respond." This machine cum fetish would "... obey even vague or ambiguous instructions; it would select among alternatives, it would make decisions based on experiences, and it would seek additional direction when necessary." As if Pygmalion, he suggests that "The burden of understanding would shift from the person to the machine."

Of course, the most fervent advocates of the wide use of the new technologies are the managers. F.G. "Buck" Rodgers, IBM vice president of marketing, observes that trends in social and technological change have played into the hands of his industry. As he explained to his audience of "difference makers," however, the inevitable growth of the computer industry is being unjustly and unnecessarily constrained. He blames "economic illiteracy" and government interference in the forms of gratuitous regulation and antitrust litigation. Perhaps more to the point is his complaint concerning technology outpacing the market. He writes that "All known studies show that something like 10 major office applications are waiting to be systematized by data processing and communications, but 70% of the customers' programming staffs are spending time maintaining older systems."

Just as in a sermon, the rationale of the argument rests on faith in an unprovable set of assumptions. If one believes that the world is information, then to manipulate information is to move the world. The computer becomes the ultimate lever. Bureaucracy depends on the ability of management to generate more information for processing. It is a trap, a form of data addiction. In accepting the urgent arguments that corporate planning be set in the context of a data processing paradigm, the corporate manager also accepts the rational incentives built into that paradigm to go on-line, to deepen his commitment to electronic systems.

When you hear this talk too often, it begins to sound visionary and frequently imperial. Bureaucracies are released from paper and emancipated from space. The head office becomes a data processing center controlling the operations of a decentralized firm. The home, Alvin Toffler's "electronic cottage," itself becomes a branch plant of the corporation. The corporation itself ascends into the ethers.

The only substantive discussion to

emerge in this collection occurs in the treatment of international issues. The key question is the validity of the free flow of information doctrine. Is it an imperialism on liberal stilts? Are expressions of concern for privacy and national sovereignty justified?

Harry L. Freeman, vice president of American Express, apparently thinks not. He views the state-owned petroleum companies of OPEC and the Eastern-bloc trading companies as the fastest growing multinational corporations (MNCs). He anticipates the formation of a new style of MNC based on joint ventures of European, American, and Japanese companies operating "... in regulated and unregulated environments to bring about major economies of scale." Finally, Freeman predicts that national governments will recognize that heightened world competition will override their need to regulate transborder dataflows.

On the other hand, Herbert Schiller, the influential Marxist communications scholar, argues that third world and OECD countries have a legitimate political and economic interest in regulation of dataflow across borders. He cites Canada, France, and Sweden as countries that have gained from such regulations. They have expressed concern in domestic and international arenas over questions of national sovereignty, their ability to control and monitor economic activity within their borders, and the urgency of preserving their cultures.

In a very shrewd essay, Kaarle Nordenstreng looks askance at the multinationals touting of global interdependence. It is, the former director of the International Organization of Journalists and professor at the University of Tampere in Finland argues, a deceptive gloss over their hidden agenda for a global economic transformation based on the new communications technologies. Like Schiller, he views the free flow issue as a hidden card to be played by third world and OECD countries in negotiations over the issues of political and economic equity.

In the final essay, Lord Asa Briggs, chancellor of Britain's Open University, comments on the present as history. In imagining the current communications revolution from the vantage point of the 21st century, Lord Briggs displays characteristic English reserve. He regards globalism, war, abundance, vast demographic changes, and increases in knowledge and education as more significant aspects of the 20th century than mere communications are. Each of these aspects, however, are interrelated. This perspective, he writes, "... will make it impossible to miss the underlying economic factors; technology will never be the only determinant."

One wonders if the audience understood his point. The other participants in the symposium hid, narrowed, and translated out of existence some of the most compelling issues of the communications revolu-

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tion. Indeed, they produced an agenda for the new technocracy. Their imagined techno-utopia is apolitical, its management relieved of responsibility for machine-directed actions. The dilemmas for public choice concerning privacy, employment, and the distribution of wealth—all in some way related to the basic problem of political and economic equity versus industrial efficiency—become so many problems for the calculating machine. Wiley-Interscience, New York (1982, 240 pp., \$21.95).

—Kenneth R. Donow

BOOK BRIEF

COMPUTER PRODUCTIVITY: A Planning Guide for Cost Effective Management by C. Warren Axelrod

An overview of computer management for medium and large organizations is presented in this straightforward, clearly-written guide. It is aimed at systems analysts, dp managers, general managers, and business administrators.

In his attempt to appeal to such a broad range of experiences, the author begins with the very basics, which may try the patience of the more experienced manager. Axelrod covers the standard techniques and terms and then presents newer and more complex approaches. Ample use of charts,

diagrams, and figures helps to illustrate his points. Chapters include "Computer Capacity Planning," "The Computer Pricing Process," and "Planning for System Effectiveness." John Wiley & Sons, New York (1982, 254 pp., \$24.95).

—J.G.

REPORTS & REFERENCES

CUTTING COSTS

"Americans could save at least \$4.9 billion a year on long distance telephoning." The 336-page report *Long Distance for Less* by Dr. Robert Self tells how. According to the report, in the U.S., we currently spend \$32 billion a year on long distance calls. Self estimates that the average savings possible for businesses and individuals is at least 15%. Some interesting statements included in the report:

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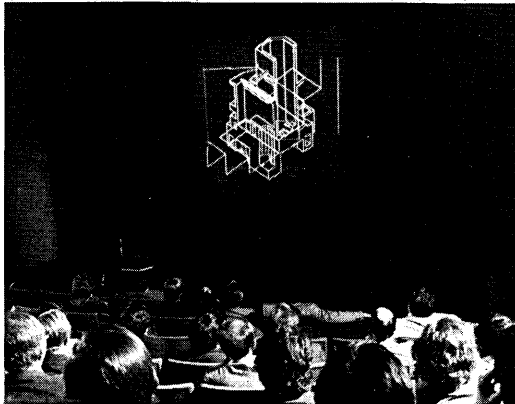
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The publisher offers frequent "Update" sheets to keep the report "totally up to date" as new prices take effect, or as new services are introduced. The report is available for \$75 from the Telecom Library, Inc., 205 W. 19 St., New York, NY 10011, (212) 691-8215.

THE SOURCE

The Small Systems Software and Services Sourcebook is 504 pages of information to guide users through the complex software and services world. There are 1,300 software listings, written in nontechnical language, to help readers to understand the applications and limitations of each program. The Information Sources, Inc. report also shows which programs are compatible with which hardware, operating systems, and languages, and what terms, prices, and training are available. Each vendor's name, address, and telephone number is included in the listing. In addition to the software information, the sourcebook contains data on related services, such as consultants and their particular fields and timesharing. For \$125 prepaid (\$135 if billed later), subscribers receive the sourcebook and a similar-sized supplement that includes hundreds of additional listings. Information



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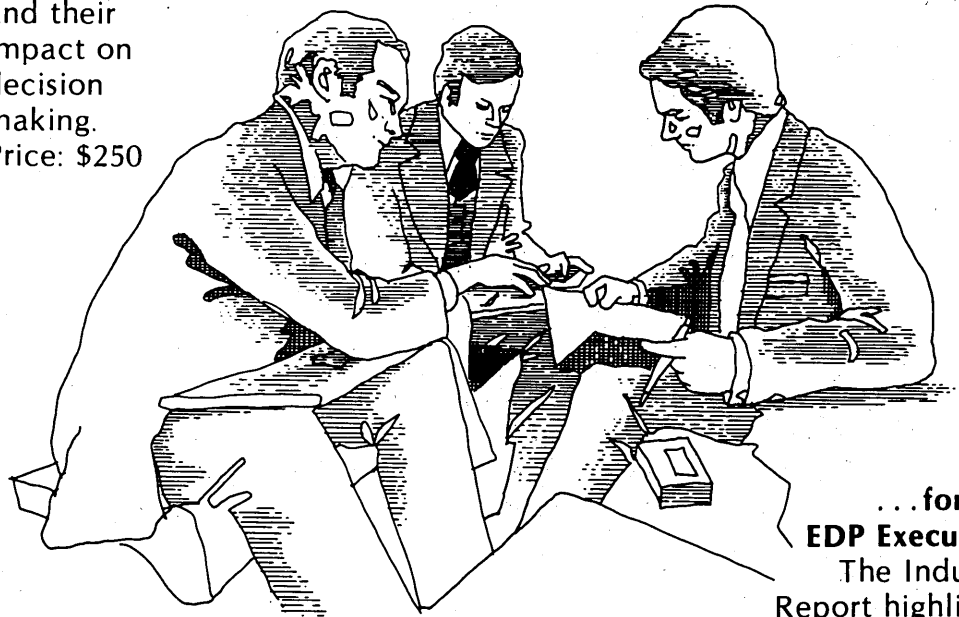
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ABSTRACT DIRECTORY

Billed as a "descriptive guide to abstracting journals, indexes, digests, serial bibliographies, catalogs, title announcement bulletins, and similar information access and alerting publications," the *Abstracting and Indexing Services Directory* is available from Gale Research Co. The volume covers a large number of publications, with topics ranging from humanities and medicine to law and technology. The three-part report costs \$85. Gale Research Co., Book Tower, Detroit, MI 48226, (313) 961-2242.

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GRAPHIC NEWS

The Institute for Graphic Communication is offering a conference from Dec. 12 to 14 entitled "Imaging Industries Over the Next Decade—Trends, Opportunities, Threats, and Forecasts." As new products and technology evolve, the traditional roles of imaging industries change. The conference will reflect these changes, as well as the future needs and trends in imaging. For more information on this or other IGC conferences, contact the institute at 375 Commonwealth Ave., Boston, MA 02115, (617) 267-9425.

INFORMATION SYSTEMS

Cosponsoring the Third International Conference on Information Systems are the Society for Management Information Systems, The Institute of Management Sciences, and the ACM. The five major topics to be covered include information system technology and design, implementation, and use; managing the information processing function; the impact of information systems on organizations and society; and innovative information systems curricula. The conference takes place Dec. 13-15 in Ann Arbor, Mich. Further details are available from Carol Dunn, Information Systems Research Group, University of Michigan, Ann Arbor, MI 48109, (313) 763-1100.

BABBAGE

The life and works of Charles Babbage will be explored and discussed at a one-day meeting (Dec. 10) to be held by the National Physical Laboratory in Teddington, England. Speakers include Dr. R. A. Hyman, author of *Charles Babbage, Pioneer of the Computer*, and Dr. J. M. Dubbey, author of *The Mathematical Work of Charles Babbage*. Contact R. S. Watson, Division of Information Technology and Computing, National Physical Laboratory, Teddington, Middlesex, TW11 0LW, U.K., tel: 01-977-3222, ext. 3980.

VENDOR LITERATURE

PABXs FOR LARGE USERS

Twelve four-color pages describe this digital PABX, designed for users who need from several thousand to 30,000 telephone lines. The SL-100 system's features, architecture, voice/data integration capabilities, and a Communications Management Center are also described. NORTHERN TELECOM, Richardson, Texas.

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CANDID CAMERA

3M's P13 ATM Documentation Camera System (ATM refers to those popular money machines) is detailed in the vendor's eight-page brochure. Touted as "an effective fraud reduction camera system for recording ATM transactions," the brochure contains system specs and features, and a number of suspicious-looking characters being photographed. 3M, St. Paul, Minn.

FOR DATA CIRCLE 351 ON READER CARD

CATALOG

Genstar Rental Electronics, Inc.'s catalog features almost 1,000 electronic instruments from over 50 different manufacturers. Products range from amplifiers and analyzers to synthesizers. GENSTAR RENTAL ELECTRONICS, INC., Woodland Hills, Calif.

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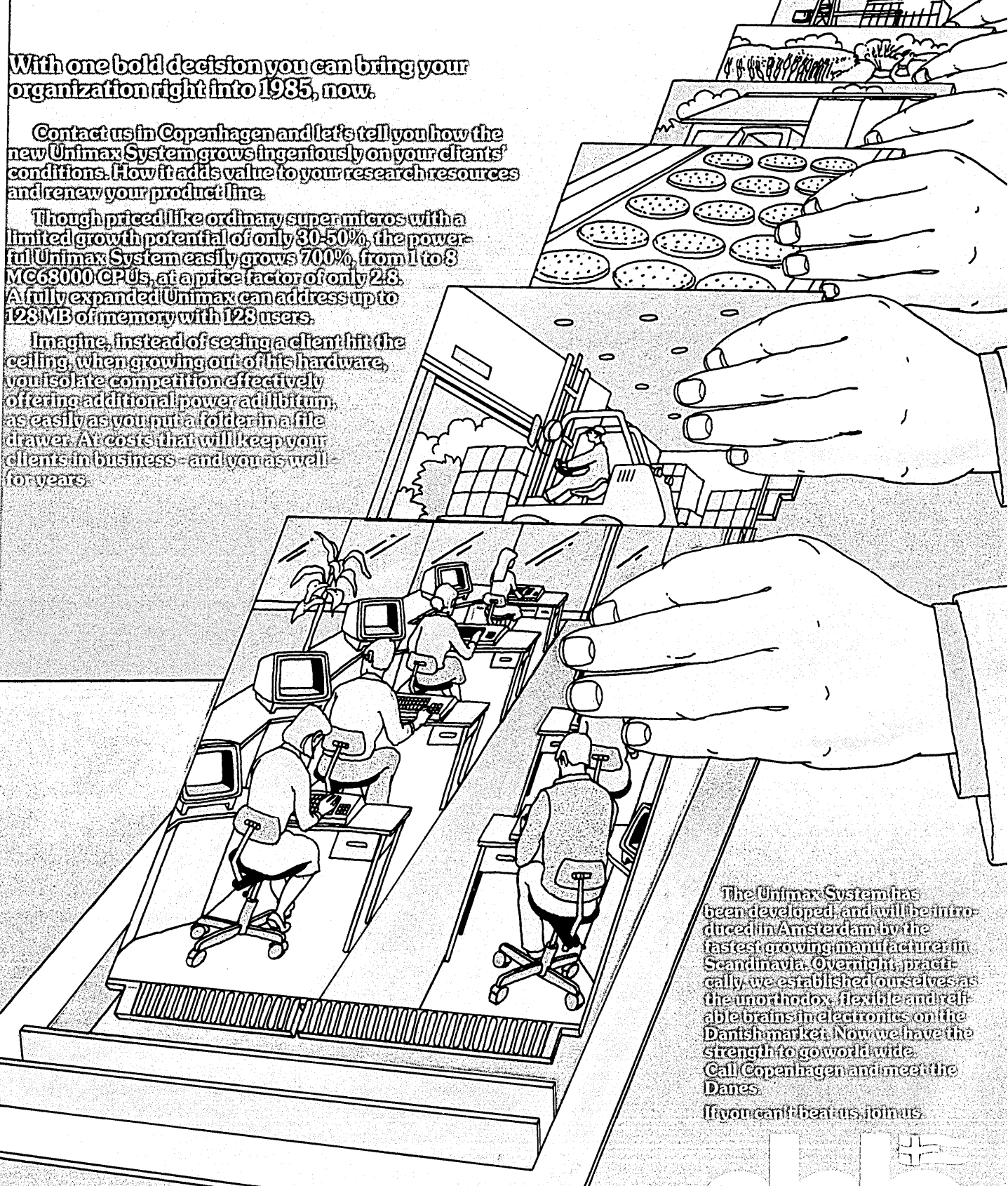
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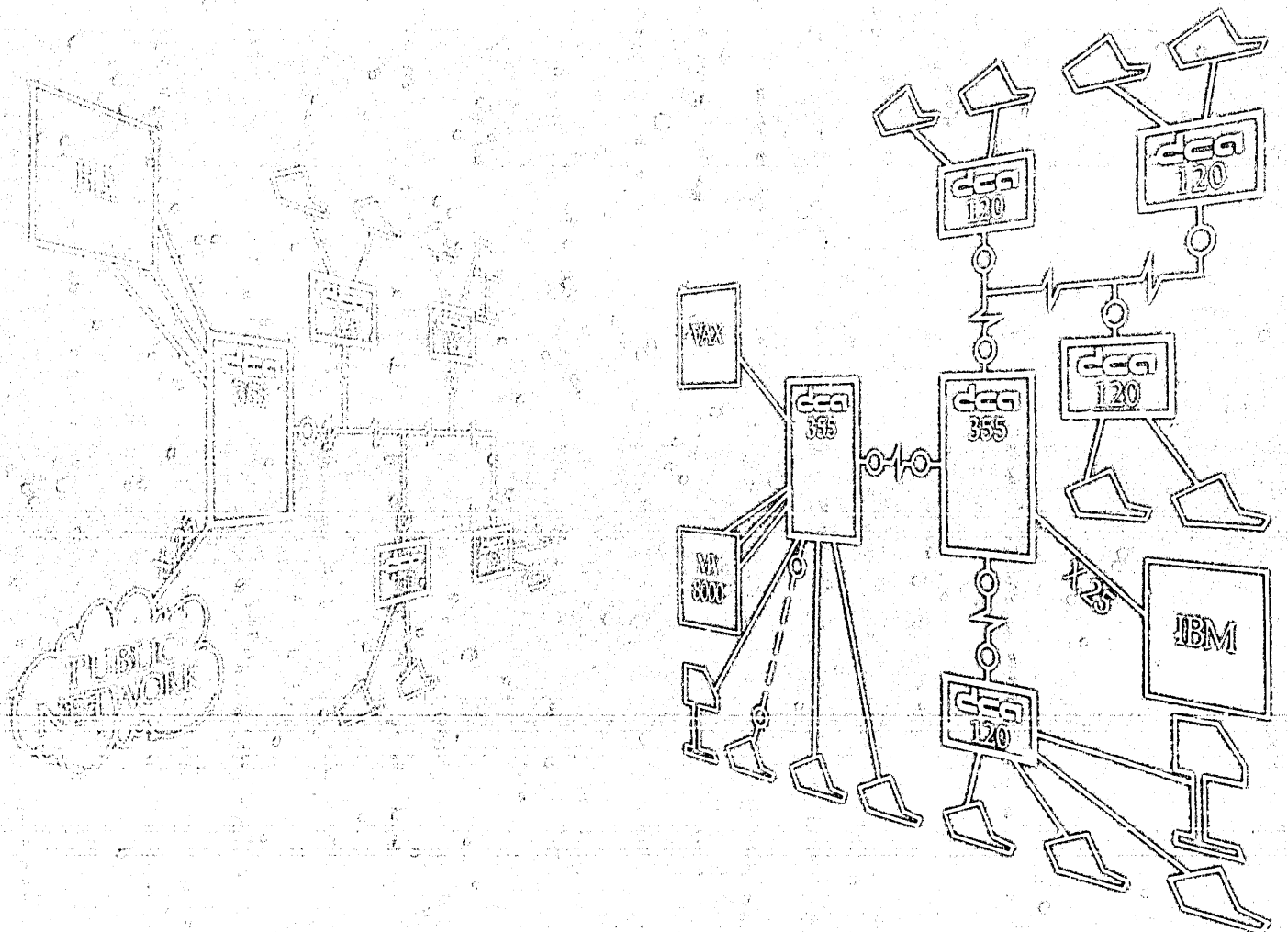
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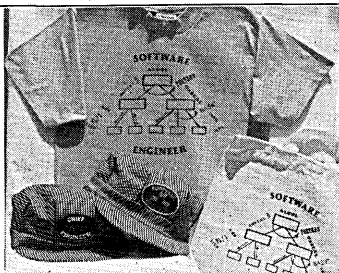
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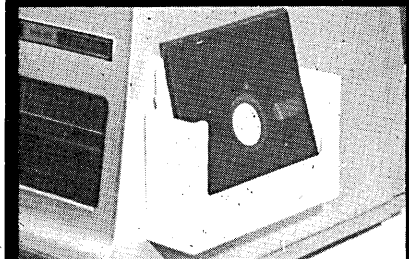
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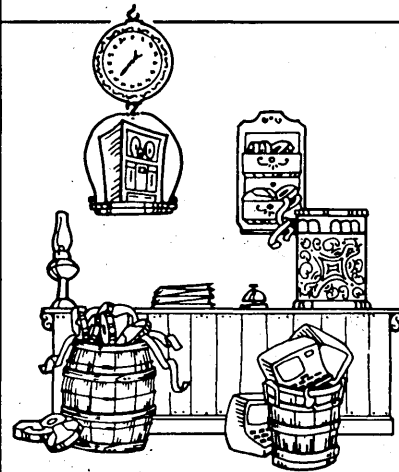
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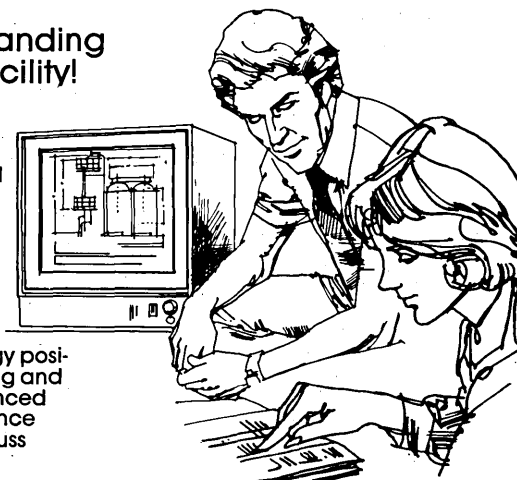
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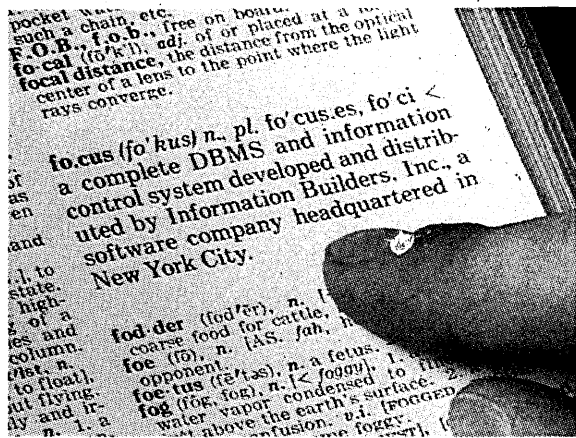
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READERS' FORUM

IT'S THE LAW

As a practicing lawyer specializing in computer law and as a reader of your magazine for 10 years, I am appalled at the complete misstatements of the status of present copyright law protection for computer software. I refer to the first several pages of the article "Fingerprinting a Program" (by Karl J. Dakin and David A. Higgins) in your April issue.

While I am not qualified to comment on some of the technical issues in the rest of the article, which appears on the surface to have some very good technical ideas, the misstatements of legal propositions (from the bottom of p. 133 to the first column of p. 134) are incredible. Surely you must have some process for review of legal materials you publish.

True, early interpretations have been inconsistent, and so far there is very little case law on the issue of software protection under federal copyright laws. However, the statement that there is a decision in which "a court ruled that a copyright on the source code for a program does not extend to its derivative object code, holding that object code is a separate physical manifestation requiring its own registration" is simply not true. According to one of the authors of your article, Mr. Dakin, with whom I have discussed the matter by phone, this statement refers to the *Data Cash* case decided under the copyright law prior to the new copyright law which became effective on Jan. 1, 1978. Mr. Dakin acknowledged to me that in the process of editorial revisions the word "registration" was substituted for "notification." This error is bad enough, but the article compounds the problem by stating that registration of the source does not cover the program when in object code form. This is *not* the law and *Data Cash* did not so hold. In fact, when it was appealed to the U.S. Court of Appeals, that court simply ruled that the lack of a copyright notice on the ROM package was fatal, because the copyright law in effect prior to 1978 required that all copies had to carry copyright notices in order to be protected.

Since that decision, the U.S. District Court for the Northern District of California decided the *Tandy* case, under the 1978 copyright law. The court correctly concluded that object code in ROM form is protected by the copyright law. Parties interested in pursuing this issue should read that case.

However, the worst and most incorrect information set forth in Mr. Dakin's article is contained in the following sentence: "If a program's source code is copyrighted, protection does not extend to the object code for the program, nor to the same program translated into a different language, and probably not to any other form of the source code (i.e., magnetic impulses on tape or disk) that are not directly readable with the naked eye."

Every single statement in that sentence is wrong, under the 1978 copyright law. Mr. Dakin has acknowledged that "in retrospect," it would appear that many of his statements about the law are not correct. For the record, the reason the statements at the

bottom of p. 134 are incorrect is that Congress, in adopting the definition used in the copyright law under Section 101, has defined "copies" as follows:

" 'Copies' are material objects, other than phono records, in which a work is fixed by any method now known or later developed, and from which the work can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device. The term 'copies' includes the material object, other than a phono record, in which the work is first fixed."

Thus, source code reduced to a magnetic image on a roll of tape is not in any way deprived of its protection under the copyright law. The regulations of the copyright office specifically provide a means of filing works that are in magnetic form, just as the rules permit the filing of documents in photographic copy form (microfiche).

Furthermore, Mr. Dakin's statement that translation of a program from one computer language to another would not be covered is clearly untrue in light of the definition of a "derivative work" as "a work based upon one or more preexisting works, such as a translation . . . or any other form in which a work may be recast, transformed, or adopted." There are a number of cases in which copyrights were held to be infringed when books were translated from a foreign language into English, or vice versa. While there is no known case on this subject concerning computer programs, the analogy is obviously clear, as is the statute.

Mr. Dakin also states that if program source code is copyrighted, the protection does not extend to the program's object code. There is presently considerable misinformation being published in technical publications which might lead to that conclusion if one were not familiar with copyright law. Since the only way the writer of a computer program can obtain object code from his source code is to compile or interpret the program through use of a machine, we find it hard to misunderstand or misinterpret the rather clear language of Section 102 (a) of the copyright law, effective Jan. 1, 1978, which states:

"Copyright protection subsists, in accordance with this title, in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."

The law goes on to state that works of authorship include a number of categories including literary works (which is the category applicable to computer programs), motion pictures, sound recordings, etc. Inasmuch as the copyright office regularly accepts videotape recordings of CBS news broadcasts as copyright deposits, which are obviously in a form of magnetic image, any position to the contrary goes against common sense.

At this stage of interpretation of the new copyright law there are few cases and fewer, if any, clear explanations of this law applied to the computer industry. Unfortunately, the computer industry's technology has moved faster than the ability of the legal

READERS' FORUM

system to keep up with it—probably because most practicing lawyers and judges have little or no scientific or mathematical background. The fact is that the Anglo-American judicial system has always had trouble dealing with the category of property known as "intellectual property," which is that body of the law relating to ideas and concepts not usually visible as tangible objects.

I sincerely hope that your publication will make an effort to inform and educate the industry by accurate and timely articles relating to these problems. Unfortunately, the article in question does a disservice to that objective.

—G. Gervaise Davis III
Schroeder & Davis, Inc. Monterey, Calif.

Kark J. Dakin, a lawyer with Corporon & Keene, Englewood, Colo., responds:

Mr. Davis has strongly criticized the article "Fingerprinting a Program," which I coauthored in the April issue of DATAMATION. I would first like to state my appreciation for the comments of Mr. Davis and others, and to DATAMATION for publishing the article. The input received has better prepared Mr. Higgins and myself as we now submit this proposed solution in actual litigation. My only regret is that Mr. Davis confined his remarks to two prefatory sentences and did not address the central theme of the article.

The two statements discussed by Mr. Davis are indeed incorrect and misleading. This is due to 1) carelessness in word selection, 2) reliance on a court case that was later overruled by another case after the article had been written, and 3) conservative reading of the Copyright Act based upon my technical background. I believe that Mr. Davis's opinion is now the prevailing one. I would add my reasons. The Copyright Act states specifically in Section 102(b):

"In no case does copyright protection for an original work of authorship extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work."

This raises the question of what remains in a computer program to be protected. One must rely upon the stated intent of the Congress in passing the 1976 amendments that computer programs were meant to be protected. One must also presume that protection goes to "derivative works" and "copies." This presently includes object code and ROMs. ADAPSO has proposed copyright protection for any equivalent of the source code. Again, this raises the question of whether we are protecting a work of authorship or an idea.

I regret that space does not permit me to go into this area in more detail. My apologies to any readers who were misled by my statements. I still welcome any questions or comments.

MORALITY IN THE COMPUTER CLASSROOM

We can argue about matters such as the precise definition of computer abuse, the number of unreported and/or undetected computer abuses, and the validity of the frequently made statement that the average loss from a computer-related crime is \$450,000, but we cannot ignore the basic issue that conditions are ripe for a surge in computer abuse.

Over the next few years, millions of computers of all sizes—many with telecommunications interfaces—will be sold and millions of people, predominantly young, will learn how to use them. Although the vast majority of these people will use computers in a constructive and responsible manner, a small percentage will not. Unfortunately, this small percentage will be significant in absolute terms and particularly troublesome because of the major impact that even a single abuser can have on the complex interrelated systems of computers, communications, and terminals upon which our society has come to depend.

This expression of concern is not new. Four years ago, the then acting U.S. assistant attorney general for the Criminal Division told a Senate hearing: "Our political, economic, and social institutions have grown increasingly dependent upon computers to the point that their illicit manipulation or malicious destruction can potentially wreak havoc on society . . . The very existence of a broad base of computer usage and computer knowledge, and its projected increase in the years to come, suggests that we will experience an increase in the opportunities for computer-related abuses in the years ahead." The problem is that we have only moved slowly and in limited ways to protect our society against the perils of computer abuse.

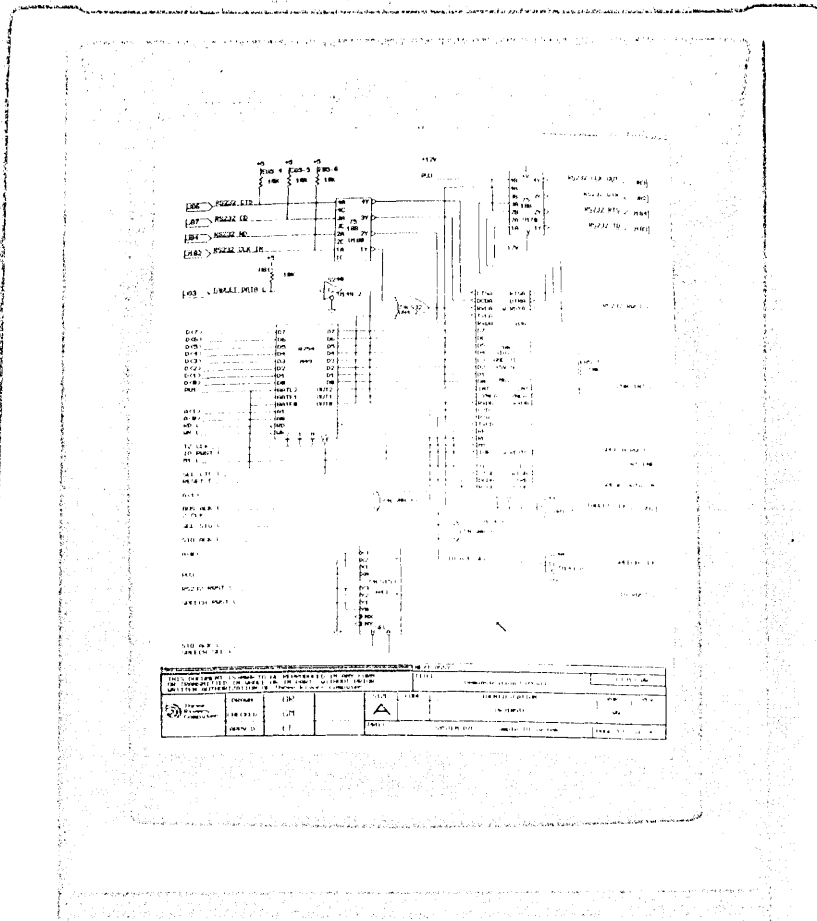
This lack of substantive action can be seen in many areas. Laws need to be updated to reflect the capability and availability of modern computer technology, but the federal government and most of the states have not yet done so, despite lengthy hearings and discussions. Prosecutors must learn about computer technology, but few law enforcement agencies are developing this expertise. Companies must be more willing to prosecute computer abusers, even if it leaves them open to some embarrassing comments by their customers and competitors, but the general feeling remains that most computer abuse by employees is hushed up. Computer systems designers must build in more mandatory protection features, but the industry has not established appropriate standards. Our young people must be trained to use computers in responsible and ethical ways, but too few educators have really faced up to this challenge.

When we look at the issue of educators' responsibility for instructing the new entrants to the field in the appropriate use of computers, we immediately come face to face with the question of the amorality of computers. Should we, to paraphrase the gun lobby, bypass the whole matter by saying "computers don't abuse, people do"? Like many slogans, this one has an element of truth in it but also a fatal flaw. One simply cannot teach, let alone use, any technology in a vacuum. Humans and their technology are inextricably interrelated. Moreover, when we separate technology from its use, we implicitly raise technology to the same level as humans and deny the human's responsibility for controlling technology. Thus, although in theory I am willing to accept the amorality of computer technology, I believe that in practice the only thing we are able to consider is the technology embedded in a particular moral environment. This is not an amoral situation. Therefore, I reject the contention that the computer scientists should teach the

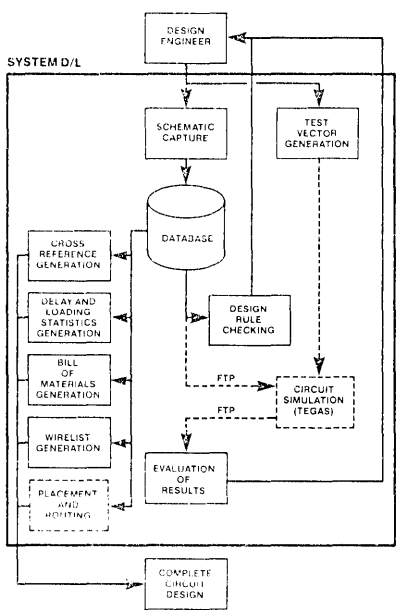


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READERS' FORUM

technology (hardware and software) and leave the moralizing to the philosophers or to those of us who teach courses on computers in society. The computer scientist must also teach the ethics of the technology.

Assuming that our hypothetical educator agrees with the essential morality of the computer in an environment, he or she may raise a second question. Is the frequency of computer abuse high enough to warrant taking up valuable class time discussing it? I do not wish to argue about the specific incidence of computer abuse, but rather to point out the potentially serious consequences of even a few malevolent acts. This is analogous to the problem of nuclear reactor safety, where the probability of a meltdown is very low but the consequences of one occurring are extremely serious.

In addition to discouraging students from becoming computer abusers, there are additional benefits to be gained from discussing the abuse issue in classes. These include making the "good" students aware of the need to defend systems against abuse; pointing out some of the telltale signs of abuse; and suggesting ways of building secure hardware and software systems. These lessons are important since abusers tend to devote a lot of their own time and computer resources to finding vulnerable spots and potential victims. The "good" computer scientist or data processor must know how to both recognize the signs of abuse and protect against abusers.

Will teaching the appropriate use of computers result in none of the students becoming involved in abuse? Unfortunately not, but I find it hard to believe that it will not help keep some students out of mischief. At the very least, it will let all the students know the ramifications of even seemingly harmless antics.

Such ramifications include wasted computer resources, wasted staff time spent tracking down the culprit, and inconvenience to other serious users of the system. For example, the theft of a single privileged password on a timesharing system usually requires the changing of all passwords on that system. A more subtle but possibly more serious effect of even a single abuser among the users of a timesharing system is that all work is, to some extent, impeded by the need for everyone to follow more extensive security procedures.

In order to teach computer ethics, the instructors themselves must be able to distinguish appropriate from inappropriate comput-

er use. This is of particular concern when relatively young people are teaching courses. Their mastery of the technical subject matter may be excellent but it may not always be matched by an understanding of what constitutes appropriate use of computers. All too often I hear of courses at computer schools, computer camps, high schools, and, yes, even colleges and universities, being taught by teenagers or undergraduates who have had no prior training in computer ethics.

For example, I recently discovered that one of our Columbia undergraduates was serving as the instructor for a computing course at a nonprofit community service organization. This would have been fine and laudable except that he was, without permission, bringing his teenage students to the university on Sundays and letting them use our timesharing system at no charge. He was able to do this because he had obtained an ID and password without proper authorization from a legitimate student user. When challenged, the young man emphatically and repeatedly claimed that he had only done it once and did not realize that it was an inappropriate use of university facilities. However, when confronted with the log records, he admitted much more extensive use. Appropriate disciplinary action was taken by the dean, and I have reason to hope that this particular individual will reform.

Interestingly, the management of the institution involved in this example had never questioned how the instructor was able to obtain free computer time at Columbia, even though the institution earlier had requested and been quoted a charging rate for using the same facility. (The institution decided to buy less expensive computer time elsewhere for its course.) Furthermore, I am not sure to this day that that institution has appreciated the poor example set for its students or the need to be more concerned about the selection of instructors for computing courses.

I am not suggesting that all young instructors are necessarily unethical and incapable of teaching appropriate use of computers. It does, however, seem questionable to entrust the training of students to people who have neither maturity nor, in most cases, any prior instruction themselves as to what is appropriate and inappropriate with respect to computer usage. The employers of such inexperienced teachers must also bear some responsibility for making sure that the courses are being handled in appropriate ways.

The lack of appreciation of ethical issues is not limited to youthful instructors. Unfortunately, a number of older teachers also have very cavalier attitudes with respect to usage of computers at their own or other institutions. Some of these attitudes stem from the widespread lack of understanding among faculty members that computers are not free goods such as traditional library services; others from a general disdain of anything perceived as being in the way of their work getting done. These instructors would not think to steal an object of value, like a wallet, but they do not always see the harm in theft of service—be it hopping over a subway turnstile to get a free ride or stealing a computer user's ID and password.

I think of one faculty member at a major university who agreed in his ID application that only he would use the ID, but then gave it to his 14-year-old son. The son then proceeded to use it in a very skillful but malicious manner. The uncovering of this problem apparently wasted at least a man-week of systems programmer time, in addition to the inconvenience caused to other users. Fortunately, not all unauthorized giving away of IDs has such serious consequences; but what sort of an example is a faculty member setting when he disregards the rules?

There have also been cases of high school and college instructors encouraging their students to attempt to break into their own or other institutions' computer systems. This is usually justified in one of two ways. First, it is socially desirable that organizations protect their computer systems and, therefore, the students are being helpful by attempting to discover loopholes. The second rationale is that such activity encourages creative thought. I categorically reject both arguments. The former is incredibly presumptuous and the latter ignores the numerous legal ways in which creative thought can be developed.



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I strongly believe that educational institutions have a responsibility not only to include ethical considerations along with the technical ones in computer courses, but also to insist that their own facilities be run and used only in ethical and appropriate ways. To do less than this is to condone and encourage computer abuse. Thus, it is necessary to enforce reasonable rules for using an educational institution's computing facilities and then to require that the students, faculty, and staff abide by them.

This is in sharp contrast to the situation at one New York school that a few years ago ran a timesharing system on which all student users had full operator privileges. These privileges were used by some of the students—probably with the implicit, if not explicit, consent of their instructor—to experiment with ways of breaking into a system. These students then tried out their new skills by attacking one of Columbia University's timesharing systems. It took our skilled systems programmers several days, including many hours at night, to repel the attack and to assure the safety of our system.

Rules are not always popular these days, but I would suggest that they are the glue that keeps any society or group from breaking apart. Moreover, by being wishy-washy about the rules, we do not help the students. If we as adults are not clear as to what is appropriate, how can we expect the students to develop responsible attitudes?

In this regard, I was particularly concerned by the attitudes expressed in a recent editorial in one of our widely circulated trade publications. Responding to a school that had set up regulations against computer abuse after an incident involving a student changing a grade stored in a computer, the editorial writer stated:

"... academic officials must remember that a major purpose of higher education is to stimulate creative thought rather than stifle curiosity. They must use the regulations they draw up as guidelines rather than as sets of hard and fast rules. Any case of reported computer abuse on campus should be judged individually and with a flexible attitude by responsible officials who are familiar with how a computer system works.

"This practice will inevitably take more time than simply pointing to the rule book and instituting disciplinary action. But the alternative could mean computer science graduates who are incapable of original concepts—and that alternative is unacceptable for both the students and the companies that need those new thoughts." (*Computerworld*, May 31, 1982, p. 24.)

To me, this is extremely muddled thinking. If educational institutions cannot provide creative challenges to students without the students having to resort to antisocial or illegal activities, then those institutions need some personnel changes.

This is definitely not to say that courses on computer security should be dropped; just that student exercises should—indeed must—be controlled. For example, if an attack on a live system were deemed to be an appropriate learning exercise, it could be carried out with the knowledge and permission of the manager of the target system. There would also have to be a clear understanding that the manager would be notified immediately of any success and that any penetration would not be followed by mischievous or malicious actions.

Returning to the general issue, it is important that a violator of the rules should have all the benefits of due process. At the same time, I believe that students should be held accountable for violations. The penalty should also fit the crime and I am not advocating public execution for minor offenses. It is important, however, that we not overlook the small problems as this may well encourage bigger ones. In practice, I have found that the word soon gets around when an abuser is caught and dealt with appropriately by his or her dean—being put on probation or suspended, say—and this discourages other potential abusers.

We must get away from the view that student abuse of computers is akin to swallowing goldfish and similar youthful pranks—goings-on that we may dislike but can ignore because the students will quickly outgrow them. It is essential that we correct

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the errors of the mischievous abusers and put them on the straight and narrow, and the malicious abusers must be made to face the consequences of their actions in the hope that a sharp pull will teach at least some of them that computer crime does not pay.

These hard-line attitudes I am suggesting for educational institutions will be of relatively little use if employers, professional societies, publications, etc., in the computer field do not back them up both by word and deed. There are lots of things that vendors as well as user organizations can do, ranging from seeking improved legislation and law enforcement to the development of more secure systems. In particular, we must neither sweep the problems under the proverbial rug nor make heroes of the computer criminals turned computer security consultants.

Bruce Gilchrist

**Director of computing activities, Columbia University
New York, New York**

BEYOND FOLK WISDOM

The Monday afternoon blahs had set in and a group of our journeyman programmers were gathered around the coffeepot discussing the weekend's collection of programming glitches. Initially, the conversation sounded pretty much like the usual misery-loves-company gripe sessions that can develop late Monday after a long hard weekend getting the new software releases up and running. (We make all our major changes late Saturday night or Sunday afternoon to inconvenience as few production customers as possible.) After 15 or 20 minutes, the discussion started to shift from the headaches of the past week to the heartburns of the next.

One junior programmer was having difficulty building screen formats for a new crt about to be introduced for a customer's application. As he described his problem, one of the more experienced programmers deduced that most of the difficulties were due to the errors being experienced in padding random length input strings to fixed lengths in order to support the application program's column oriented formats.

Once the first programmer finished his tale of trouble, the second programmer started to show him how to scan the input buffer from right to left, rather than from left to right, in order to more easily detect the end of the string and hence compute the number of blanks needed for padding. About the time this explanation was completed, a third programmer pointed out that this was still more difficult than necessary. Since the program under discussion was coded in PL/1, the third programmer noted, it would be much easier just to concatenate a long string of blanks to the input buffer and then truncate the string at the desired length with the help of the SUBSTR function. Not only did this eliminate the need for looping through the input buffer to find the last character, it also automatically solved problems resulting from entry of a null or overlength string.

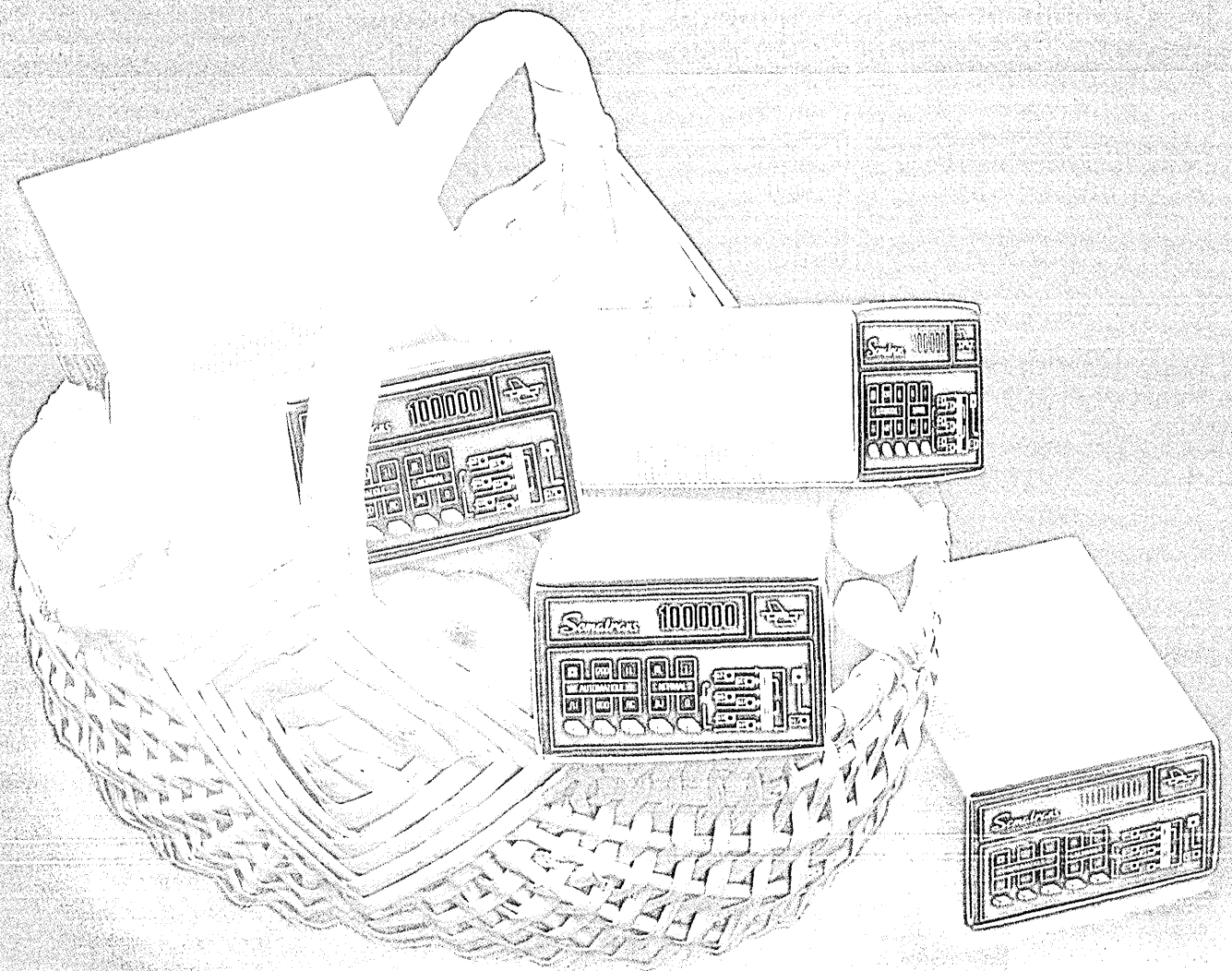
My coffee grew cold as I listened to the discussion. Here were bright, talented, trained programmers teaching one another what I would consider routine tricks of the trade much as our ancestors back in the forest used to teach their children. Somehow the juxtaposition of 1980s technology and the ancient teaching technique of passing information orally from one person to another got me laughing. The laughing stopped quickly, however, once I got back to my desk and saw a treatise on software engineering that I had been meaning to read for a few weeks.

What was going on here? On one hand, highly competent programmers were teaching each other techniques around a coffee table, and on the other, some of the finest minds in the country are developing metrics for program development as if programming were an engineering discipline. How were these new programming

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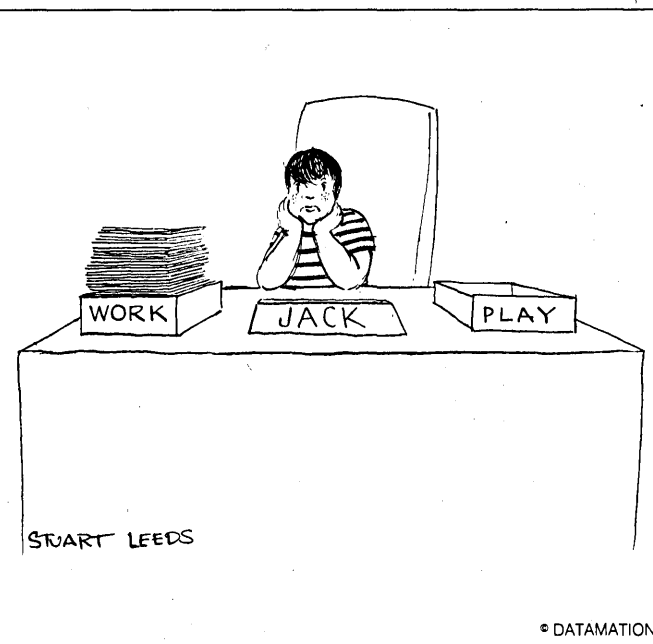
methodologies going to be used if we were still teaching the current, relatively elementary techniques as if they were folklore?

The very term "software engineering" implies a discipline to software development akin to that used in the already established engineering fields (e.g., electrical, civil, aeronautical, chemical). It should be possible, I thought, to isolate the differences between, say, chemistry and chemical engineering, and then apply the conclusions obtained from these differences to the computing world. Even if the conclusions could not be acted upon immediately, at least there would be some understanding of the steps necessary to move programming (essentially still an art form) toward engineering (a discipline).

Well, I ran my personal comparison between chemistry and chemical engineering. Two significant differences surfaced. The first is related to formal education: there are two distinct chemistry curricula, depending on whether an individual is being trained as a chemist or a chemical engineer. Computing has, in general, only one curriculum: computer science. There is only limited formal training available in computer software engineering. The upshot of this missing education is that the practitioners of computer science (i.e., programmers and analysts) get nearly all of their "practical" training on the job—after they graduate from school, rather than before they go to work. Since this mode of programmer training is not explicitly recognized by most commercial firms, the practical (as opposed to theoretical) knowledge necessary to produce good programs must be imparted informally by conversations among peers gathered around a coffee table.

The second difference is the absence in computing of common reference books containing the simple formulas of programming that comprise a significant portion of every program ever coded. No chemical engineer would ever need to derive from scratch the steps necessary to convert one chemical compound into another. Virtually all the formulas she would normally need are contained in a few standard reference volumes such as the *Handbook of Chemistry and Physics*. In computing, on the other hand, almost every programmer at one time or another must design primitive routines from scratch (e.g., the code to scan an input buffer to determine the length of the data).

With the above differences in mind, the paths to improved programmer productivity are a bit clearer. Those of us in industry need to adjust our thinking regarding graduates of computer science curricula (by whatever degree title). We tend to expect engineers when instead we are getting scientists. While there is nothing intrinsically wrong with this, it does mean that we cannot expect every computer science graduate to immediately be able to program



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complex routines in the production oriented mode we now require. It means we must plan to provide our computer science graduates with training that teaches them the applied techniques of programming necessary for success in the industrial world.

While we are establishing our courses of applied programming, we need to begin a close cooperation with the academic community. There must be a mutual understanding of the distinction between computer scientists and software engineers, and the differences in educating them. In the long run, the educational system will be able to train graduates that are appropriately specialized in one area or the other. Once this stage has been reached, industry can then phase out significant portions of its applied programming training.

In parallel with our efforts in applied programming training, a coordinated effort to prepare a handbook of programming primitives should be undertaken. These primitives should be those program codes that every programmer ends up coding from scratch in support of his logic development (e.g., converting binary data to alphanumeric printable form, converting Julian date to calendar day/date, scanning an input buffer). Ideally, this effort should be coordinated by a national (e.g., ANSI, ACM, IEEE Computer Society, NBS) or even an international organization so that the primitives collected will be as broadly based as possible.

Notice that I have intentionally illustrated a program primitive in a broad, encompassing manner. In some cases, a programming primitive may be considered suitable for coding as a subroutine/procedure; in others, it may be short enough that it can be easily copied from a handbook into a section of code. The distinction between what is a programming primitive and what is not should be left to the coordinating organization. The point here is that industry could immediately benefit from such a handbook.

Preparation and broad, inexpensive distribution of a programming primitives handbook, coupled with recognition of the applied programming training issue, will allow industry to significantly improve its ability to prepare effective, timely software products. The need for some "coffee table" education will always be with us, but at least the amount of time spent teaching software engineering as folklore can be significantly reduced.

—David A. Feinberg
Seattle, Washington

WRITING GOOD, OR EVEN BETTER

It was late Saturday afternoon. Paul Willsome had a report to finish. He'd been at his word processor for nearly a week now. His Friday noon deadline was history, and so perhaps was his marriage. Willsome didn't know for sure. When he had asked his wife on Friday to bring him a change of underwear, she hung up on him. When he called back later, a voice said, "The new number is unlisted."

Willsome had already toiled through three drafts. The first came back marked "turgid." On the top of the second had been written, "Turgidity quotient increasing." Gamedly, Willsome handed in a third, then stood outside his boss's door waiting for the verdict. He felt certain this time his report would get a glowing review. Suddenly he heard the low hum of a machine followed by an awful munching noise. His report had vanished into the shredder. Willsome didn't even have a photocopy. His boss emerged, handed him a ball of confetti, then slammed his door.

By then Willsome was a tad resentful. Sure, his boss had been a communications major. While he had been lounging in the cool shade of campus maples perusing Jacques Barzun, Willsome had been reshaping the world with statistics, higher calculus, and stress coefficients. In his college papers Willsome's sentences had

been as complex as long-chain molecules, but so what? His charts were sheer elegant simplicity. *That's* information, he muttered, but his conviction was shaken. (Like hey, I can talk as good . . . er, as well . . . as any darn communicator.) But the folly of his obstinacy was beginning to be apparent.

In desperation Willsome went to the company library and began leafing through trade magazines. He needed a model, something to look up to. Just in time his gaze strayed over a cover blurb: "How to Write: A Primer for Engineers." The article offered Willsome nine simple ways to save his job, his marriage, and get home in time for dinner. He punched open another Coke, parked himself at the processor, and began to read.

1. Prepare yourself for writing. Empty your mind of irrelevant thoughts, wipe the mayonnaise off your fingers. A training regimen is helpful; sit in front of a blank tv screen for several hours a day. This will tone lower back muscles. Squeeze tennis balls in each hand at the same time to strengthen your grip.

2. Write in your own style. If you don't have one, buy one, and get the best. Lewis Thomas is \$49.59. Carl Sagan only \$19.95. Skimping in this department will ruin your chances and may cause you to be confused with a punk hairdresser.

3. Stick to the point. Use periods. Provide ample space between words. Eat your soup.

4. Don't overstate the obvious. Example: Life is short. Such a statement will please somebody—anyone under 5 ft. 5 in.—but it will make others gnash their teeth. In Higgins vs. Rowjast, Higgins was awarded sizable damages after he crushed a molar while reading Rowjast's report. The offending phrase was: atoms are like peas in a pod, only smaller. Counterexample: it is not easy to weave a rope from silicon chips.

5. Avoid high-minded references. You may be literate, but your reader is probably still subscribing to *Time*. This is especially important if your reader is a vice president. Mention *Ulysses* and he will think, "I do?" If you feel you need the armature of another's wisdom, quote a Latin poet. For your own sake, though, leave it in Latin.

6. When you mention a person, use initials for all but the surname. This lends you the credibility of science. It also avoids the awkward Mr., Mrs., Ms., or Miss problem, especially nettlesome when gender or even species is not obvious.

7. Always include dollar figures. People feel good about money. It is portable, burns easily, and in bundles substitutes for firewood, and will make you more friends than "est" ever will. If your report is a bit controversial, staple a \$10 bill to each page.

8. Don't supply a dedication, especially one beginning, "Thanks a lot to Koko in the mailroom for putting extra glue on the stamps, and to . . ."

9. Keep it simple. Keep it brief. Consider keeping it to yourself.

Willsome was elated. Here it was, all laid out for him. He began writing, his fingers flying over the keys with the speed of a romance novelist. In less than an hour Willsome's report was under his boss's scrutiny. As he read a twitch of admiration—or was it envy?—played at the corner of his mouth. "Not bad, Willsome," he said. "Why the hell have you been tormenting yourself?"

Willsome drummed his fingers together. "The first three drafts were a little experimental," he said shyly. "I've been reading some Robbe-Grillet."

"Well," his boss said, "Every good report writer needs space to locate his milieu. You and the missus got plans for dinner?" He slapped Willsome on the back. "All these Hamiltons will come in handy."

—Tom Parrett
New York, New York

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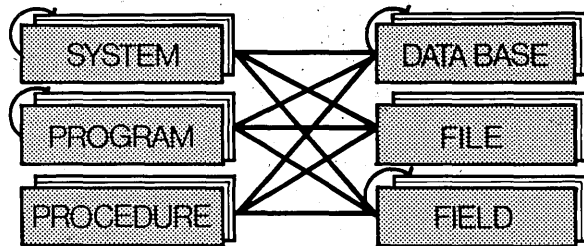
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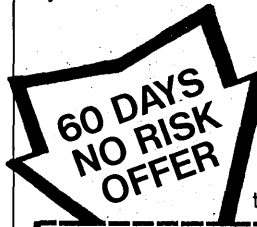
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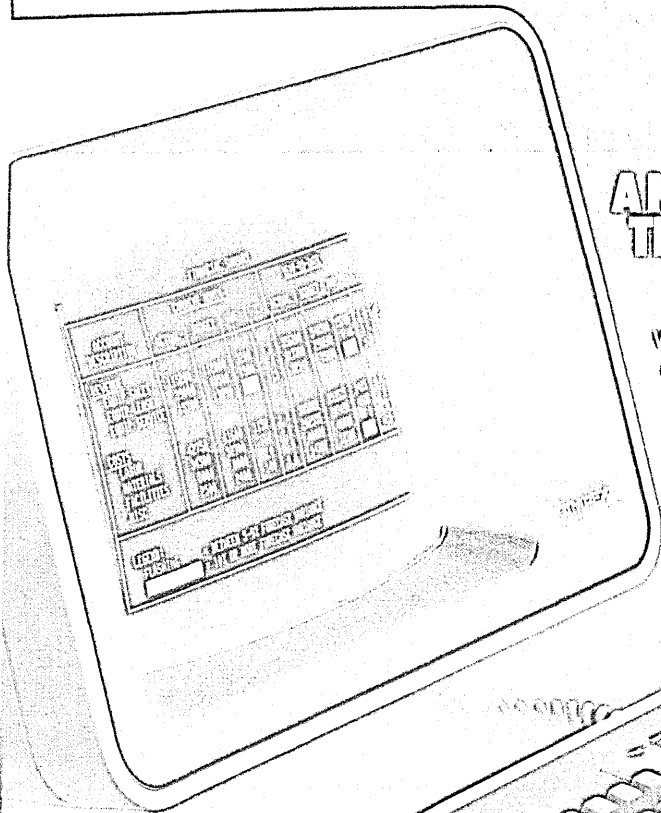
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