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JULY 1984

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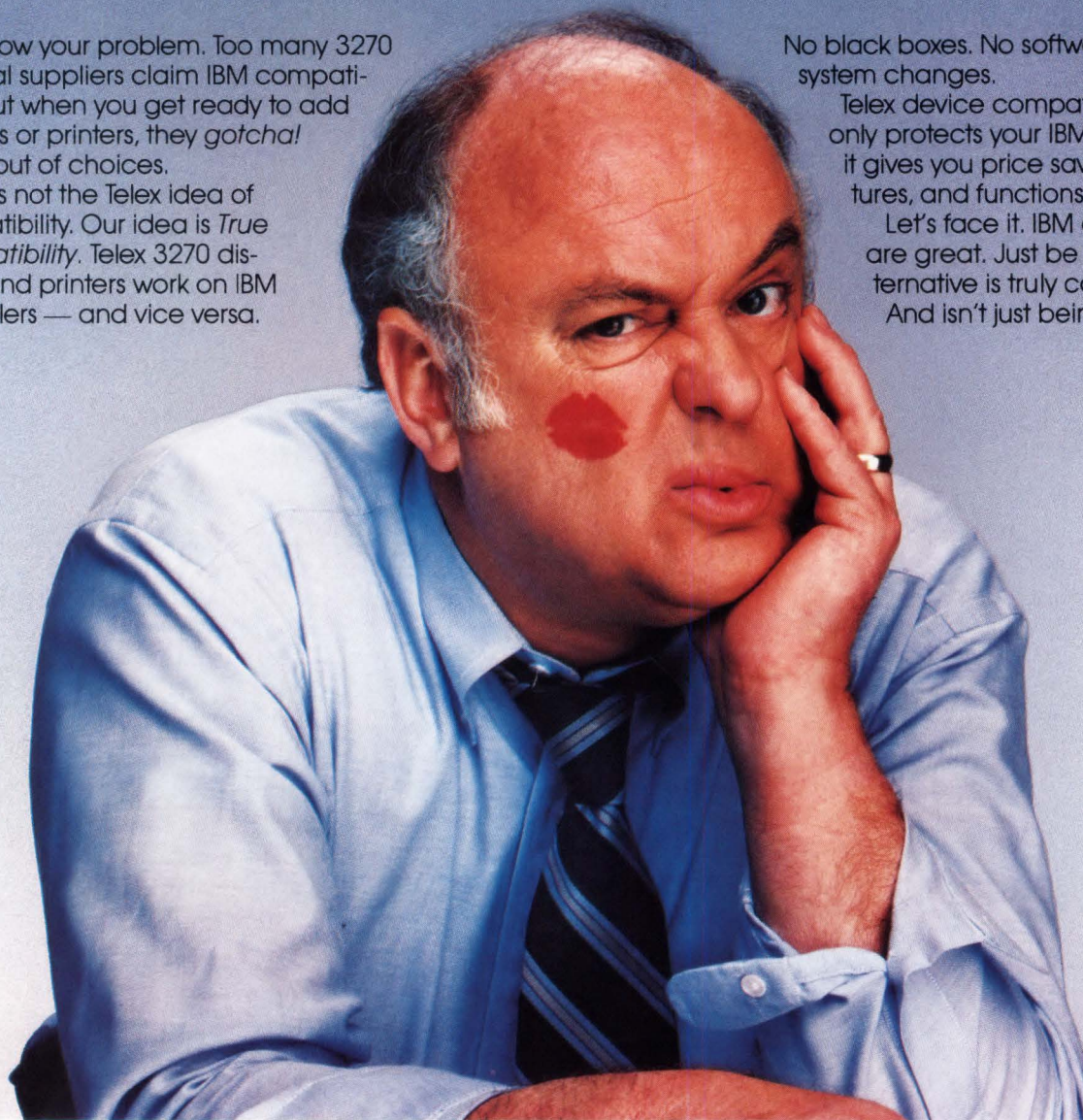
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JULY 1984

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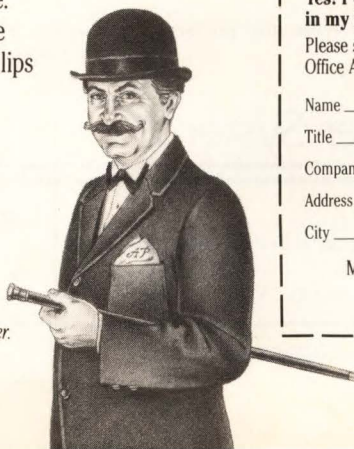
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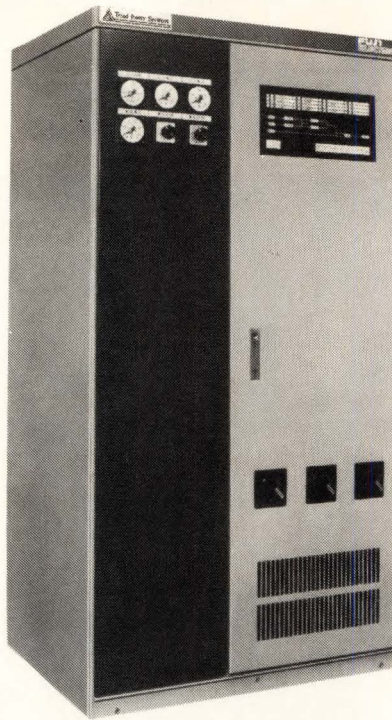
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Headquarters Office
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Publisher/Vice President: Don Huber

Editor: Mel Mandell

Executive Editor: Donne Florence

Senior Editor: David Whieldon

Software Editor: David J. Kull

Art Director: Bonnie Meyer

Microsystems Editor: Susan Foster Bryant
Western Editor: Martin Lasden
(408) 736-6667

New England Editor: Mary Miles
(617) 746-4441

Southwestern Editor: Jennifer E. Beaver
(213) 548-7877

Data-Comm Editor: John Seaman

News Editor: Joseph Braue

Associate Art Director: Lynn M. Holl

Production Editors: Claudia Nalven,
John Rymer, Susan Trembly

Staff Writers:
Theresa Conlon, David R. Roman

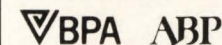
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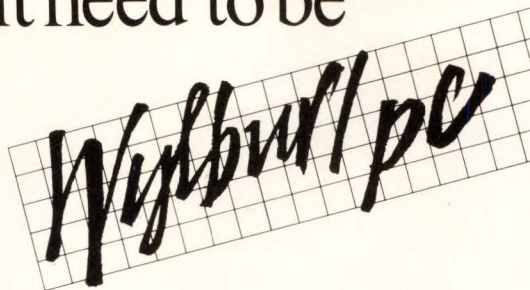


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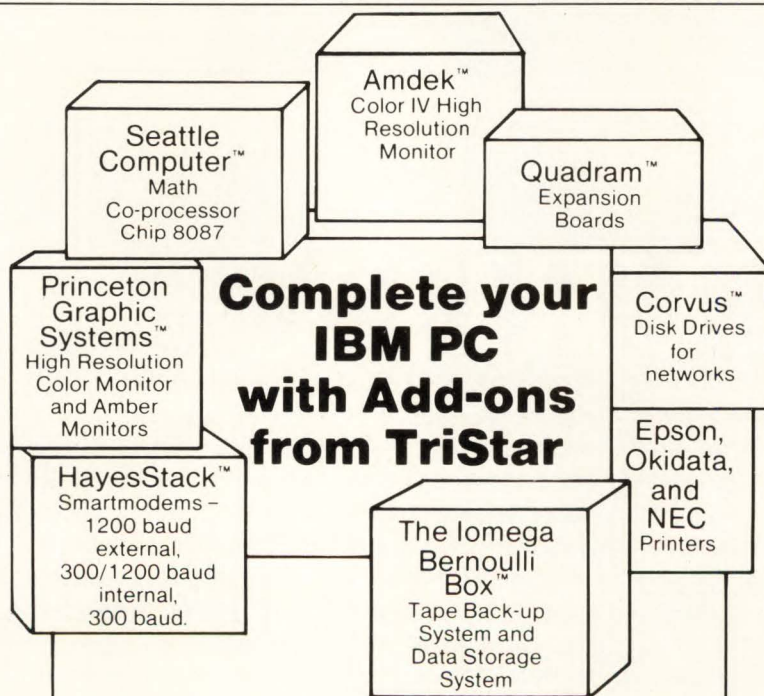


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Recruitment, Classified, Direct Action Cards

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Sales Support Manager

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Publication Staff

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Production Manager: Craig Balick

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INSIGHT

Don't cast your lot with amateurs

The credibility of the computer industry is being eroded by amateur entrepreneurs who either fail to deliver on their promises or fail to accurately gauge their markets.

Last October, for example, a startup operation announced what it called "the greatest event in the computer industry since the invention of the personal computer." The product was an integrated software package for micros, clever but hardly earthshaking. The vendor had one problem to overcome before hitting the market: The package was little more than a prototype. The organizers of the new venture hadn't even figured out how much to charge for the package; they offered the excuse that they couldn't reveal the price for competitive reasons. At this writing, the operation still hasn't delivered a dollar's worth of the software.

Failure to deliver (or late delivery) is not unusual in the computer industry. Most of the industry's giants have had their embarrassments—even IBM, which suffered through a traumatic introduction of the System/38 minicomputer. However, there have never before been as many failures to deliver announced products as we've seen in the last year. Some executives try to hide their problems behind public-relations smokescreens. Others are more candid about their problems.

Vendors that make a short-lived big



Illustration by Dan Cullane

splash, only to falter or fail, are also troublesome to MIS/dp managers. Several years ago, a group of experienced executives introduced a portable computer/terminal that was touted as the Cadillac of its class. The price was about \$8,000. However, competing "luggable" portables like the Osborne 1 cost only a quarter as much. Not too surprisingly, this attractive machine has not been selling well at all—even at a reduced price of \$5,000—and the future of the manufacturer is in jeopardy. Woe to those who cast their lot with this vendor without scrutinizing its marketing plan for weaknesses that would undermine its ability to survive.

For corporate managers, late (or no) delivery dashes expectations and frustrates plans. In the case of a supplier struggling for survival, support for hardware or software can

be compromised.

Who is to blame for this plague of amateurs? The venture capitalists, of course. They have been throwing millions of dollars at the feet of untried computerniks—men and women in need of years of experience before they would be ready to found new businesses, if indeed they ever would be.

If today's venture capitalists were to avoid deals with concerns that have untried executives at the helm, they'd spare corporate customers—especially those who buy personal computers and all that goes with them—many sour deals. Of course,

that practice would have prevented the launching of one of the all-time great deals—Apple Computer. But for every Apple Computer, there are or will be a score or more of failures. Compared to the collapse of Osborne Computer, these will be of slight consequence, but some corporate customer will get burned nonetheless.

There are signs that venture capitalists are changing their attitude toward startup computer ventures: Newcomers that were once able to sell shares at ever-higher prices are now receiving lower bids. That makes prior investors very unhappy, but bad news for them is most likely good news for the computer industry's corporate customers. They may see the recent flood of half-baked products and poorly conceived ventures abate.

mel Mendell

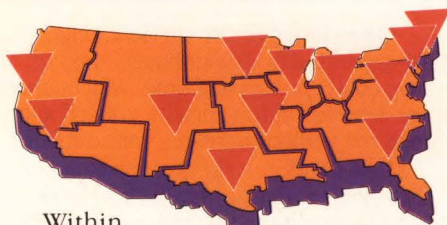
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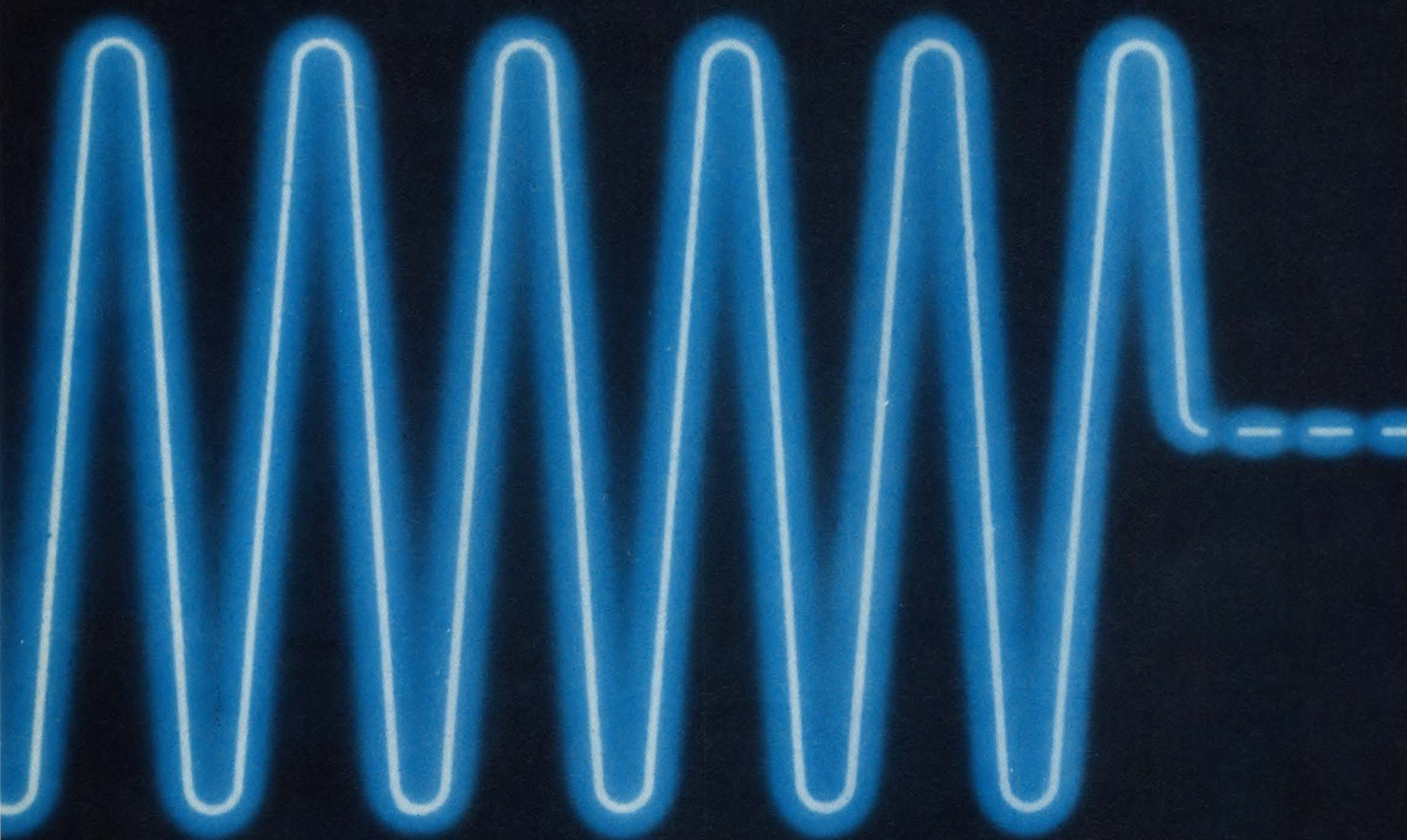
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With the TeleVideo® IBM Compatible line—PC, XT and portable computers—you'll get the most out of all the most popular software written for the IBM® PC—more than 3,000 programs.

Because every TeleVideo Personal Computer offers the highest level of IBM compatibility on the market and

THE BEST HARDWARE FOR THE BEST PRICE.

Features	Tele-PC	IBM PC	Tele-XT	IBM XT
Monitor	YES	OPTIONAL	YES	OPTIONAL
Screen Size	14"	12"	14"	12"
Tilt Screen	YES	NO	YES	NO
Quiet Operation	YES (NO FAN)	NO	YES	NO
Memory	128K	128K OPTION	256K	256K OPTION
Graphics Display (640 x 200 resolution)	YES	OPTIONAL	YES	OPTIONAL
Printer Port	YES	OPTIONAL	YES	OPTIONAL
Communications Port	YES	OPTIONAL	YES	YES
MS™DOS/BASIC®	YES	OPTIONAL	YES	OPTIONAL
System Expansion Slot	YES	YES	YES	YES
RGB and Video Port	YES	OPTIONAL	YES	OPTIONAL
Typical System Price	\$2995	\$3843	\$4495	\$5754

PC compatibles. for the best software.

has the standard—not optional—features you need to take full advantage of every job your software can do.

Study the chart below. It proves that TeleVideo—not IBM—offers the best hardware for the best price.

Note that TeleVideo's ergonomic superiority over IBM extends from fully sculpted keys and a comfortable palm rest to a 14-inch, no glare screen that tilts at a touch.

THE BEST MICROCHIPS.

What is perhaps most impressive about the TeleVideo IBM PC Compatible can be found deep within its circuitry. We use the same 8088 central processing unit that runs an IBM PC. But we also employ new VLSI (Very Large Scale Integration) microchips that are designed and built exclusively for TeleVideo. These interface more efficiently with the powerful 8088 and yield numerous benefits.



For example, our tiny custom chips do the work of many of the larger, more expensive circuit boards in an IBM PC. So we can offer a computer system that comes in one attractive, integrated case, is ready to run and occupies less desk space. A computer that edges out IBM's added-cost component system for reliability, ease of service and purchase simplicity.

Fewer circuit boards to cool also allowed us to eliminate the noisy, irritating fan IBM and most other PCs force you to put up with. And TeleVideo compatibles accept



THE BEST PORTABLE FOR THE BEST PRICE.

Features	TPCII-S	IBM PC
High Capacity Storage	YES	YES
Quiet Operation	YES (NO FAN)	NO
Display	YELLOW	AMBER
Memory	256K	256K
Graphics	YES	YES
Communications Port	YES	OPTIONAL
Printer Port	YES	OPTIONAL
MS™ DOS 2.11	YES	OPTIONAL
Typical System Price	\$2395	\$3130

any IBM hardware options without modification.

THE BEST LINE.

But the Tele-PC is only one element of the TeleVideo IBM PC Compatible line.

The TeleVideo XT is the best hardware for users of popular IBM XT software who would appreciate an extra 10 megabytes of storage capacity along with the advantages listed on the chart at the left.

As the chart above demonstrates, our portable IBM compatible computer, the TPC II, is far and away better hardware than IBM. Better hardware—standard—at a better price.

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The TeleVideo IBM PC Compatible line is made by the world leader in multi-user computer systems and the number one independent manufacturer of terminals.

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Before you invest, make a few simple comparisons. You'll find that TeleVideo—not IBM—has the best hardware for the best software. At the best price.

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Personal Computers
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NEWS & COMMENT

IBM's LAN: To wait or not to wait?

Can you afford to wait for IBM's promised delivery of a local-area network (LAN) two to three years from today? That's the question in the wake of Big Blue's announcement of a cabling system that will eventually be the framework of its token-ring LAN.

"What corporation can afford to wait years when it needs an LAN now?" asks John Murphy, vice president of Advanced Office Concepts, a consultancy in Bala Cynwyd, PA. Because IBM won't be ready for such a long time, many organizations will be forced to go elsewhere for LANs. Independent vendors, such as Ungermann-Bass Inc. (Santa Clara, CA) and 3Com Corp. (Mountain View, CA), should get a boost from "IBM's reticence to announce an LAN architecture," he adds.

Other industry watchers believe managers can act on faith in IBM's pledge to offer an LAN. "I think a lot of Fortune 1,500 companies with IBM shops will probably install the

cable and wait for the LAN," says Kenneth Sobel-Feldman, program director for the Gartner Group, a Stamford, CT-based consultancy that follows IBM. "A two-to-three-year wait for a network might not be devastating to a lot of companies. Besides, IBM's proposed LAN is the best way to connect computers. Therefore, it will be cost-effective in the long run to install the cable and wait."

In IBM's proposed token-passing LAN, personal computers, office systems, distributed systems, and central computers will be attached to the cabling system in a ring. A special electrical signal called a "token" circulates at high speeds around the ring, passing through one device after another. The token lets each processor or device notify the network when it has a message to transmit. Still under development by Texas Instruments Inc., Dallas, are the chips that will create the tokens.

Compatibility is the big issue for corporate users that choose not to wait

for IBM's LAN. Will those users pay a premium to bridge a compatibility gap later? Says Brian Jeffrey, director of research for the International Technology Group, Palo Alto, CA: "I tell corporations that want to move fast to proceed with available LANs. They'll risk being incompatible for only a while." He doesn't consider the risk prohibitive.

Choose a nonproprietary LAN, cautions Jeffrey. Open architectures like those deployed by Wang Laboratories (Lowell, MA), Digital Equipment Corp. (Maynard, MA), and Data General (Westboro, MA) will let corporations construct bridges with IBM's LAN if necessary.

Corporations with existing wiring systems shouldn't feel compelled to replace them with IBM's cables, even if they're worried about IBM compatibility. "IBM isn't advocating that users tear out their existing lines to put in the new cable," says Jeffrey. "We haven't seen enough of the token-ring scheme to justify that. Also, IBM has said that it will continue to support its existing cables."

IBM's announcement is directed mainly at companies planning to build new facilities, renovating existing buildings and offices, or installing new equipment. Explains IBM spokesperson Nadine Fletcher: "When you install a device, you have to cable it anyway, so you might as well use the cabling system that will be consistent with IBM's network."

What good is the cable without the LAN? "The only advantage to installing the cabling system now is that it will position a company to implement the LAN as quickly as it becomes available," says Sobel-Feldman. In the interim, the cabling can conduct conventional communications.

IBM claims its cabling system reduces the cost and complexity of in-

(News continued on page 21)



***DIGITAL JUST GAVE
32-BIT MICROS
A GOOD NAME.***

VAX.

DIGITAL'S MICROVAX I. THE BEST ENGINEERED 32-BIT MICROCOMPUTER IN THE WORLD.

Several years ago, Digital's engineers set out to revolutionize computer performance by extending virtual address space to unprecedented proportions.

They succeeded with VAX™ architecture. A design strategy so successful, it completely revised what the world expected from 32-bit computers.

Those same engineers have been at it again. This time, compacting VAX architecture into the MicroVAX I™ system.

A micro by every measure, the MicroVAX I system nevertheless delivers all the versatility and speed you've come to expect from its larger namesakes. It guarantees both hardware and software compatibility with other VAX computer family members. It lays claim to the same treasure chest of development tools, utilities and languages. It provides access to the same impressive library of proven applications.

With the MicroVAX I system, the industry's premier 32-bit architecture has been miniaturized by VLSI technology. Along the way, Digital's engineers dramatically reduced something else: the cost.

Entry into the celebrated VAX computing family is now possible for as little as \$10,000.

THE UNCOMMON BENEFITS OF VAX ENGINEERING HERITAGE.

A genuine VAX computer, the MicroVAX I system has

been, in a sense, already proven at tens of thousands of VAX installations.

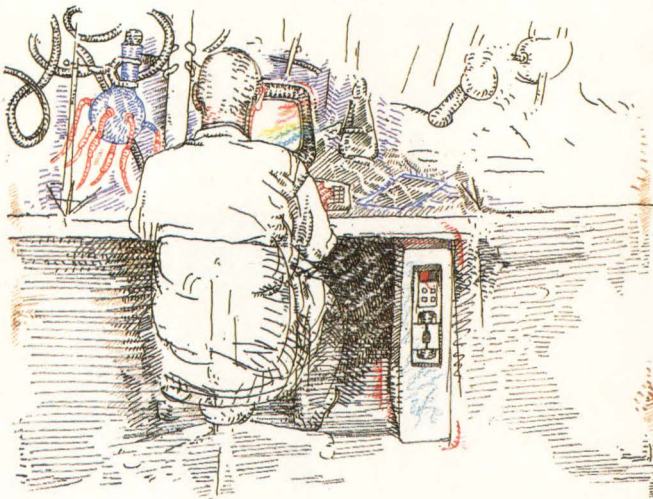
Its high bit-efficiency, for example, is achieved in true

free MicroVAX I system users from memory overlays, program segmentation and other encumbrances of competitive 16- and 32-bit micros. VAX

power of Digital's VAX-11/780 computer. Enough to satisfy your most demanding super-micro applications. Enough to comfortably support up to five users.

There is big system capacity: one-half million bytes of physical memory is standard, and expandable to four megabytes. For highly technical applications, MicroVAX I systems also come standard with support for both single and double precision floating point arithmetic.

To enhance the already impressive execution speed, Digital's engineers even put in



VAX architectural fashion — by accommodating data types ranging from one to 128 bits, and 21 distinct addressing modes. You can select precisely what your programs call for. The system boasts over four gigabytes of address space, made possible by full virtual memory management.

The MicroVAX I system also inherits the elegant VAX instruction set. Some three hundred separate instructions. This gives developers exquisite control over the micro, and in turn, gives the system extraordinary applications flexibility.

Bit efficiency for speed, elegant instructions for flexibility, and consequent growth potential are the heart of VAX architectural excellence. They

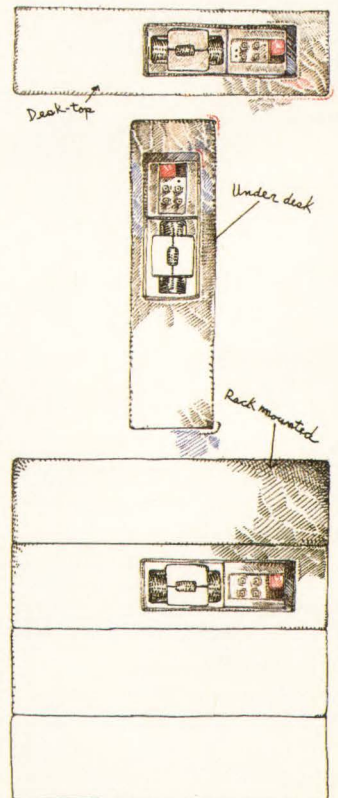
system sophistication means compact compilers and operating systems. It means applications that execute with speed.

The MicroVAX I computer enters the marketplace prepared both to live up to the legendary status of its predecessors, and to make a name for itself.

HARDWARE ENGINEERED TO GIVE YOU BIG SYSTEM PERFORMANCE.

To be sure, the MicroVAX I computer is a true micro. It fits under the desk, on the desk, or most compactly of all, taking up just 5 1/4" of height in a 19" rack.

The MicroVAX I system delivers over 35% of the raw



an eight-thousand byte direct-mapped cache memory.

**SYSTEM SOFTWARE
ENGINEERED TO GIVE
YOU UNMATCHED
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While ordinary micros give you just one, often thinly supported operating environment, the MicroVAX I system gives you a choice.

There is the MicroVMS™ operating system, Digital's famous VMS™ general-purpose system repackaged for the MicroVAX I computer. Within the storage capacity of your configuration, it will execute any user-mode VMS application. Unaltered. This opens up the complete range of unique and highly specialized Digital and third party applications and tools.

For incomparable economy, the MicroVMS operating system has been packaged by function into modules. You buy just the modules you need for your environment, then tailor the system to your application. The basic system module contains all the capabilities necessary to run applications. You can then add a program development module, a choice of networking modules, programming languages, and other optional products simply and easily. Because you never buy what you don't need, up-front investment is minimized and system overhead is reduced.

For realtime control, distributed computing and network-based multiprocessing, there is the VAXELN™ realtime programming toolkit. It gives you access to all the productivity tools of VMS. Applications developed on VMS with VAXELN software can be transported to other VAX or MicroVAX I target systems for execution. The applications do not need an underlying operating system.

The MicroVAX I system will excel in a variety of applications settings. It is a team com-

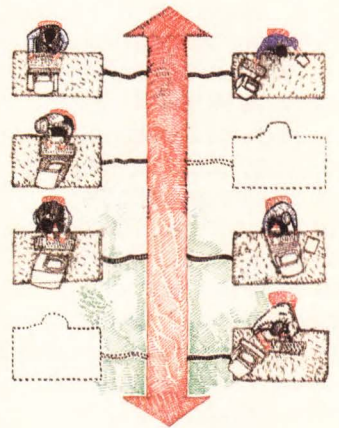


puter in business. A network node in process control. A technical workstation. It is a compact, high-powered computer that can be taken on location for seismic, marine and field engineering applications.

**DIGITAL'S Q-BUS
ENHANCED FOR HIGH
PERFORMANCE I/O.**

Inexpensive and high performing, the Q-bus™ data path has become a leader in the micro world and the choice of Digital's engineers for the MicroVAX I microcomputer.

The Q-bus data path now performs block mode data transfer, substantially improving its efficiency. The bus delivers transfer rates of over three



million bytes per second.

There are hundreds of devices and interfaces available for it. You may already have an investment in Digital's Q-bus structure. If so, a MicroVAX I system affords an easy and economical upgrade path to 32-bit power. For design start-ups, it gives you ready access to a complete range of supplementary products.

**NETWORKING:
YOUR WIDE-RANGING
PRESENT, YOUR FAR-
REACHING FUTURE.**

The MicroVAX I system is a full-fledged member of one of the broadest ranges of compatible hardware ever sold. With it, you may employ a single, consistent computing strategy from micros to huge clustered systems.

(Continued overleaf)

You can progress along this computing path with ease, transporting programs and data among systems as your needs dictate.

As your micro applications grow, for example, it is easy and cost-effective to transport programs and files from the MicroVAX I computer to larger systems. Conversely, a MicroVAX I system becomes an ideal target for programs developed on a bigger CPU. The MicroVAX I computer can communicate with all of Digital's other computing systems via DECnet™ software. As part of a DECnet network, MicroVAX I systems can also be linked with highly efficient gateways leading to IBM's SNA™ networks and X.25 public packet switching networks.

Within smaller geographic areas, the MicroVAX I system connects to Ethernet (supported by DECnet software) by simply clamping onto the cable. In doing so, it becomes the first ready-to-implement microcomputer for building high-speed data communications and powerful processing into local area networks. Both MicroVMS and VAXELN software support the Ethernet connection.

ENGINEERED-IN RELIABILITY: INCOMPARABLE SUPPORT.

Like all of Digital's products, the MicroVAX I microcomputer is engineered for quality and produced to Digital's enviably high manufacturing standards.

The MicroVAX I computer incorporates many built-in system diagnostics. The most powerful of these is a micro-code verify that performs a CPU self-test each time the computer is powered up. Many diagnostics run concurrently with normal processing, so if a failure does occur, it can be corrected quickly.

Every detail that helps

assure reliability has been attended to. The system's 230-watt power supply, for instance, features thermal shutdown, overvoltage and overcurrent protection, a/c input transient suppression, and a minimum four millisecond powerdown time.

Overall, modular con-

struction makes system service both rapid and inexpensive.

The MicroVAX I system is backed by one of the industry's most experienced small system support organizations. Digital pioneered on-site service with guaranteed up-time contracts and a selection of field services, software support

programs, and user training agreements so comprehensive they suit virtually every need.

No other 32-bit microcomputer in history has ever offered its users greater potential for success.

While others promise performance, you'll be working with the industry standard 32-bit engine.

While others promise software, you'll have a choice of operating environments and programming tools.

And while others promise support, you'll be dealing with a company that has over 475 support offices in 44 countries.

BEST ENGINEERED MEANS ENGINEERED TO A PLAN.

The MicroVAX I computer, like every Digital hardware and software product, is engineered to conform to an overall computing strategy. This means our systems are engineered to work together easily and expand economically. Digital provides you with a single, integrated computing strategy direct from desktop to data center, from chips to huge multiprocessing clusters.

As its name suggests, the MicroVAX I microcomputer is the beginning of a complete system and component program based on Digital-developed VLSI technology.

The MicroVAX I system is shipping now.

For additional product information or the name of your nearest Digital sales office or Authorized Industrial Distributor, call 1-800-DIGITAL, extension 225. Or write: Digital Equipment Corporation, Dept. MV1, 200 Baker Avenue, West Concord, Massachusetts 01742.

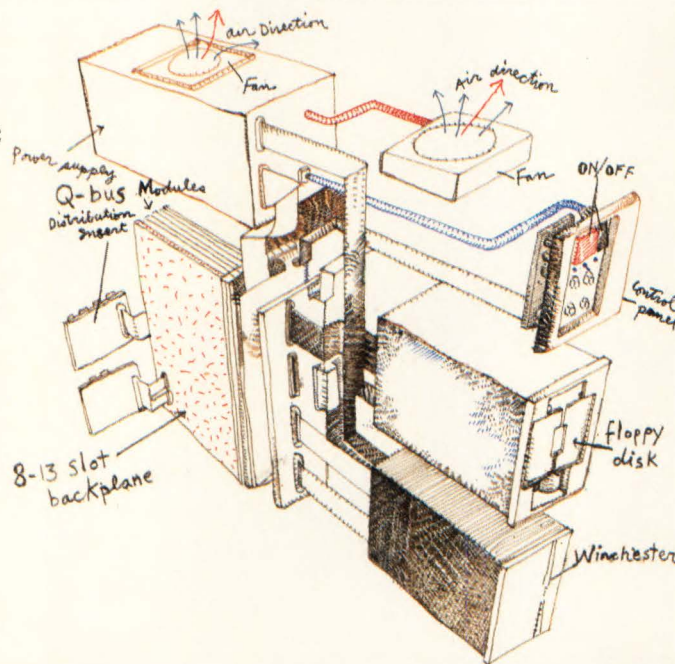
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DIGITAL'S MICROVAX I TECHNICAL SUMMARY

SYSTEM CONFIGURATION

Basic system for \$9,995 (U.S. price, one only) includes: Two-board CPU, one-half Mbyte main memory (expandable), modular power supply, I/O port, and eight-slot Q-bus backplane. A disk-based system at \$13,880 (U.S. price, one only) includes a 10 Mbyte fixed Winchester (expandable) and an 800-Kbyte floppy drive. Volume OEM discounts apply.



HARDWARE OPTIONS*	Optional	System Maximum
Memory:	256 KB, 512 KB with parity	4 MB
Floppy Disks:	2 x 400 KB	4 x 400 KB
Fixed Disks:	11 MB, 31 MB	62 MB
Communications:	1, 4, 8 lines Asynchronous Ethernet Synchronous	

*All configurations not supported by all operating systems.

SOFTWARE

Operating Environments: MicroVMS™, VAXELN™
Supports Applications Written In: BASIC; COBOL; FORTRAN; PASCAL; PL/I;
C; DSM; MACRO; LISP; OPS/5; DIBOL;
RPG II.

MECHANICAL SPECIFICATIONS	Width	Height	Depth
Rack Mount:	48.3 cm 19"	x x	13.3 cm 5.25"
Floor Stand:	25.4 cm 10"	x x	62.3 cm 24.5"
Table Top:	54.6 cm 21.5"	x x	15.2 cm 6"

WEIGHT (chassis only): 22.68kg (under 55 lbs.)

OPERATING TEMPERATURE: 15-32°C (59-90°F) at sea level.

OPERATING HUMIDITY: 20-80% relative humidity, noncondensing.

NEWS & COMMENT

(Continued from page 16)

stalling or moving computers and related devices within a building. It consists of twisted pairs of copper wire connecting wall outlets to which computers are connected. When IBM products, including workstations, are moved from one office to another, activating them is as simple as plugging them into the wall outlet and making an adjustment in a wiring closet. IBM estimates the cabling can pay for itself in a few years.

In addition to twisted-pair copper conductors, IBM is also offering fiberoptic cable to link central wiring locations. Some observers believe the fiberoptic offering indicates IBM has broad plans. "It implies that IBM has something more in mind than its token-passing LAN," says John Murphy. "Fiberoptics is broadband in capability and could be the basis for a whole spectrum of local 'connectronics' two or three years down the road."

What about the future? Will IBM's twisted-pair technology be able to accommodate future data needs? Sobel-Feldman says the wiring can handle data speeds needed at workstations for the next 10 years. IBM is using the fiberoptic cables to handle the higher data-transfer rates between networks, he adds.

"If, in the near future, you don't see your company needing high-speed graphics, video, or teleconferencing, and you have a limited number of users, then you should go ahead with the twisted wire," says Leonard Yencharis, a North Massapequa, NY, market researcher. "It's when you want the value-added services offered with a wider bandwidth that twisted wire is inadequate." Twisted-pair wiring is a low-cost solution, he notes, and usually isn't deployed for more than 3-Mbit transmission rates. Twisted pair also has severe distance limitations—in most cases, it can't transmit data at 1 Mbit to 2 Mbits more than 500 feet.

Still, twisted-pair wiring is useful in many applications. "Although coaxial cable is a better technology, it's more expensive and the applications are more limited," says Randall Sherman

of Creative Strategies, San Jose, CA. "Wang offers leading-edge technology such as coaxial cable and broadband—but do you really need all that horsepower?" Organizations may need a lot of bandwidth during peak-usage periods, but it will remain idle the rest of the time.

For many organizations, twisted-pair wiring is a stopgap solution, says Sherman. "When there's a need for point-to-point communications with high-speed computers, or when you're downloading huge amounts of data, it probably should be handled with dedicated lines and modems," he says.

The cabling system, developed by IBM's Communication Products Division, will be available from IBM distributors or directly from IBM in October.

—Theresa Conlon

Will users nix a Unix standard?

Will Bell Labs' Unix operating system become an industry standard or is it hype? Supporters are lining up on both sides of the question.

There seems to be little doubt that Unix helps programmers develop applications. But in the world of non-technical corporate employees using personal computers, the operating system has unacceptable flaws, asserts the anti-Unix contingent. Unix supporters acknowledge that the system has some failings. But it will become a standard, perhaps by default, because it is by far the best-known multi-user, multi-tasking operating system, they say.

IBM could make further debate on a Unix standard meaningless by introducing a small multi-user microcomputer with a Unix-type operating system. David Fiedler, editor of *Unique Newsletter*, believes the leading maker of business computers will introduce such a machine, probably built around a processor such as the Intel 286 and "Unix or something very much like it." With IBM's blessing and the virtual guarantee of a

market for Unix applications software, the software houses would start churning out business programs that are not available under Unix right now, he predicts.

Others aren't convinced, however, despite AT&T's multimillion-dollar advertising campaign extolling the system's virtues. Unix does not interact well with the bit-mapped displays of the IBM Personal Computer and Apple Computer's Macintosh, causing prohibitive response delays of up to 10 seconds on multi-user systems, says Robert Harp, chairman of Corona Data Systems Inc., a Westlake Village, CA-based micro manufacturer. "Unix is a multi-user operating system designed to interface only with dumb terminals," he says. "It can't transfer information onto a personal-computer display. Ultimately, the biggest problem with Unix is that it doesn't interact well with a bit-mapped display."

Far from supporting Unix' development into a standard, trends indicate growth for the business applications software written for the IBM PC and its MS-DOS-derived operating system (PC-DOS). Those packages comprise about 85 percent of the business software available, he says. However, Unix may still become a standard simply because AT&T and industry gurus "force it down the customers' throats," concedes Harp. "It seems everyone in the industry is convinced it is going to become a standard. The only person who is not convinced is the customer."

Harp's outlook is supported by one market-research house's installed-base estimates. Last year, there were 93 percent more MS-DOS-based micros than Unix-based computers, according to Yates Ventures, Los Altos, CA. By 1987, Yates estimates that the MS-DOS installed base will be 83 percent larger than the Unix base. The firm estimates that last year, there were 125,000 Unix-based computers (90 percent of which were micros) while there were 1.6 million micros with the MS-DOS operating system. By 1987, Yates estimates that

NEWS & COMMENT

there will be about 2.5 million Unix-based machines and 15.5 million based on MS-DOS. Michael Dubrall, managing analyst, cautions that because Unix is a multi-user system, the number of employees using Unix-based systems will be much higher than the 2.5 million installed-base estimate.

At the recent Comdex show in Atlanta, an executive with a tiny New Jersey-based vendor marketing a competing system launched a stronger attack. "AT&T's new slogan is: Unix—from now on consider it a standard. It should really be, Unix—from now on consider it dead," said John Little, director of systems-software development for Multi Solutions Inc. of Lawrenceville, NJ. Little claims that the S1 operating system sold by his company gives everything that Unix promises but doesn't deliver. "The emperor has no clothes. Unix never was a standard, is not now, and never will be," Little said.

Little said Unix has several serious shortcomings. Unix is billed as a system that can be transported between mainframes, minis, and micros, but its many versions make it impossible to freely transport applications from one Unix machine to another, Little says. Eight separate versions of Unix have been produced by AT&T, along with other versions from other vendors and the University of Berkeley (CA). An application on one system has to be modified to run on another. Little also called Unix' networking capability nonexistent and its file system inadequate. In addition, its user interface contains commands

such as "ar," "as," and "at," which are not easy for users to work with. Quoting Dennis Ritchie, an inventor of Unix, Little says the system is vulnerable to inadvertent or deliberate file tampering and destruction.

AT&T, which invented Unix in the 1960s and now sells it to users, OEMs, and software houses, swatted the Multi Solutions fly with dignity. "Unix is not hype," said David I. Sandell, AT&T manager of software and sales. Agreements with microprocessor makers like Motorola Inc., Intel Corp., Zilog Inc., and National Semiconductor Corp., coupled with the fact that mainframe vendors such as Amdahl Corp. now can run Unix systems, confirm Unix' popularity, he says.

Sandell said many of Little's dagger thrusts were directed at the original Unix configurations. The recent release of AT&T's System V Unix version and refinements to the system made by OEMs and software houses have made it more adaptable to business needs, rather than the laboratory and the university for which it was originally targeted.

Sandell concedes that some user applications may need modification by programmers to be transported from one Unix version to another, but most don't. Even if modifications are needed, they're minor, he says. On the question of networking capabilities, he suggested a software driver be added to increase efficiency at the interface between the operating system and networked devices. OEMs have fine-tuned Unix to fit the needs of various end users, and have written

front ends to the system that are more user friendly, he added. Others have developed encryption codes to make the system more secure.

Other supporters believe Unix' strongest selling point is its multi-user capability. Corporate personal-computer users, who are just getting used to the technology, are beginning to recognize the need to share information with other micros. This can be accomplished through networks, but if users want to instantaneously update information, they will have to timeshare a processor via a multi-user operating system like Unix, says Marc Rochkind, vice president of Emerging Technology Consultants Inc. in Boulder, CO.

If timesharing is not necessary for an organization, there will be a huge need for a central file server to handle the micro network's data. This file server will need an operating system with multi-tasking capabilities so that it can handle requests from many users simultaneously, Rochkind says. Although a less opulent operating system could be used for this job, Unix is the most widely known multi-tasking operating system, Rochkind says.

"Once people begin to understand networking, they'll see there is a need for a central file server that has to be more powerful than the IBM hard-disk PC XT. When they go looking for a solution, they'll go looking for Unix," Rochkind says.

Mainframe DSS: doomed species?

Decision-support software packages that run on mainframes and minis will be obsolete within three years, displaced by packages for quicker, friendlier personal computers, predicts Michael Treacy, assistant professor at the Massachusetts Institute of Technology's Sloan School of Management in Cambridge. The large system's role in decision support will be as a central

(News continued on page 26)

ITT enters an "extra" micro

Joining IBM and AT&T, another giant corporation known by its initials, ITT Corp., has entered the micro arena. ITT's Xtra Personal Computer is a 16-bit machine built around the Intel 8088 microprocessor. It has a standard 128-Kbyte random-access memory (expandable to 640 Kbytes), a cursor-controlling mouse, an IBM-like keyboard, and compatibility with the IBM Personal Computer.

Several versions of the Xtra are available, including one with a single, 360-Kbyte floppy-disk drive (\$3,529 with a color monitor) and one with a 10-Mbyte hard-disk system (\$6,399 with color monitor). For more information, call (602) 894-7000.

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CIRCLE 17

NEWS & COMMENT

(Continued from page 22)

data manager, he says.

Treacy offered his obituary for mainframe decision-support systems at the recent DSS-84 conference in Dallas. "The products vendors are offering on mainframes and minis today will not be relevant to the majority of users of decision-support systems because, on a mainframe, you simply can't deliver the highly interactive, easy-to-use interface," he said.

Treacy's prediction applies only to big-system packages that do modeling, statistical analysis, and online queries, as opposed to packages used to aid in software development. As more and more data are shared by micro users, large processors will assume the role of traffic cops. "The only role left for the mainframe is as a central data manager and a switch for communications," Treacy said. "That's the direction in which a lot of the vendors are taking their products—as quickly as they can."

The quick response of personal computers is behind the trend away from large-scale DSS packages, said Treacy. A user running a spreadsheet package on a micro can change a screen in one-fifth of a second. A terminal connected to a mainframe via a 9,600-baud modem takes two seconds to do the same, he said. And because the response time is so quick, designers can make interfaces easier to use.

The losers in this migration could be Digital Equipment Corp., Maynard, MA, and Prime Computer Inc., Natick, MA. Both make large shares of the departmental minicomputers many DSS packages run on. "Those guys will be taking it on the chin because the analytical functions are going down to the micro—where they don't have a presence," said Treacy. In addition, data management is the kind of technical chore that can be tightly coupled with transaction-processing systems—and that's IBM's turf, he noted.

An important variable in Treacy's equation is the rough fit of mainframe DSS packages and microcomputers. Complex mainframe packages "have

to diet before they can fit on a micro," Treacy said. None of the vendors has successfully migrated its DSS packages to micros, mainly because of inexperience with microcomputer software, he added.

Treacy also asserted that DSS is still an unfulfilled promise for many users. "If one happens to be quantitatively oriented and analytic—and is lucky enough to have data in reasonable, accessible condition—then the promise of decision-support systems is fulfilled," he said. For many managers and executives, however, the technology's value is diminished by its unfriendliness.

Slashing the cost of voice mail

Digital Sound Corp. (DSC), Santa Barbara, CA, claims its new voice-mail processor may cost users up to 60 percent less than similar products. The cost will be between \$80,000 and \$100,000, as opposed to the \$250,000 average cost for processing subsystems.

The secret of the DSC-2000 Voice Server is proprietary compression algorithms that reduce voice messages to lower data rates than competing processors. The low rate reduces storage requirements and allows a less powerful processor to handle voice fil-

write software to connect Voice Server with workstations and private branch exchanges, Ludlow said. For more information, call (805) 569-0700.

Will truce yield network standard?

Must corporations only dream about multi-vendor hardware compatibility? For a shining moment at the National Computer Conference, 13 vendors will demonstrate that by supporting a networking standard, diverse machines can talk to one another. Several vendors say that an enthusiastic reception by users may spur further cooperation on networking standards.

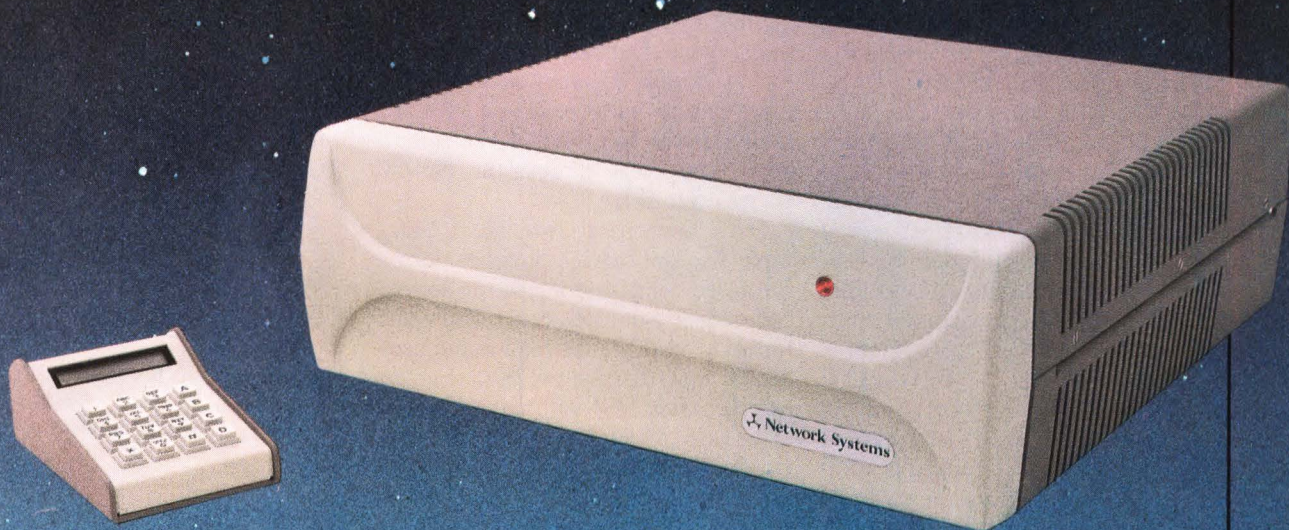
Fed up with incompatibility, General Motors Corp., Detroit, the Boeing Computer Services Corp., Seattle, and the National Bureau of Standards (NBS) put together the networking display. It will be featured July 9 through July 12. Nine vendors, including Digital Equipment Corp. (DEC), Hewlett-Packard Co., Honeywell Information Systems Inc., Intel Corp., and NCR Corp., plan to take part in an NBS test of a networking standard for business applications using the carrier-sense-multiple-access method with collision detection (CSMA/CD). Seven companies, including IBM, DEC, Hewlett-Packard, Motorola, and Concord Data Systems, will take part in a test of an industrial-networking scheme that uses the token-bus method.

During the four-day presentation, the vendors have agreed to honor a networking standard promulgated by the International Standards Organization (ISO). ISO has developed an Open Systems Interconnection (OSI) reference model, a seven-layered configuration that describes the way to address all the data-communications functions of networking. The vendors have agreed to honor the fourth level—the "transport" layer—of the OSI model, which provides control over the flow of data



ing, says Michael P. Ludlow, vice president of marketing. A 16-port, 32-hour system will be shipped to OEMs this fall. OEMs, in turn, will

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between machines.

None of the vendors is bound by the standards demonstrated at the exhibition. After all, offering incompatible equipment is an effective way for a large vendor to lock in customers and freeze out competitors. However, Arthur B. Lane, networks-operation-engineering manager for Hewlett-Packard, suggests that if more users, like GM and Boeing, demand standards, compatibility in multi-vendor shops will not be just a dream. "The best thing that could happen would be customers saying, 'Vendors, we'll make your lives miserable unless you continue this movement,'" says Lane.

Several vendors believe that if manufacturers of non-IBM computers—including the Bunch (Burroughs; Univac, now Sperry; NCR; Control Data; and Honeywell)—agreed to honor a common set of multiple standards, they would be a stronger force against IBM and AT&T. "If we'd all get together and compete on our capabilities rather than our incompatibilities, the customer would be better off," says Lane.

Escrow means secure software

The vendor who sold you software for an essential business application just went out of business: Do you know where your source code is?

It might be under a ham-and-cheese sandwich in the office of a lawyer designated as an escrow agent. It might no longer exist, a casualty of the bankruptcy. Or, it might be safely stored in the climate-controlled vault of an escrow service.

A new niche in the ever-changing software industry has been created by firms that agree to act as neutral third parties in software-licensing arrangements. An escrow service holds updated versions of source code, protecting the interests of users and vendors alike. The user gets access to the source code if the vendor fails or discontinues a product line. The arrange-

ment doesn't compromise the trade secrets of vendors.

Liliane Choney, vice president of the Data Securities International Inc. (La Jolla, CA) escrow service, believes the escrow clauses in many software-licensing agreements are inadequate. "You would be hard-pressed to find anyone who has implemented an escrow clause," Choney says. "Either there was no one around to make sure a clause was followed or the sellers hoped the users forgot (the escrow clause) was there."

Data Securities' Intelligent Software Escrow service supplies forms for agreements and keeps the source code safe in a climate-controlled vault for up to \$1,000 (the vendor and user decide how to split the fee). For an extra charge, DSI will update source code as particular programs are revised, or test the source code to make sure it's the real thing. "We can be as pesty as the user wants us to be," says Choney. The company also offers insurance underwriting for the escrow materials, encryption, and administrative updates of the escrow account.

Some user corporations want more than the knowledge that source code is safe and accessible in the event of the demise of a vendor or product line, says Choney. In addition to holding source code, many escrow agreements direct DSI to retain the names of the inventors of the software or other documentation that would aid in updating or altering programs. Also, an increasing number of users are including terms that call for the release of source code if a software vendor defaults on maintenance provisions.

If a user wants access to source code in escrow, he or she submits a request to the escrow firm, which passes it to the software vendor. The vendor must respond within the time set in the escrow agreement. If the vendor objects to the release of the source code, the matter can be brought to an independent arbitrator, Choney said. Otherwise, democracy prevails: The vendor has one vote, the user has one vote, and DSI decides who wins. For more information call (619) 457-5199.

Small wonder

Which is the smallest personal computer of them all? The new Seiko Data 2000 digital watch may qualify for that honor. It can store 200 10-character lines describing appointments, important phone numbers, and flight information. Any micro can store calendars, but not many are as portable as this watch. The entire 2,000-character



memory can be read in a single scroll. Data are entered into the watch via a keyboard that doubles as a calculator. The combination watch and calculator lists for \$195, but has already been heavily discounted in large cities. Contact your local Seiko dealer for information.

Your peers are better than gurus

The best expert to consult about an MIS/dp problem may be a colleague rather than a data-processing guru.

Omicron of Morris Plains, NJ, has formalized this notion into a business. It offers "no holds barred" meetings of up to 20 technical and human-resource professionals on how managers and pros successfully implement technology in organizations. For \$4,800 a year, an organization's exec-



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utives can participate in up to 16 of about 50 scheduled Omicron meetings a year. More than 50 corporations participate in Omicron's sessions.

Omicron's founders, Howard D. Rothman and James B. Webber, call these meetings interchanges. They are informal discussions where participants speak frankly about their businesses and career experiences without fear of disclosure. "The greatest benefit that anyone can get is to talk to someone in similar straits," says Rothman. "Our meetings allow participants to say things like, 'Listen, I'd like to do that but I can't get a nickel out of my boss. How can I do it?'"

Rothman and Webber describe Omicron's slant on MIS/dp problems as "systems humanics." They believe people and the ways they relate to technology are the keys to making technology work in organizations. To help MIS/dp managers grasp this idea, Omicron also brings together human-resource specialists and technical specialists. The interchanges are most useful for key vice presidents and director/managers involved in data processing, human resources, fi-

nance, user departments, and related activities.

Among the systems-humanics problems Rothman and Webber cite are selling new technology to the boss, recruiting, successful end-user computing, and organizational-structure problems. Previous interchanges have addressed problems such as measuring and increasing the productivity of programmers and analysts, strategic systems planning, information centers, the accountability of the user for information-resources use, and effective disaster planning.

Rothman, 60, and Webber, 43, met in the early '70s while working for the Berton Group, an executive-search and consulting firm formerly located in New York. After they left the firm, they kept in touch and lunched with other friends in the dp field at a restaurant in New York. At the same time, Rothman said he gathered an informal group of about 30 top dp executives who would get together four times a year to discuss common business and career problems. Omicron, started in 1981, was the result of their common belief in systems humanics and the benefits of intensive discussions of business problems

among peers.

In addition to the one-day interchanges, Omicron offers three-day conferences, research reports, and what it calls a "participant network" of executives who will help peers with work-related problems. For more information, call (201) 267-0024.

More missing links

Three more products have joined the parade of micro-to-mainframe connections. ILink from Information Center Software, New Paltz, NY, is a dictionary-driven package designed for information centers. The vendor claims the package can upload, download, and crossload information from a variety of mainframe-database packages and personal-computer software. ILink downloads data by transforming mainframe data files into DIF or CSV formats that can be read by personal computers. The package's creators boast it is not product-specific like other links.

File uploads are performed by transforming DIF or CSV micro files into mainframe-exchange files that can be accessed by packages running

Tongue in check If you tell the boss you're anxious for the new chief programmer to start, don't be surprised if he or she asks why you're worried. Chances are, you're *eager*, not *anxious* for the new staff member to arrive.

Anxious is often substituted for *eager*, and, realistically, the two words are linguistic back-fence relations. When you're *eager*, you're excited, impatient, and keen to learn or receive something—sort of like a beaver who's discovered a tasty tree. An *anxious* person is also excited and impatient, but he or she dreads the awaited event or transaction. If the new chief programmer is a nemesis from a former job, for example, you'd be *anxious* about his or her arrival. But if your organization is just short-staffed, you'd be *eager* for the extra help to arrive.

Particularly when discussing nontechnical employees, using the latest computing tools, the misuse of *anxious* can throw the meaning of a statement into doubt. Many managers talk about users who are *anx-*

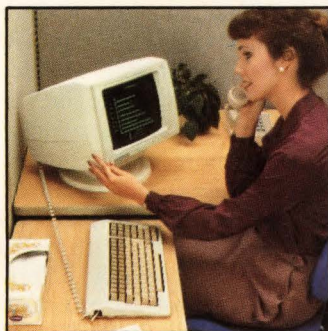
ious to obtain the latest integrated software package, for instance. That statement implies that the users are wringing their hands over the prospect of learning to use a complicated new tool, which may be the truth. Some users, however, are undoubtedly flush with the anticipation of getting their hands on the hottest new item going. *Anxious* overlooks those eager beavers.

When told about these *anxious* users, the boss might suddenly take a dim view of your plans to buy the new software. Why should the corporation invest in a product that strikes fear into employees' hearts? Expensive training and a lot of hand-holding may be required to overcome the fearsome aspects of the package.

Linguists recognized the gradual replacement of *eager* with *anxious* long ago. Some assert that the distinction between the two words has vanished from spoken English, to be appreciated only by careful writers and readers. In either spoken or written English, however, ignoring such subtle distinctions between two words can make your audience anxious about your meaning.

—John Rymer

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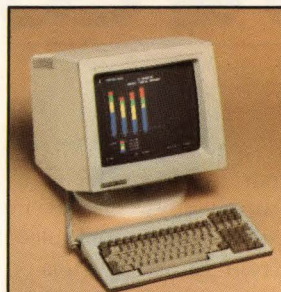
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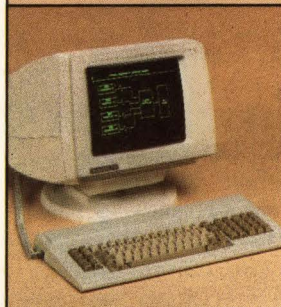
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under IBM's VM/CMS operating system, including SAS from SAS Institute (Cary, NC), Ramis from Mathematica Product Group (Princeton, NJ), Focus from Information Builders (New York), and ADRS and APL/DI from IBM. ILink runs on the IBM Personal Computer, the hard-disk PC XT, and compatibles with at least 128 Kbytes of memory. The basic iLink package costs \$12,000. Call (914) 255-8925 for more information.

DBase/Answer from Ashton-Tate of Culver City, CA, and Informatics General of Woodland Hills, CA, offers downloading from mainframe database packages such as IBM's IMS, IDMS from Cullinet Software (Westwood, MA), Total from Cincom Systems (Cincinnati), and Adabas from Software AG (Reston, VA) to IBM Personal Computers running Ashton-Tate's dBase II and III, Friday!, or Framework. DBase/Answer connects to mainframe databases with CICS or IMS/DC communications monitors. A typical configuration with one mainframe Answer/DB module and dBase/Answer for 50 IBM PCs costs \$45,000. Call (818) 887-9040 or (213) 376-6978 for more information.

Finally, Decision Manager, an integrated software package from Management Science America, Atlanta, offers downloading capabilities from mainframe applications by allowing personal computers to emulate IBM

3270-type terminals. In addition, Decision Manager provides word-processing, graphics, spreadsheet, and telecommunications capabilities. It runs on the IBM PC XT (the version with hard-disk storage) running PC-DOS 2.0 and on the IBM PC with a hard disk running PC-DOS 1.1. The package requires 256 Kbytes of memory and is available at a special introductory price of \$625. Call (404) 239-3000 for more information.

All of these products require communications packages such as the Irma enhancement board from Digital Communications Associates, Norcross, GA, to link the mainframe and micro functions.

New portables mean business

Successful portable computers of the future will run the same kind of software that business users run on their office workstations, say several market researchers. Three new transportables and two new lap models do just that.

In coming years, the functional distinctions between heavier transportables and lighter lap models should blur as one gets lighter and the other gets more powerful. There are more than four dozen of both kinds available today, says Sandy Gant of Infocorp, a Cupertino, CA-based market research firm.

"People who use portable computers don't like to have to learn new programs," says John Hemphill, vice president of technology for Future Computing, a market research firm in Richardson, TX. "In corporations, you are dealing with the IBM PC-compatible standard. You don't want to give users new sets of commands."

Hewlett-Packard's new lap-sized portable is called, strangely enough, The Portable. It costs \$2,995, weighs 9 pounds, and offers bundled 1-2-3 from Lotus Development Corp. (Cambridge, MA), which combines spreadsheet, graphics, and file-management capabilities. The unit is powered by three batteries that run 16 hours without a recharge. For an extra \$795, The Portable will also run the MS-DOS operating system on an optional battery-powered 3½-inch-disk drive.

Among the packages available for The Portable are dBase II from Ashton-Tate (Culver City, CA) and Wordstar from MicroPro International (San Rafael, CA). It features a flip-up, 16-line-by-80-column liquid-crystal display and a full-size keyboard. A link that allows The Portable to share data with the IBM Personal Computer and Hewlett-Packard micros is available for \$125. Contact your local Hewlett-Packard sales office for more information.

Morrow Inc. is offering the Pivot, a 9-pound, 16-bit portable with a built-in 5¼-inch-disk drive. With a base price of \$2,500, Morrow offers a pop-up 16-line-by-80-character liquid-crystal display. Pivot offers 128-Kbyte random-access memory (RAM) expandable to 512 Kbytes, a full-featured keyboard, and a 12-volt, 1½-pound battery that can run five hours before it needs to be recharged. The Pivot is expected to be available next month. Call (415) 430-1970 for more information.

On the transportable side, Franklin Computer has introduced a new line of 25-pound portables called the CX Series. These computers not only run programs written specifically for the Apple II Plus from Apple Computer

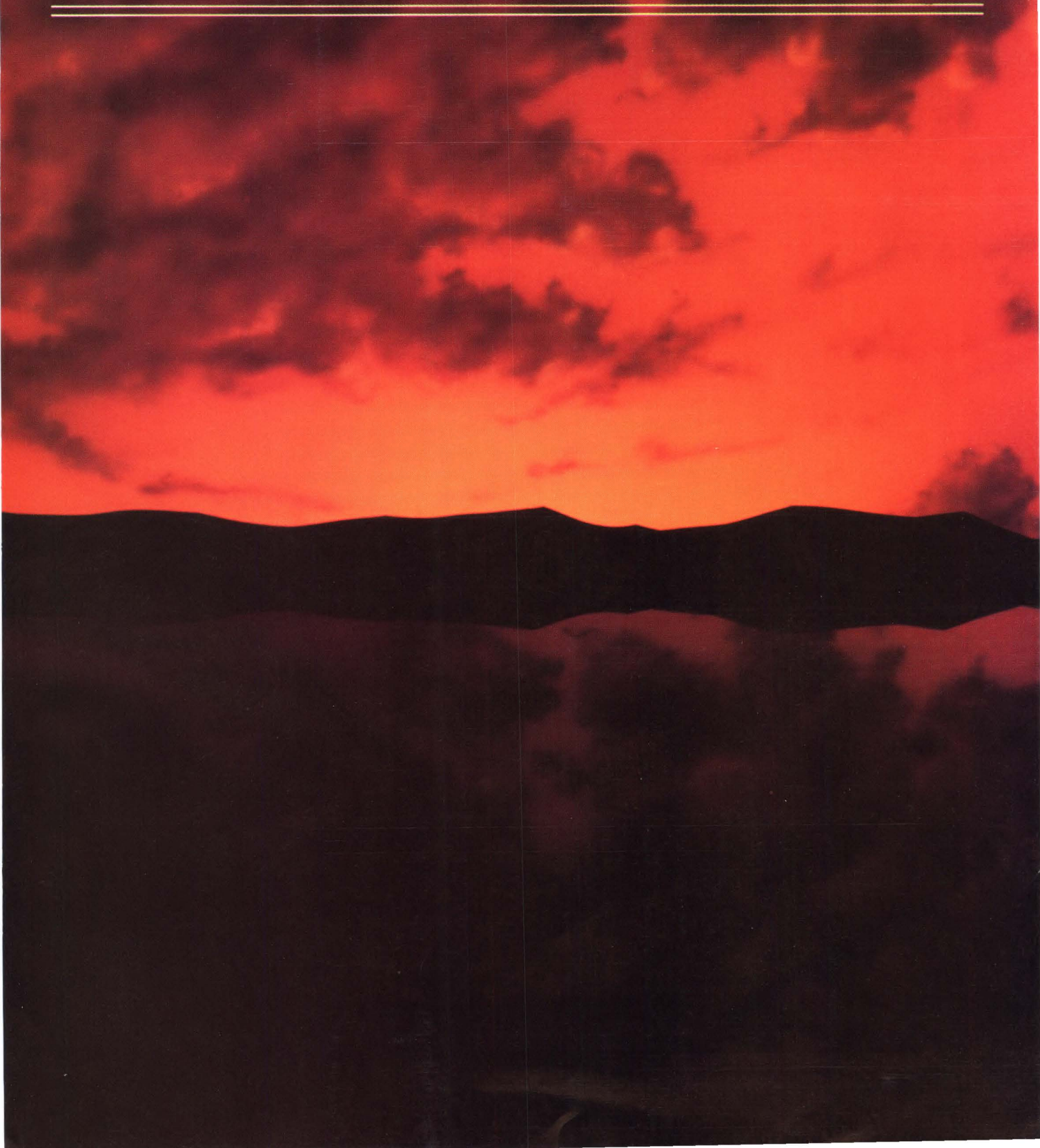
A thin VDT in your future?

Sharp Electronics Corp. claims to have seen the future of video-display terminals and it is flat. The Japanese manufacturer, with United States headquarters in Paramus, NJ, projects that when the cost of electroluminescent (EL) displays, such as its recently announced 25-line-by-80-character panel, is reduced by refinements and mass production, they will replace the standard cathode-ray tube on the desks of corporate America. "When you look at the executive's office, the big crt just takes up too darn much space on the desk," says Robert Garbutt, general manager of Sharp's Elcom Group.

Sharp's flat panel is only 1½ inches thick. Garbutt claims it is even more reliable than the crt. Sharp makes smaller ELs with 16 lines, but the company claims its 25-character-by-80-line model is a first. Most personal-computer software is written for screens of that size. The panel is about 9 inches wide and 5 inches high and is expected to be sold to OEMs, says Garbutt.

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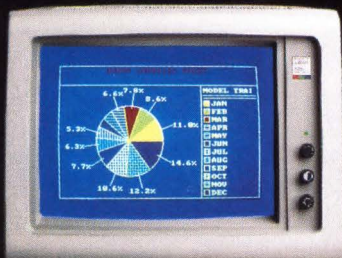
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Inc. (Cupertino, CA), but also MS-DOS and CP/M applications. A single-disk-drive model with 64 Kbytes of RAM retails for \$1,395. A model with dual disk drives that includes the capability to run CP/M programs and 64 Kbytes of additional RAM costs \$1,995. A model that offers MS-DOS and 128 Kbytes of additional RAM costs \$2,295. All of the units can be upgraded. Call (609) 488-0600 for more information.

The Alex 500A from Comp-U-Save also offers Apple and CP/M compatibility. It weighs 18 pounds and is 15 inches wide, 14 inches long and 5 inches high. It has a 5-inch green monitor. The Alex 500A costs \$2,495. Call (704) 274-3003 for more

information.

Weighing in at about 19 pounds is the Otrona 2001 from Otrona Advanced Systems Corp. The basic model with a single 128-Kbyte disk drive, keyboard, and 7-inch monitor costs \$2,495. The top-end portable with a built-in 10-Mbyte hard disk and one 5¼-inch floppy costs \$4,495. Otrona also offers add-ons like a \$795 13-inch monitor that transforms the portable into a desk-top workstation. The Otrona models run MS-DOS, but users can purchase an extra Z-80B processor for \$495 that will allow the machine to run CP/M programs. An add-on 8087 math co-processor costs \$395. For information, call (303) 444-8100.

Improved office software for VAX

An improved version of the Vox integrated office-automation software system for Digital Equipment Corp. (Maynard, MA) VAX minicomputers links spreadsheet, word-processing, database-management, graphics, and office-management software. The links are modular, letting users buy only the links to the software they need, according to Aquidneck Data Corp., Newport, RI, and Hamilton HGL Software Limited, Allendale, NJ, vendors of the package.

With any one link, purchasers get an electronic-mail program that includes a send/receive function for exchanging files and documents and an office-management program that includes a calculator and personal-time manager. The entire Vox package costs \$46,000, but each link and package can be bought separately. Vox runs on VAX/730 models and higher, and competes with DEC's own All-in-One Office Menu offering. For more information, call (401) 847-7260 or (201) 327-1444.

"Friendlier" dBase debuts

The rap against Ashton-Tate's dBase II personal-computer database management system (DBMS) is that ordinary users find it too difficult to use. In a recent survey of database packages for IBM-compatible micros, for example, *Ratings Newsletter*, published by *Software Digest*, rated dBase II 11th out of 20 packages, primarily because of a "fair" rating in the ease-of-use category.

With its recently announced dBase III, Ashton-Tate of Culver City, CA, claims to have answered these complaints by adding a command-assistance mode, dubbed dBase Assistant, that helps users set up databases by providing prompts and menus of choices. With dBase II, a user was required to input commands one line at a time without the aid of a list of options. DBase III also presents a help message that explains the proper syntax for a command and what the command is used for. Users can access these menus with a single keystroke. Further, the dBase Assistant automatically offers help for querying, listing, and other database functions.

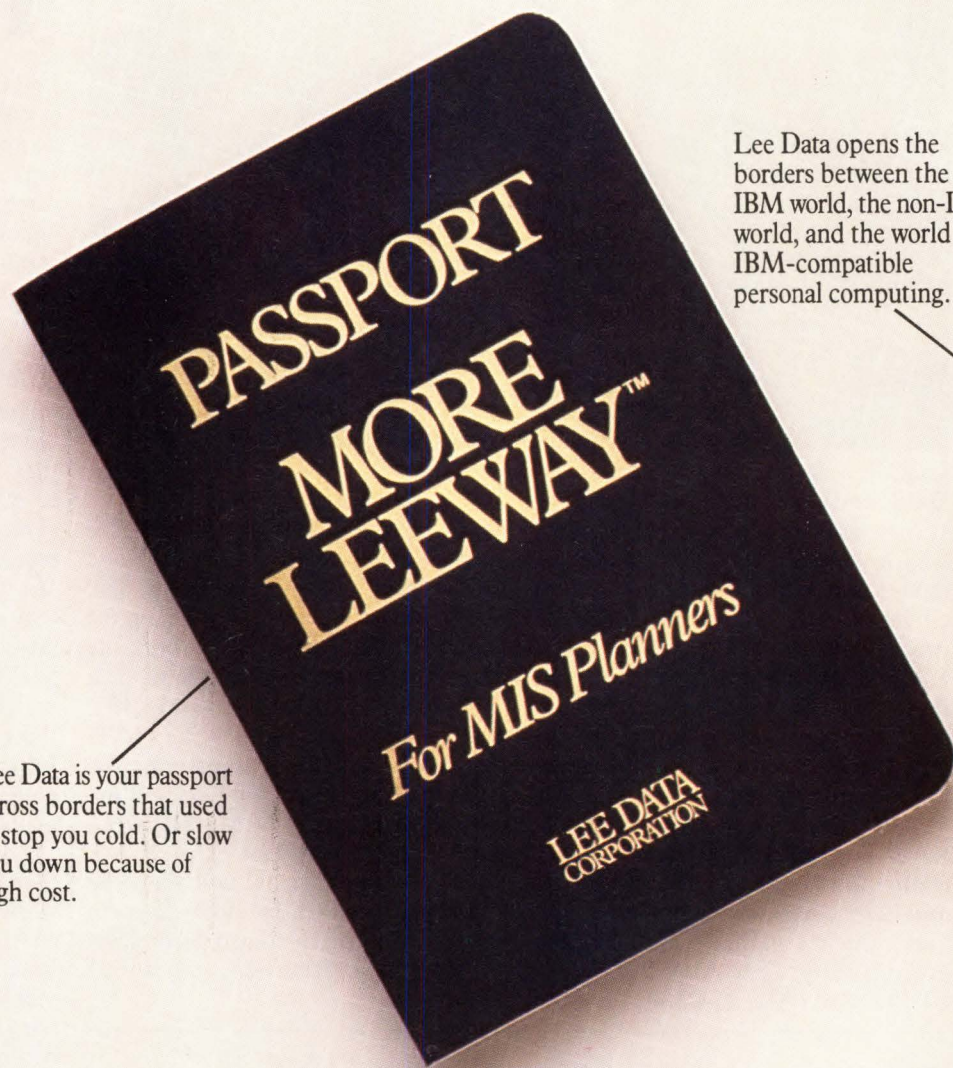
DBase III is also more powerful than its predecessor. It allows users to work with 10 database files at a time; dBase II could handle only two at a time. The length of fields has been increased from 1,000 to 4,000 bytes per record. The number of fields in a record has been increased from 32 to 128.

DBase II had separate versions running on 8-bit and 16-bit personal computers with 128-Kbyte random-access memory (RAM). DBase III will run on micros that are 16 bits and above with a minimum of 256 Kbytes of RAM. Ultimately, Ashton-Tate hopes to make dBase II the database package for 8-bit micros and dBase III the standard for 16-bit micros.

For organizations with a commitment to Bell Labs' Unix operating system, the new package is written in

(News continued on page 36)

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NEWS & COMMENT

(Continued from page 33)

the high-level C language, which could enable Ashton-Tate to develop a Unix version for multi-user micros in the future. The package runs on the IBM Personal Computer, the hard-disk PC XT, and compatibles and requires two 5 1/4-inch, 360-Kbyte diskette drives or one hard-disk drive and one diskette drive. It costs \$695. For more information, call (213) 204-5570.

Keystrokers pick up the pace

Data-entry operators averaged 11,944 keystrokes per hour in 1983, an increase of 4.5 percent over the previous year, according to a recent survey of 170 organizations by the Data Entry Management Association (DEMA).

Last year's increase continues an upward trend in keystrokes per hour

that DEMA believes has been fueled by technological advances. Since 1980, operators have picked up the pace of their work by a total of 11 percent, and last year's level was double the 1966 hourly rate. Managers who previously measured data-entry performance on a 10,000-an-hour keystroke standard, should think about raising that level to 12,000, according to DEMA.

The survey of companies in the United States and Canada conducted last winter also revealed that the net hourly cost for the average data-entry operator (not counting overhead costs) rose from \$8.77 to \$9.22. The average monthly salary of a data-entry operator increased 4.9 percent, from \$1,083 in 1982 to \$1,136 last year. The average monthly salary of data-entry managers rose 6.9 percent, from \$2,222 in 1982 to \$2,360 last year.

The DEMA survey, designed to

help provide statistics for data managers to plan schedules, set work standards, and determine pay scales, is available from DEMA for \$15. Call (203) 322-1166 for information.

Sperry offers micro Mapper

Sperdy's Mapper software is at the heart of a new small computer that can be connected to IBM mainframes. Until now, Mapper, an applications-development tool for nontechnical users, has only been available on large Sperry systems.

Two multi-station systems, Mapper 5 and Mapper 6, cost \$40,000 apiece. The systems come with a variety of peripherals, including mass-storage devices and printers. Up to 16 workstations, including the Sperry Personal Computer, can be

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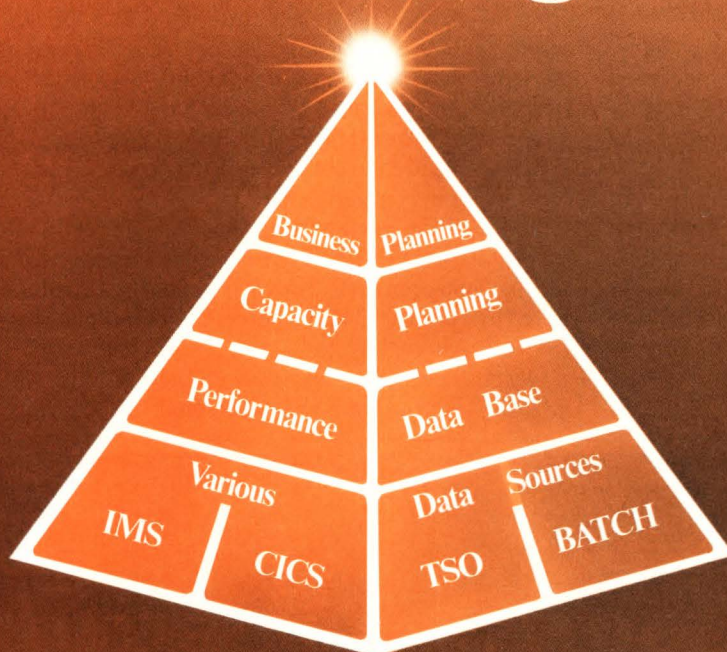
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NEWS & COMMENT

supported by the systems. Mapper 5, which is available now, can only be connected to Sperry mainframes. However, Mapper 6 can be hooked to IBM mainframes; it will be available in September. For more information, contact your local Sperry sales office.

Office micros are moving home

Home-computer use is being fueled by office personal computers, according to a recent survey by *Dial*, the magazine of public television.

Eighty-nine percent of the respondents use computers at work. Of that group, 67 percent use their computers both at work and at home. Fifty-four percent said they purchased their computers to do work at home, and 63 percent of the home-computer owners use them for work-related tasks. Of

the respondents who purchased personal computers for home computing not related to work, 61 percent said their experience at home has helped improve their performance in the office.

Dial also asked its readers who use computers on a regular basis, either at work or home, how the machines effect them. The majority (82 percent) felt very favorable about the computer in their homes. Not one of the 1,000 respondents who were sampled at random said they felt "very unfavorable" (the lowest possible rating on the question) about their machines. When the readers were asked if their feelings about computers had changed since they first started using them on a regular basis, 50 percent reported feeling "more positive," only 2 percent were "less positive," and 1 percent felt "more negative."

Despite the great enthusiasm the majority have about their personal

computers, most of the respondents (71 percent) have experienced at least one significant problem with their computers. The foul-ups included problems with software manuals (41 percent), hardware manuals (21 percent), and incompatibility between systems and software (27 percent).

The most popular use of home computers is word processing (76 percent), but home users are finding other applications as well. Just over half (51 percent) report using them for information management (44 percent), 36 percent use them to run educational programs, and 20 percent send and receive electronic mail.

The more uses found for the computer, the more satisfied computer users are, and respondents who use their computers to communicate with other computers were the most satisfied of all. Those who spent between \$1,000 and \$3,000 on hardware are much more satisfied than those who



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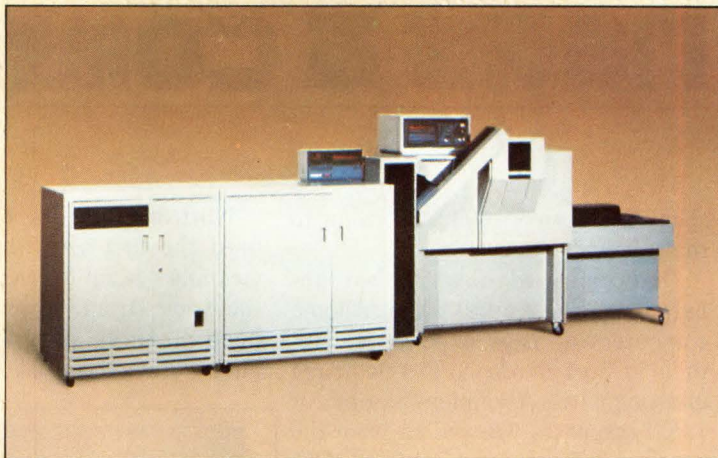
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news & comment

spent less than \$1,000, according to the survey.

Dial conducted the survey last January by asking readers who use home computers or have experience with them at work to respond to a two-page questionnaire. A random sample of 1,000 responses was pulled from the nearly 5,200 responses received. Out of the random selection 72 percent were men and 27 percent were women.

Hand truck-workstation for technicians

Your technicians servicing information-processing equipment in the field may find use for the K117 Instrument Shuttle, a plastic hand truck for delicate electronic instruments. The device also folds into a stand that gives the technician easy access to tools, claims Tektronix, Beaverton, OR, the manufacturer. Instruments are strapped to the shuttle so that dials are accessible and screens visible without unloading the equipment. When locked into position, the shuttle maintains precise calibration settings, which can be a vital factor in some repair jobs, according to Tektronix.

The frame, made of Lexan FL1000 structural foam, can hold up to 120 pounds and its compact size (3 feet long by 1 ½ inches wide) allows it to squeeze into tight places. Also, Lexan FL1000 is nonconductive and will act as an insulator, the vendor claims. The product costs \$265.

Software cleans microcomputers

To prevent data loss and errors, the disk drives of heavily used personal computers should be cleaned at least once a week, suggests a spokesman for Nortronics, a Minneapolis-based maker of head-cleaning products.

Nortronics claims to have developed the first software-based head-cleaning system for the IBM PC and the Apple IIe and Apple II Plus. "The head-cleaning program takes the guesswork and confusion out of main-

taining the heads on a personal computer," says Edward Griffin, manager of the Recorder Care Division of Nortronics.

To use the Nortronics' kit, users insert a software disk in one drive and

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a cleaning diskette in the other. The software prompts users by flashing instructions on the video-display terminal, and automatically runs the read/write the disk-drive heads on an unused band of the cleaning diskette

for 30 seconds. At the end of the cycle, it shuts off the disk drive, and tells the user how many cycles are left on the cleaning diskette, the vendor claims. The software also tells the user when to throw away the cleaning diskette.

A second version of the head-cleaning software was introduced for the Atari 800 and 800 XL, and the Commodore 64. The Diskette Head Cleaning Kit, which includes two cleaning diskettes, a reuseable diskette jacket, head-cleaning spray, and instructions, retails for \$40. For information, call (612) 545-0401.

Laser printing on a desk-top

The Formwriter 2 from Computer Language Research Inc., Carrollton, TX, brings laser-printing to desk-tops for about \$5,000. Formwriter 2 is the newest component of the Sprinter line of electronic-forms systems. The systems, designed to meet the needs of forms-intensive businesses such as insurance, government, banking, finance, and manufacturing, replaces preprinted business forms with electronically generated equivalents stored on an IBM Personal Computer and compatibles. Formwriter 2 is compact enough to fit on a desk. It costs \$5,000.

Formwriter 2 lets a user simultaneously print the template of a business form and the information that completes it, the vendor claims. Instead of using four-part preprinted forms—a time-consuming, error-prone, and expensive process—a user electronically “paints” the image of the form onto a blank sheet of paper, according to CLR. Formwriter 2 prints eight pages a minute, and it can print regular text files generated by PCs running Lotus 1-2-3, Visicalc, and other popular packages under Version 2.0 of the PC-DOS operating system.

The Sprinter forms-management software that drives Formwriter 2 costs \$1,000. It provides a directory of the forms, fonts, logos, and signatures stored on the PC's disk. The system supports up to 125 different fonts, logos or signatures and 1,000 different forms. For information, call (214) 250-7003.



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CIRCLE 26



by Susan Foster Bryant, Microsystems Editor

PERSONAL COMPUTING

Freedom from the tyranny of canned software?

There's a new surge of activity in personal-computer software, but the spotlighted packages aren't what you might expect. They aren't new integrated packages, or more windowing packages. The latest craze is programs that let personal-computer users escape the tyranny of packaged software by writing their own.

These application, or program, generators actually let nontechnical users design their own software. The concept isn't new—the mainframe and minicomputer worlds have long used application generators to cut the cost of software development. The cost of the new micro program generators, of course, is much less than that of large-scale packages. Prices range from about \$50 to \$700. Now micro users can enjoy the same benefits—and frustrations—of automated program-generation tools.

Most microcomputer program generators are structured one of two ways. The user's work is guided by either plain-English questions or a menu of choices. Users answer the queries or pick items on the menu, and the software uses the information to design a custom-made program.

Applications programs written for a mass audience rarely give each user organization all the capabilities it needs. In many cases, features of canned programs are inconvenient or inappropriate for the way a particular organization executes a task. On the surface, software that lets micro users custom-tailor their programs sounds like a splendid idea: Why buy ready-to-wear clothing when you can easily and inexpensively design and make your own? The choice, however, isn't always that simple. Many managers, particularly those with programming experience, may

be able to put these products to good use. But for managers who think programming distracts from the real work of their staffs, the price of software freedom is too high.

Program generators for personal computers actually got off to a bad start. The first one announced was *The Last One* from Blue Sky Software (\$495). According to the vendor, the program was the only solution (the last one) organizations would ever need. When *The Last One* finally appeared a year after the announcement, nontechnical users found it difficult and time consuming to use.

Ease of use remains the biggest complaint about micro program generators. Many employees don't have the time to learn to use these tools, and many companies have better things for their employees to do during work hours. Indeed, employees can consume as much time learning to use a programming tool as they save designing custom applications. The result can be no savings or a net loss of productivity.

In the meantime, other software houses are offering program generators they claim are easy to use and inexpensive. Most can create only database applications, although some will generate graphics, process text, and perform spreadsheet analysis as well.

Program generators for personal computers work best for applications that will be widely distributed. Probably the best known program generator for personal computers is Quickcode from Fox and Geller. Quickcode (\$295) is designed for use with dBase II and dBase III, micro

(Continued on page 46)



The Logical Natural Language, running here on a Logical Business Machines L-XT micro, describes functions and data in plain English. The vendor also offers a version for the IBM Personal Computer.

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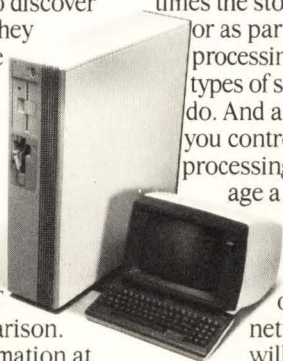
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from 40 million characters to 214 million. Translated, that means it will hold anywhere from 13,000 to 71,000 pages of text (it's not for short story writers) or from 260,000 to 1,420,000 names and addresses (you'd better have plenty of friends).

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PERSONAL COMPUTING

(Continued from page 42)

database management systems (DBMSs) from Ashton-Tate, Culver City, CA.

Quickcode allows users to quickly set up screen designs by typing in the names of fields where they should appear in a particular layout. These instructions are then locked into place. The program also offers several special features. It validates data entry and offers database keys to retrieve information instantly.

For those with a bit more programming experience, Greenleaf Software offers The Greenleaf Functions, with a library of more than 200 routines for the IBM PC and hard-disk XT, and source code in C and assembler. This software lets a user learn the complexities of C—pointers, structures, unions, and style. All the capabilities and routines of BIOS and DOS are available in at least one C function. If a dedicated function doesn't take care

of a special task, the software shows you how to build one that does.

For organizations with a commitment to Cobol programming, Screen.Cob 2, a screen generator from Remrol Computer Services, might be worthwhile. You'll need IBM PC Cobol from Microsoft, Bellevue, WA, to use it. This program generates code for four Cobol files: input screen (entry), output screen (display), edit module, and record declaration, and the code always conforms to Cobol specifications. Screen.Cob 2 (\$50) promises to save hours of time that would have been spent on code entry.

Another alternative is a DBMS with integrated program-generation capabilities. Because a DBMS often plays an important role in automated applications development, buying one that includes program-generation capabilities often makes good sense. For example, both dBase II and

Ashton-Tate's new DBMS, dBase III, include the dBase programming language, which allows users to design their own programs.

Software has always been written in computer languages like Cobol, Basic, or Fortran, which express the algorithms and data structures that computers understand. To the average user, however, learning these languages is like trying to master ancient Greek. For managers and users who shy away from learning computer languages, several products offer so-called natural languages that sidestep the language issue.

One of the natural-language products that's been around for awhile employs a different approach. Logical Natural Language from Logical Business Machines was previously available only on the vendor's integrated hardware and software systems. Recently, L-PC/S, a \$1,190 version for the IBM Personal Comput-

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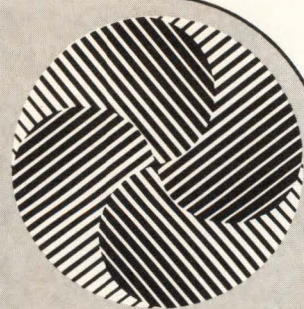
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er, was introduced.

Logical Natural Language lets a user quickly develop business applications using everyday nouns and verbs rather than the lexicon of programming. The package includes a disk and an add-on board containing up to 256,000 bytes of random-access memory (RAM), a calendar clock, additional serial and parallel ports, a print spooler, and a RAM disk emulator.

The language was introduced in 1974 with the vendor's first small computer to allow users to generate data-entry screens and reports and create and manipulate data files. It uses verbs to describe functions—like creating and indexing files, manipulating data, and answering prompts—and nouns to describe data. A standard 46-verb vocabulary can be expanded module by module, allowing the language to grow in building-block fashion.

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Circle 667

Compared to Basic variables, which are often one- or two-character abbreviations for words, Logical Natural Language's verbs can extend up to 24 characters in length, including spaces. Logical claims this characteristic helps make the language easy to read, maintain, and modify.

Allowing employees to generate their own programs may not be your

cup of tea, no matter which tool they use. If your organization needs custom personal-computer programs, the natural-language products probably bear looking into. But before you commit your organization to any product, ask for a detailed demonstration, and then decide if the freedom from software tyranny is worth the cost. □

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Perfecting what you have

We can be forgiven, in these days of exciting technological developments, for directing much of our attention toward the future. Technical solutions to many information-handling difficulties loom tantalizingly near. Managers must be ready to implement them, or else risk missing a chance. Besides, it's much more stimulating to build for tomorrow than to poke around in the present, shoring up existing programs.

The lure of the future, however,

should not obscure opportunities for more immediate gains. With today's tools and techniques for assessing and enhancing data-processing operations, managers can move their organizations several steps forward by perfecting what they already have. Raising the performance of hardware, software, and personnel can save money and improve service. And working toward perfection can provide an intriguing professional and intellectual challenge. Indeed, some observers contend that refining today's

systems represents a new frontier in information technology.

"We're entering an era in which software and the functioning of machines are givens, not something we're going to create," says Nicholas Zvegintzov, secretary of Sigma, the Special Interest Group on Software Maintenance (a component of the Data Processing Management Association), and editor of its newsletter. "Now we have to learn what it is we've inherited."

Understanding the operations of complex systems is the first step to-

(Continued on page 56)

Disk, tape, and file management

Vendor	Package	Equipment	Price	Circle
Advanced Information Mgt. (617) 367-1612	CI/Analyzer	IBM and PCMs under OS and DOS	\$1,000	685
Cambridge Computer Assoc. (617) 868-1111	Zipsort-II	Any DEC PDP-11 under RSX-11M, RSX-11D, or 1AS	\$700	686
Cambridge Syst. (415) 941-4558	ASM2	IBM 360, 370, 30XX, and PCMs	\$19,500	687
Century Assoc. (205) 329-2663	Qwiksort	NCR Century from 50 to 350, 8200, and Criterion	\$1,000	688
CGA Software (201) 946-8900	MSM	IBM mainframes and PCMs under MVS, MVS-SE, MVS-SP, SVS, MVT, or XA	\$5,400/yr.	689
Clyde Digital Syst. (801) 224-5306	Calout	DEC PDP-11 under RSTS/E and VAX under VMS	\$1,500	690
Computer Assoc. Int'l. (516) 333-6700	CA-Dynam/Series	IBM 360 and up under DOS/VS(E), OS/MVS, or VSI	\$4,000 to \$15,000/3-yr. lease	691
Compuware (313) 540-0400	File-aid/SPF	IBM mainframes and PCMs under MVS or MVS/XA	\$7,200 to \$15,100	692
	File-aid/Batch	IBM mainframes and PCMs under OS	\$5,200 to \$10,800	
Corodale Inc. (617) 426-8780	System/Manager	IBM mainframes and PCMs under DOS/VS, DOS/VS(E), EDOS/VS, EDOS/VS(E), or DOS/MVT/VS(E)	\$4,000 to \$29,000	693
Duquesne Syst. (412) 323-2600	PMO	IBM mainframes under MVS or VS1	\$5,000 to \$12,000	694
	CPO		\$7,500	
	Quick-Fetch		\$9,000	



Computer Interruptus

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STRICTLY SOFTWARE

(Continued from page 48)

ward modifying and enhancing them. As Zvegintzov sees it, a new breed of analyst will evolve to unravel the complexities.

"Programmers have been translating human language into code that machines can act on," he says. "Soon we'll need professionals to translate the machine's activities into human language."

There are already tools for dissecting, analyzing, and improving both machine operations and code. There are some good, old-fashioned management techniques that will help managers make the most of what they have. And there's a brand-new programming technique, advocated by IBM's Harlan Mills, that may help

programmers boost productivity on brainpower alone. Let's look first at the software side.

A product from Computer Associ-

IBM's Harlan Mills says programmers may be able to boost their productivity on brainpower alone.

ates, CA-Optimizer, is designed to bring efficiency automatically to Cobol programs. Applications it optimized for one user, the Mellon Bank in Pittsburgh, required 15 to 20 per-

cent less processing time than the originals. The package also helps programmers analyze a program's execution and detect bugs. It will identify unused code and pinpoint which parts of a program use the most central-processing-unit (cpu) time, for example.

Creaky applications

Many of the aging applications that just creak along today suffer from unwieldy structures. Untying their knotty logic to straighten out a problem or insert an enhancement takes expensive time and rare patience. There are at least two ways to restructure Cobol programs without having to rewrite them significantly.

Catalyst, a service from Peat, Mar-

Disk, tape, and file management

Vendor	Package	Equipment	Price	Circle
Empact Software (404) 296-7771	Stop-X37	IBM mainframes under OS/MVS	\$5,000 to \$10,000	695
ESI (904) 224-5182	Basys Plus	Burroughs medium-scale systems	\$8,000 to \$13,000	696
Goal Systems Int'l. (614) 888-1755	Faver/XP	IBM 370 and up under OS/VS, DOS/VS, or DOS/VS(E)	\$3,080/DOS \$5,040/OS	697
Independent Computer Syst. (602) 944-9693	Toolbox	Honeywell DPS/6	\$9,000	698
Informatics General (818) 716-1616	Shrink/2	IBM and PCMs under OS/VS, OS, DOS/VS(E), or IMS	\$27,000	699
	Shrink/IMS		\$39,000	
	Shrink/DOS/VS(E)		\$10,000	
	Smart/DASD		\$10,000	
Innovation Data Processing (201) 777-1940	FDR	Any OS/VS & MVS System	\$4,500	700
	Compaktor		\$3,000	
	ABR		\$7,500	
Macro 4 (201) 895-4800	Boost	IBM mainframes and PCMs under DOS/VS or DOS/VS(E)	\$100/mo.	701
	VSAM-Tune		\$150/mo. to \$300/mo.	
Proto Syst. (415) 420-9579	D-M-Drive	DEC PDP-11 under RSX-11M	\$550	702
	Diskim		\$900	
Raxco (301) 258-2620	Rabbit-5	DEC VAX under VMS	\$4,000	703
Software Assistance (408) 930-9714	VServ	IBM mainframes under DOS or DOS/VS(E)	\$1,000	704
Softworks (301) 868-4221	VSAM I/O Plus	IBM mainframes and PCMs	\$12,500/OS	705
	VSAM Quick		\$3,750/OS	
	Index		\$3,000/DOS	

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terminal: defining and validating screens, files and logic. Testing and debugging a program. Running trial executions of the application and putting it into production.

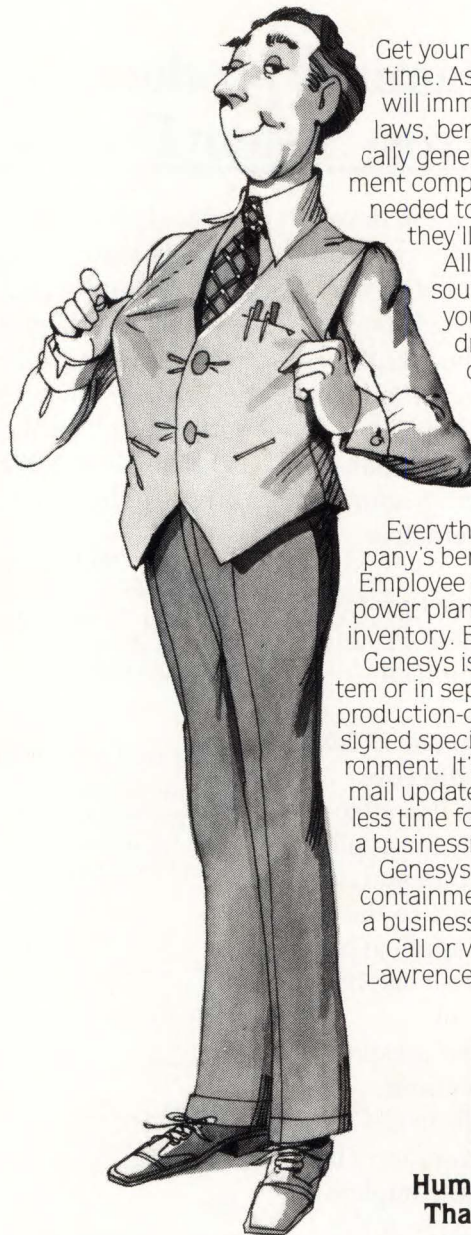
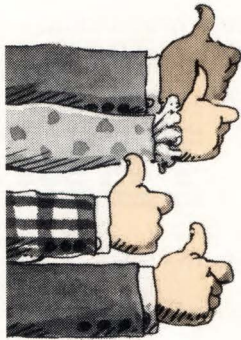
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**Human Resource Management
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(Continued from page 56)

wick, Mitchell & Co., will take the program away and bring it back structured. The cost ranges from \$1 to \$2 per line depending on the job's complexity.

Another method is Superstructure, a package from Group Operations Inc. Maintenance teams at The Equitable, the New York-based insurance and financial-services giant, recently began using the product to clean up some of the code they work on. The results, according to Florence Bell, a research consultant with the company's application productivity group, have been encouraging. But the degree of success, she says, depends on the application you're trying to fix.

"If the program is complex because the operation is complex, Superstruc-

ture won't help," she says. "If it's complex because it's unstructured, the product does a good job."

She notes that The Equitable's own tests found that the restructured output is "100 percent reliable." That is, the reworked program does exactly what it originally did. The company's experience also indicated that Superstructure works best on handwritten code.

Changing habits

The Equitable's maintenance teams have also had success using Scan/370, a related product from Group Operations, for analyzing and testing Cobol programs, Bell says. But some programmers use the product as a matter of course, while others em-

ploy it only rarely. According to Bell, the difference is mostly a matter of habit. ("It's much easier to find useful tools than it is to get people to use them," she says.)

Attention to the human element is also important in enhancing machine operations. There is plenty of automated help for examining a system's functioning and planning for changes. (See the two-part article on capacity management in this issue.) And there are software solutions for most of the problems the analyses uncover. The lists accompanying this column detail products for automatic job scheduling, file maintenance, and disk management.

Success stories abound: One large center reduces cpu time by 40 to 50

Disk, tape, and file management

Vendor	Package	Equipment	Price	Circle
Star (203) 529-7128	DADS	IBM mainframes under MVS/CICS	\$5,500 to \$7,500	706
Sterling Software Mktg. (916) 441-7234	DMS/OS	IBM 370, 303X, 43XX; all OS/VS Facom M Series	\$12,000 to \$27,000	707
	Comparex	IBM 370, 30XX, 43XX under DOS/VS(E), OS/VS, or VM/CMS; Fujitsu FacomF4	\$4,000/DOS \$3,000/OS \$4,000/VM/CMS	
Syncsort (201) 568-9700	Syncsort/OS	IBM mainframes and PCMs under OS, OS/VS, MVS/XA, MFT, MVT, VS1, or SVS	\$7,600/3-yr. lease	708
	Syncsort/DOS	Under OS/DOS or DOS/VS(E)	\$4,650/3-yr. lease	
	Syncsort/CMS	Under VM/SP, BSEPP, or SEPP	\$7,600/3-yr. lease	
	Syback	Under VM/SP, BSEPP, SEPP	\$9,000/3-yr. lease	
System Performance House (614) 764-1585	Dopter	Any RSTS/E system	\$750	709
	Single Disk Dopder		\$550	
Universal Software (203) 792-5100	ADAS	IBM 360, 370, 43XX under DOS/VS(E)	\$7,975	710
	PSAM		\$13,775	
University Computing (214) 353-7100	UCC-1	IBM mainframes and PCMs under OS	\$24,000	711
	UCC-1/VM Tape		\$9,500	
	UCC-3		\$17,000	
VM Software (703) 821-6886	VMBackup	IBM 370 or PCM under VM/SP	\$9,000	712
	VM Tape		\$9,000	

STRICTLY SOFTWARE

percent on batch applications with VIO Plus from Softworks Inc., which produces its savings primarily by allocating just the right amount of buffers. Another shop, at Sunmark Companies, a health-food processor in St. Louis, solves response-time problems by analyzing CICS activity with Omegamon from Candle Corp. and adjusting processing priorities to accommodate vital tasks during peak hours. The enhancement tools work. But they require human skills.

"Omegamon gives us carloads of information," says Tom Bennett, manager of technical services for Sunmark. "We're still learning what

we can do with it."

With most performance-evaluation and job-accounting packages, managers must cull useful information from a wealth of data. According to John Diesem, who works in the management-consulting practice of Touche Ross & Co., dp organizations can develop fundamental performance indicators by holding themselves to the same reporting criteria as any of the corporation's other production or service centers.

On the production side, a 200-page report on every item that flushes through a system is next to useless, Diesem contends. A dp center should

be able to summarize its major products on one page, just as a manufacturing division might do. Other key reports should list each major cpu's production, test, and idle time. On the service side, the dp manager should monitor the rerun rate, the morning backlog, and response time. Peak, rather than average, response time is the more important figure, he notes.

Using the performance-evaluation data to extract the most from a system is largely a matter of human resolve. An MVS system's multiprogramming level may drop below an expected six jobs at a time, for example. The

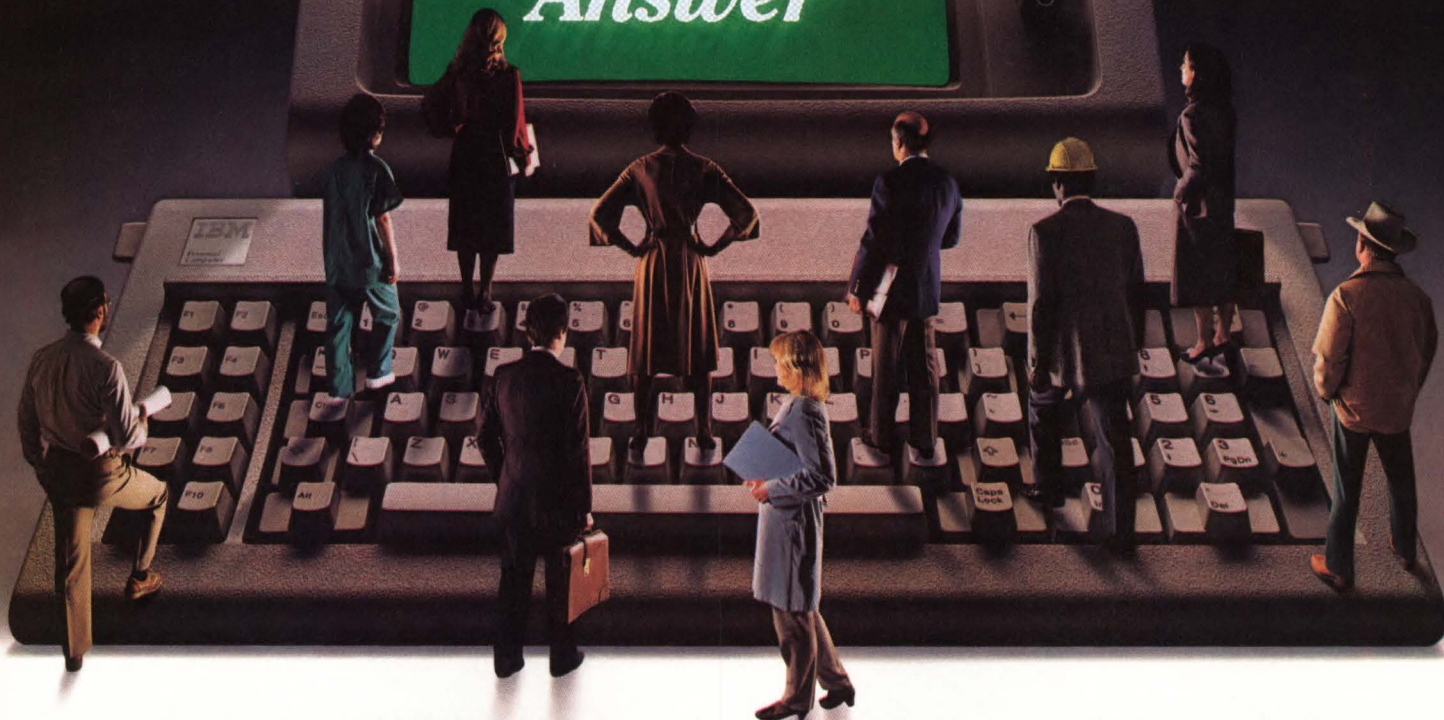
(Continued on page 64)

Data-center management, job scheduling

Vendor	Package	Equipment	Price	Circle
Cambridge Syst. Group (415) 941-4558	ADC 2	IBM 370, 30XX, and PCMs	\$42,000	713
ESI (904) 224-5182	Job Flow	Burroughs small and medium-scale systems	\$8,000 to \$15,000	714
	Job Flow Plus	Burroughs medium-scale systems	\$10,000 to \$18,000	
Goal Systems Int'l. (614) 888-1775	JCLMan/XP	IBM 370 and up under DOS/VS(E)	\$5,600	715
Greene Software (716) 924-4456	Queue/34	IBM System/34	\$295	716
	Queue/36	IBM System/36	\$295	
Help/38 Systems (612) 935-3311	Robot/38	IBM System/38	\$20/mo.	717
Macro 4 (201) 895-4800	Logout/Multilog	IBM mainframes and PCMs under DOS/VS, DOS/VS(E)	\$125/mo. to \$250/mo.	718
On-Line Business Syst. (415) 391-9555	OBS Prosper	IBM mainframes under MVS, VS1 SVS, or MVS/SP	\$20,000	719
Software Concepts (404) 659-1331	CSAR	IBM mainframes and PCMs under OS or DOS	\$34,500/OS	720
	Workflow		\$11,500/DOS \$12,000/OS \$7,500/DOS	
System Performance House (614) 265-7788	Dynpry	Any RSTS/E system	\$250	721
Triangle Software (408) 554-8121	Prodict	IBM mainframes and PCMs under OS/VS, MVS, or MVS/XA	\$8,750	722
University Computing (214) 353-7100	UCC-7	IBM mainframes and PCMs under OS	\$59,000	723
	UCC-11		\$19,000	
Value Computing (609) 482-2500	DCMS	IBM 370 and up and PCMs	\$64,000/MVS \$39,000/VS1 \$18,000/DOS \$44,500/non-IBM	724

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- **Selectivity** through dBASE/Answer's qualification logic ability. It allows end users to select and qualify the data they want—and you to deliver only the data they need.

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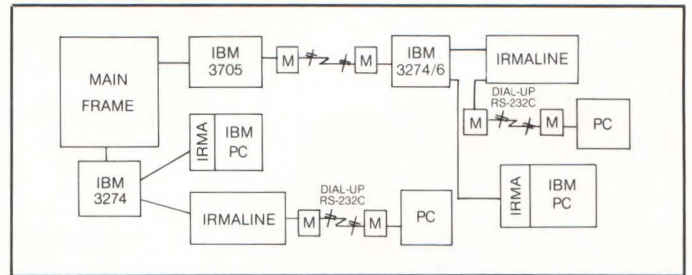
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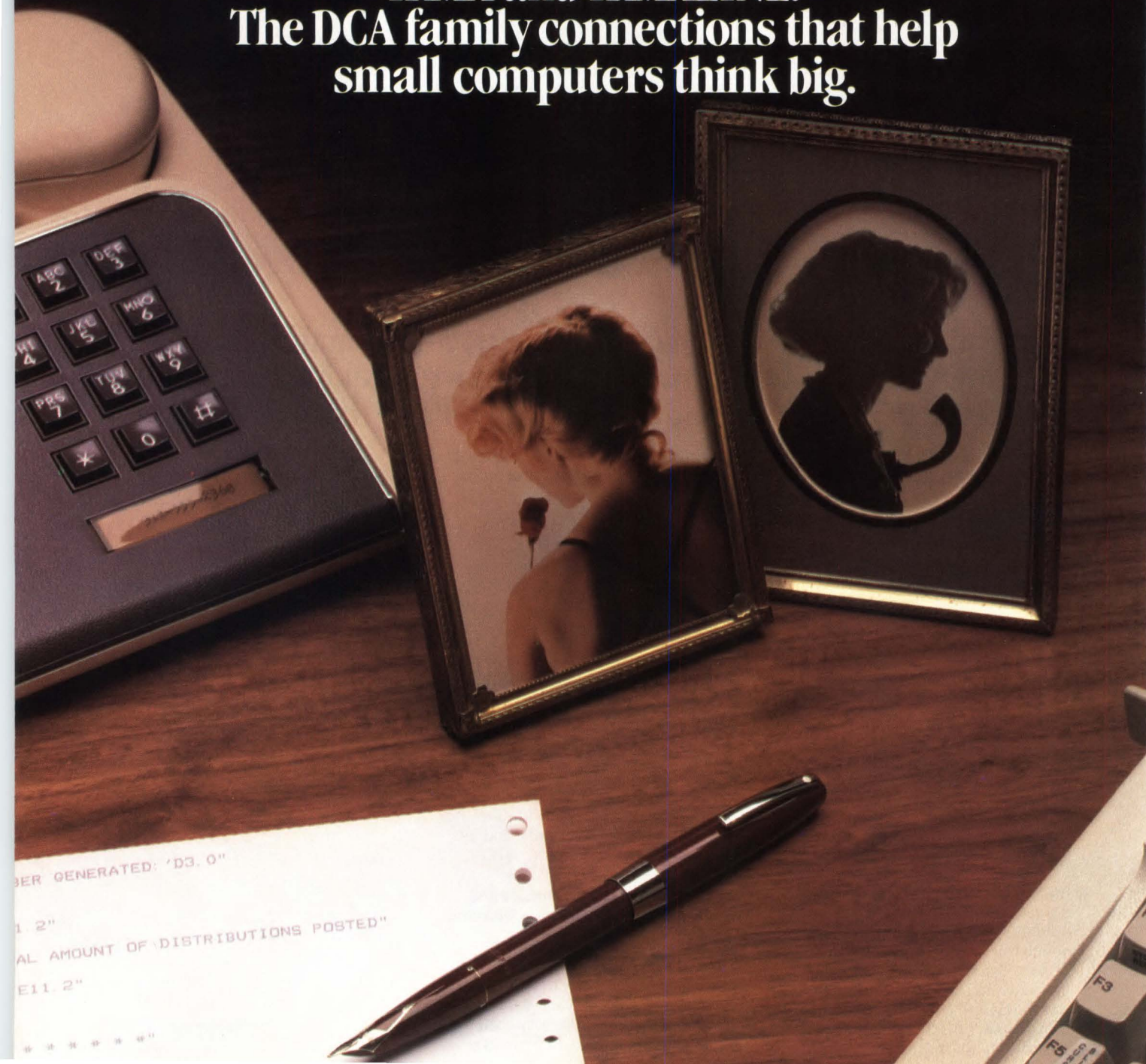
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STRICTLY SOFTWARE

(Continued from page 60)

solution may be in getting the tape library to stick to delivery schedules. The data center can help its own cause by holding firm to other commitments, too, perhaps with the help of performance data. When service levels for testing are guaranteed, for example, programmers and analysts will cooperate by using cpu time efficiently, Diesem says. Turnaround time for tests should depend on the resources used, he points out, perhaps ranging from 10 minutes for a no-tape, no-disk run to two hours for a two-tape test. But whatever the turnaround, if it's assured, it may even negate the need for online, interactive testing facilities, Diesem contends.

How does an organization know when the system it has, no matter how efficiently it runs, just isn't enough? It comes down to judgment. According to J. William Mullen, a management consultant with Peat, Marwick, Mit-

chell in Houston, some popular rules-of-thumb don't always apply. One such rule holds that 30 percent utilization is peak for direct-access storage devices (disk drives). But Mullen sees no problems with higher utilization, as long as it doesn't cause

"Soon we'll need professionals to translate the machine's activities into human language." *Zvegintzov, Sigma*

queuing. When the system's capacity has been determined and service demands are taxing it, Mullen says, management must decide how to allocate the available resources.

A data-processing asset with a largely overlooked potential for gain

is the human resource. At a recent IEEE conference on software engineering, IBM's Harlan Mills, a force behind the movement toward structured programming, argued that programmer productivity can increase on the strength of brainpower.

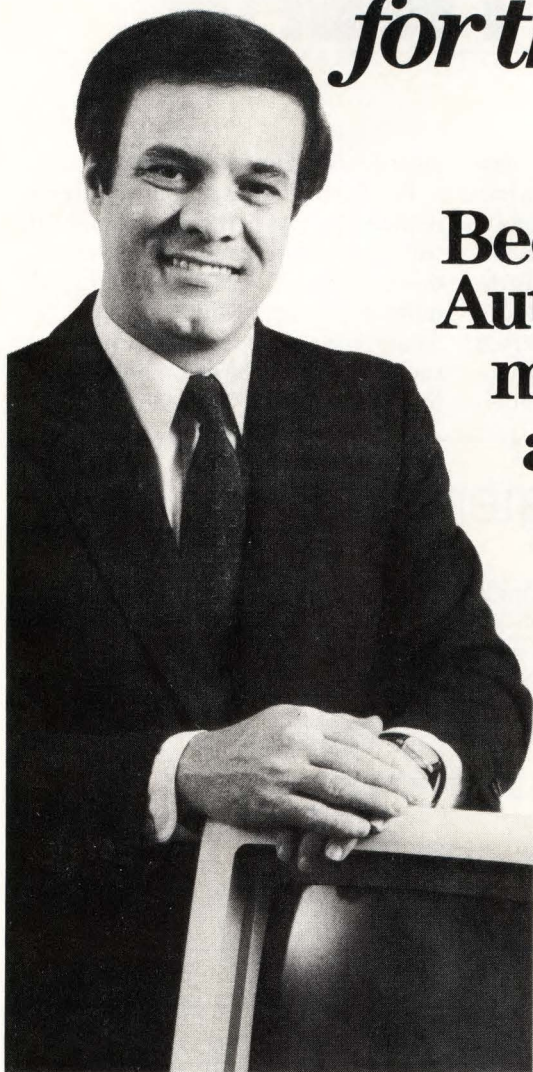
Mills advocated development of an approach he termed "structured programming II," which relegates arrays and pointers to a fate similar to that of the "goto" statement used in today's structured programming. Data are handled strictly through sets, stacks, and queues. This reduces the complexity of data spaces the way structured programming now reduces the complexity of control spaces. The resulting programs have fewer errors and they are verifiable mathematically via randomized testing. A 3,300-line program developed in an early trial of the approach, for example, underwent 120 randomized tests,

Program optimization

Vendor	Package	Equipment	Price	Circle
Cortex (617) 237-2304	Application Accelerator	VAX and PDP-11 series under VMS, RSX-11M, -11MT, or IAS	\$6,000 to \$15,000	725
Computer Assoc. Int'l. (516) 333-6700	CA-Optimizer	IBM 360 and up under DOS/VS(E), OS/MVS, or VS1	\$17,500/DOS \$42,500/OS	726
Compuware (313) 540-0400	Abend-Aid	IBM mainframes and PCMs under OS or DOS	\$6,800 to \$8,400/VSI \$7,900 to \$16,000/MVS	727
Group Operations (202) 887-5420	Superstructure Scan/370	IBM mainframes and PCMs	\$28,000 \$23,000	728
Macro 4 (201) 895-4800	Dumpmaster	IBM mainframes and PCMs under DOS/VS(E)	\$100/mo. to \$275/mo.	729
On-Line Software Int'l. (201) 592-0009	Intertest	Any system running CICS	\$24,000/OS \$20,000/DOS	730
Raxco (404) 955-2553	Rabbit-6	DEC VAX under VMS	\$4,000	731
Syncsort (201) 568-9700	Sydoc	IBM mainframes and PCMs under OS/VS, VSI, SVS, or MVS	\$18,750/ 3-yr. lease	732
Tower Software (213) 545-7073	Sleuth	HP 3000	\$1,500	733
Triangle Software (408) 554-8121	JCL Check	IBM mainframes and PCMs under OS/VS, MVS, MVS/XA, or VS/CMS	\$15,500	734

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**Frank L. Chisholm is Cullinet's Executive Vice President. Frank has worked closely with Cullinet users and prospective users for more than six years. As a key member of Cullinet's management team, Frank has contributed heavily to Cullinet's database product development strategy.*

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CIRCLE 36

STRICTLY SOFTWARE

Mills said. The first five uncovered 12 errors, the next 115 ran error-free.

Mills acknowledges that programmers "must think harder" to apply structured programming II. Giving up the seemingly powerful programming devices of arrays and pointers will seem unnatural to them. But Mills believes that with education and

direction they will take to the new technique. First, however, educators and managers may have to reevaluate their opinions of their charges' abilities. In the movement toward fifth-generation software-engineering tools, there is a tendency to undersell human potential. Predicting technological advances is easier than antici-

pating human improvements, he says.

He illustrates the point by referring to the early days of the automobile: "It was easy to foresee then the eventual development of a car that would go 60 miles per hour," Mills contends. "It would have been less obvious that such a car would be commonly driven by grandmothers." □

Console support, multiple-system facilities

Vendor	Package	Equipment	Price	Circle
CFS (617) 566-0222	Docs	IBM 370, 43XX, 30XX and PCMs under DOS/VS(E)	\$7,610	735
CGA Software Products Group (201) 946-8900	GCD	IBM mainframes and PCMs under MVS, MVS-SE, or MVS-SP	\$5,400/yr.	736
	Single Image Software	SVS, MVT, or XA	\$17,900/yr.	
Duquesne Syst. (412) 323-2600	STAM	IBM mainframes under MVS or VSI	\$10,000 to \$12,000	737
	SDSI		\$12,000 to \$15,000	
	SCON		\$7,000 to \$10,000	
Exact Syst. (914) 273-8100	Go	Data General systems	\$1,800 to \$63,000	738
Goal Systems Int'l. (614) 888-1775	Faqs/XP	IBM 370 and up under OS/VS or DOS/VS	\$4,760	739
Macro 4 (201) 895-4800	Tubes	IBM mainframes and PCMs under OS/VM	\$200/mo.	740
National Advanced Syst. (415) 962-6000	Extend/SP	IBM mainframes and PCMs under MVS or MVS/SP	\$5,000	741
Simware (613) 235-6736	Sim/Passthru	IBM mainframes under MVS or VM	\$7,500/yr.	742
Sterling Software Mktg. (916) 441-7234	Tracs	IBM 360 and up under OS or DOS	\$5,500/DOS \$8,000/OS	743
Wild Hare Computer Syst. (303) 494-0221	TSS	Data General Nova and Eclipse	\$5,900	744

Printer enhancements

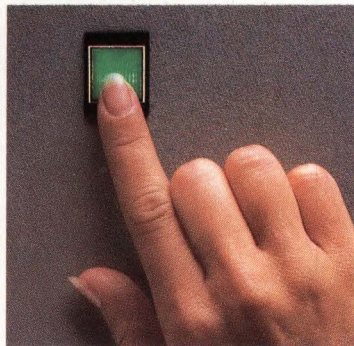
Vendor	Package	Equipment	Price	Circle
H & W Computer Syst. (208) 377-0336	CTOP	IBM 4300 and up under DOS, VS1, or MVS with CICS	\$3,000	745
Macro 4 (201) 895-4800	CICS Print	IBM mainframes and PCMs under DOS/VS(E)	\$185/mo. to \$225/mo.	746
Tone Software (714) 991-9460	ISP	Any IBM or PCM supporting VS1 or MVS RSTS/E	\$8,000	747
	TS-Print		\$8,000	

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by John Seaman, Data Communications Editor

DATA COMMUNICATIONS

Software helps build model networks

As the importance of data-communications networks to your organization grows, so do the potential expenses. Network managers are often caught between corporate forces pulling for better network service and those pushing for lower expenses. Network-modeling software can help you please both extremes, and make top management think of you as a hero, as well.

Modeling software can save thousands of dollars by rooting out bugs before network changes are implemented in connections, cable, and sweat. But these software packages are not panaceas, and the manager who fails to go about network modeling correctly or picks the wrong package will end up being a goat. The packages also raise organizational issues. Training can be a big additional expense, warns John M. McQuillan, a Cambridge, MA-based consultant. "It's not all that easy to use modeling software," he says.

Until recently, network designers had to rely entirely on experience and intuition when designing a new communications network or revising an existing scheme. Needless to say, intuition can be tricky: Sometimes it leads designers to spectacular results but other times it produces calamitous failures. Modeling software sets up mathematical prototypes of networks, letting designers predict a real system's behavior. Serious errors in system designs can be caught while they're still inexpensive to correct.

The packages available today have many uses. "They help determine how to route calls, how to topologically and geographically place circuits, how to

manage traffic, and how to select the type of line or facility that is best for your needs," says John E. Dulfer of Telecom Planning, a Melbourne Beach, FL-based consultancy.

Modeling packages automatically analyze the alternatives in a network, helping managers make the most cost-effective choices from start to finish. "For instance, a model might help you fix points of concentration in a multiple-star network [one of the most common layouts]," Dulfer explains. "Next, the model would find the shortest route between the stars in the network and analyze the performance of each link. Depending on each link's speed, the user can determine how many terminals can be accommodated. Finally, the software would determine which link architecture will minimize costs."

"We couldn't do it manually"

Household Finance Corp., Prospect Heights, IL, is revamping its network with the help of Network Design and Management Systems (NDMS) from the DMW Group. According to Denise Orlich, modeling is the only way to go.

The new network will replace Western Union telegraph connections between Household Finance's 1,200 branches. Building it is a massive job. "We're switching over to AT&T leased lines running at 4,800 bits per second [bps], with higher speeds for the trunks [up to 56,000 bps]," Orlich explains. "We're also adding 3,800 new terminals [for a total of 5,000]. All of our traffic is being rerouted through 12 hubs and our headquarters. We just couldn't manage all this

without automated support."

NDMS is based on the AT&T tariffs, an essential characteristic for Household Finance's project. Orlich isn't entirely satisfied with the package, however. NDMS, she notes, doesn't include online order-processing, administration, and circuit-change-billing capabilities. "We're mailing handwritten requests for circuit changes to AT&T, and there's too much of a chance for error," she says. "I'd like automatic verification of billing for circuit changes."

Contel Information Systems Inc., a consultancy and systems integrator, offers a similar large-scale system called Modular Interactive Network Designer (Mind), a timesharing product for centralized networks. Users of Mind can add Graphical Interactive Network Designer (Grinder) to model distributed networks. Both are available only via timesharing. Mind and Grinder are available together for an annual license fee of \$20,000; Mind is available separately for a \$9,000-per-year license fee.

Macro or micro?

If your organization can't cost-effectively deploy one of the macro options, it can still gain the benefits of network models. Modeling software for personal computers costs only about \$500. One such system is Opal II from Salt River Software. Opal II allows designers to simulate installed or planned multi-drop data-comm links using mathematical models.

Centerre Bank of St. Louis (over \$5 billion in assets), a holding company for 23 banks with 60 branches, uses Opal II for its network modeling. Cen-

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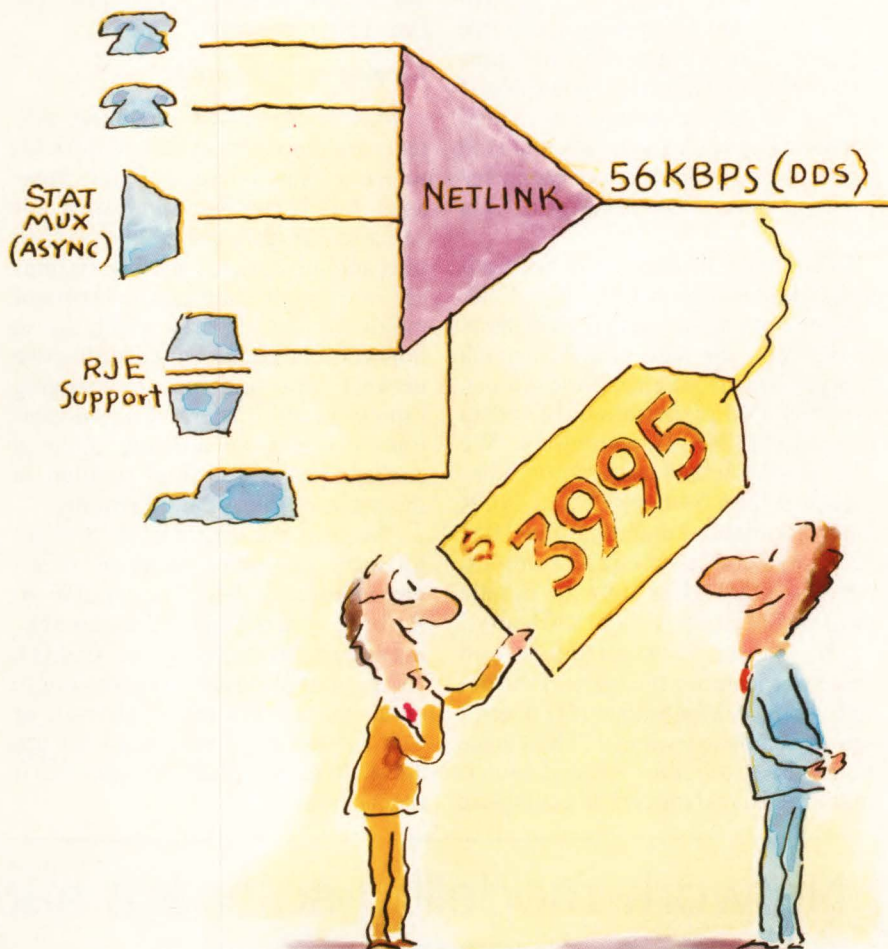
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DATA COMMUNICATIONS

terre has about 50 leased lines communicating at speeds of up to 14,400 bps in a network based on two IBM 3033s. Mainframe packages are much more powerful, but Opal II handles the bank's limited requirements at a much lower cost.

"We've had to handle rapid growth—we only had five leased lines five years ago," says Larry Allin, assistant vice president. Opal II is a valuable, if limited, tool to help complete manual designs. The bank acquired Opal II to assist a fairly inexperienced employee who was doing some redesigns, Allin recalls.

"Our main problem was accumulating data for the model," says Allin. "We're not an 'all-vanilla' IBM shop. If we were, the task would be much simpler. Our front ends, for example, are IBM 3705 processors and Tandem Computer TNS II computers. We also have Diebold automatic teller machines and Honeywell and NCR teller terminals emulating the IBM 3270 protocol. It's all quite complex, but the Opal II is able to handle local design issues without difficulty."

The choice between micro and macro depends on the scale of the design job, says McQuillan. (He doesn't sell modeling software.) "The choice is related to whether the end user is making a casual inquiry or a complete

redesign," he says.

Micro systems are much easier to use than the large alternatives, but they sacrifice power, says McQuillan. "They are for small networks or minor redesigns of large networks," he says. The largest network a micro package can handle comprises between 100 and 150 locations.

Keeping up with tariffs

Mainframe-based modeling systems are more expensive and difficult to learn than microcomputer packages, but they offer significant advantages. In this era of upheaval in telecommunications, the big systems are more up to date on the tariffs of major carriers. Tariffs, which are so important in laying out cost-effective network arrangements, are changing rapidly as the Federal Communications Commission and the common carriers jockey for final position in the wake of the AT&T breakup.

"Most of the tariffs used in micro software are either outdated or approximations at best," says David A. Rubin, president of network-management systems at Contel. "Micro-based systems require you to either update the tariffs yourself or wait for the supplier to send out updated diskettes. Most managers do it themselves."

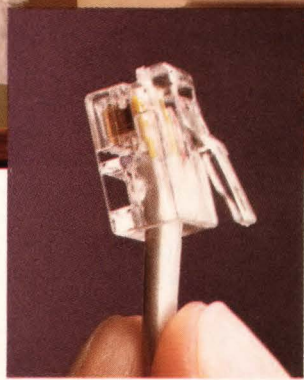
On the other hand, says Rubin, tariffs are continually updated in the Mind system. In fact, the changes are released prior to a tariff's effective date, giving managers a valuable head start on modifying strategies to reflect the changed tariffs. For example, the new AT&T communications tariff was available to Mind users for several months before the implementation date. "No micro software even addresses the new AT&T communications tariff, which is significantly changed compared to the prior tariff. Every micro package in existence will be obsolete on the day the new tariff takes effect."

Of course, that is just one vendor's opinion. Walter Nichols, president of Yes Computer Sciences Inc., parent of Salt River Software, believes tariff information isn't important to every user. "Many applications don't require tariff information," he says.

The experience of users with both macro and micro systems is illuminating. It shows that modeling software can answer real needs in laying out and maintaining today's sophisticated data-comm networks. Network modeling can play an important role in your organization by preventing expensive headaches as you expand to meet the challenges of tomorrow. □

Network-modeling software sampler

Vendor	Package	Requirements	Price	Circle
Aries Group (301) 963-7555	Odin	Timesharing service; access via any ASCII or EBCDIC dialup terminal	Price based on usage	680
Contel Information Syst. (516) 829-5900	Mind Grinder	IBM or DEC mainframes IBM or DEC mainframes (leased only with Mind)	\$9,000 (license) \$20,000 (license) for both	681
DMW Group (313) 971-5234	NDMS Networker	IBM mainframes Same systems	\$8,000 (license) \$20,000 to \$40,000 (license)	682
Salt River Software (617) 995-8519	Opal II	IBM PC	\$495	683
Telco Research (615) 383-2251	Micro Optimizer Network Architect	IBM PC; TRS-80 Model II IBM mainframes; Data General minis	\$1,000 \$38,000 to \$96,000	684



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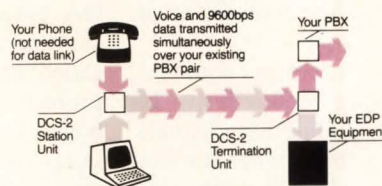
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OFFICE AUTOMATION

Office productivity can be measured

Some so-called experts expect the office of the future to "happen" without any need to define and measure office productivity. Others claim productivity can't be accurately measured anyway, so why try?

Some organizations—fortunately, few in number—take an industrial-engineering approach to the measurement of office productivity. They use time-and-motion studies or the statistical-counting approach to determine if productivity can be or has been increased. Too often, these methods reveal only how individuals carry out their tasks, not how their tasks contribute to their job objectives or to the enterprise. Even worse, the statistical-counting approach looks at only a small portion of what goes on in the office; the danger here is that larger numbers of memos, letters, and reports may be uncritically and unquestioningly identified as productivity gains, regardless of the usefulness of those documents.

Both of these points of view are wrong and possibly dangerous. We must have a concept of office productivity that supports management and facilitates planning, decision-making, execution, and control. We need a view that avoids counting and helps us concentrate on doing the right things as well as doing things right. I believe we can define office productivity in a way that recognizes that the office is the nerve center of the corporation.

Let's start with the basic equation for manufacturing productivity. In manufacturing, productivity equals output divided by input, where output is usually the number of items produced and input is the resources consumed in creating those items.

This simple formula can be applied to the office if output is defined not as

volume of paperwork, but as contribution to business performance and realization of corporate objectives. Input becomes the effort of office workers (managers, professionals, and support staff) multiplied by unit costs (labor, material, and allocated capital costs).

Office automation can increase office productivity (thus defined) by increasing the contribution of the office to business performance or realization of business objectives (output); by reducing effort (input); or both.

Next, we must be able to assess office productivity—and changes in it—to put the concept of office pro-

"We need to define office productivity in a way that helps us do the right things as well as do things right."

ductivity to work. To do so, we need to determine the impact of office automation on each element of the office-productivity equation. This is not at all easy, but it is possible.

For example, we utilize a proprietary methodology called Office Automation Methodology for Assessment and Planning. OA/MAP is both practical and successful and supports OA planning, implementation, and capture of benefits. It requires detailed assessments from managers, professionals, and support staff on how each office activity and its attributes contribute to their overall output or effort and how introduction of automated tools might raise productivity. OA/MAP helps depict for higher-level management how effective an organization is; how it might

be improved through changes; and how successful actual changes have been.

OA/MAP was applied earlier this year at the Department of Community Affairs of the State of New Jersey. The methodology has been applied so far as an initial step to gain a better understanding of needs and point to more effective ways to implement OA. James Alexander, the department's director of administration, reports: "The survey highlighted information about current conditions and needs which, in a sense, we might have known but had not focused on in a coherent fashion. There are clearly different approaches that can be taken to our situation, but the OA/MAP survey and the opportunities it revealed have contributed substantially to the development of a sense of purpose and approach.

This methodology is not fixed. It is frequently revised and improved. We find it can be applied to new needs. For example, when the Department of Community Affairs in New Jersey used it, the data were analyzed separately for five subordinate divisions. This helped to pinpoint specific needs, which differed widely among divisions. It also yielded some interesting comparisons within the department that had not previously been articulated.

So we learn as we gain experience with the technique. And we have proved that productivity can be measured in the office in ways that contribute to the objectives of the enterprise. □

Robert M. Dickinson is a partner at Performance Strategies Inc., a New York-based management-consulting firm. Previously, he founded the internal office-systems consulting group for Exxon.



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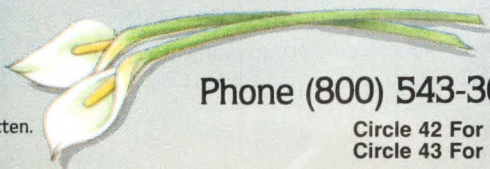
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FOLLOWING THE LEADERS

Where DEC is No. 1

AT&T's entry into the mini-computer business can be seen as a double threat to Digital Equipment Corp. Until recently one of DEC's leading markets, AT&T now possesses the resources to become a formidable competitor.

Is there cause for DEC to worry? I don't think so. The VAX line, DEC's premier minicomputers, still has substantial technical advantages over AT&T's recently announced 3B line. These advantages, plus DEC's impeccable reputation among its users, should make it very tough for AT&T to displace the VAX line—even in the telephone-operating companies that once called it Ma Bell. AT&T may have difficulty replacing its own VAX machines. Once a user has become accustomed to a particular machine, he or she is loath to change, and AT&T's employees are no exception to the rule.

The 3B line *appears* to closely resemble the VAX. Both offer Bell Lab's Unix operating system, which has won favor among programmers in DEC strongholds like scientific and educational fields. Yet the virtual-memory limitations of AT&T's Unix System V, the incompatibility between the machines in the 3B series, and the lack of supportive network architecture indicate that AT&T has a long way to go before it can match DEC's minis.

Another advantage enjoyed by DEC is the great number of VAX systems in use. DEC has recently finished shipping 25,000 of its VAXs, almost all of which run VAX/VMS. In contrast, IBM's competing VM/CMS system is run at an estimated 12,000 sites. As many as 70,000 sites run Unix, but there are



According to author Sonny Monosson, the VAX line, DEC's premier minicomputer, still has substantial advantages over AT&T's recently announced 3B line.

many variations, many of which run on micros. AT&T's Unix System V, the would-be standard, was only introduced last year.

IBM, AT&T, and DEC, which may someday be known as the Big Three in computers, are all competing for the same distributed-processing markets. Of course, their systems have fundamental differences. DEC's VAX/VMS is the strongest of the three because it's the only machine conceived, built, and maintained for interactive use in distributed processing.

VAX/VMS wasn't developed until 1975. Unix and VM/CMS are, respectively, six and eight years older.

Due to the time element, DEC had the benefit of learning from its competitors' mistakes. By 1975, DEC was firmly committed to an approach that supported the essential ingredient of distributed computing: multi-user, interactive timesharing that provides each user with the resources of a large computer.

DEC equipped the first VAX models with 32-bit addressing. DEC also integrated its DECnet networking architecture, and DEC lay the groundwork for ease of use, compatibility, integration, and communication capabilities—the bywords of distributed processing. VM/CMS and Unix did not incorporate these features until later.

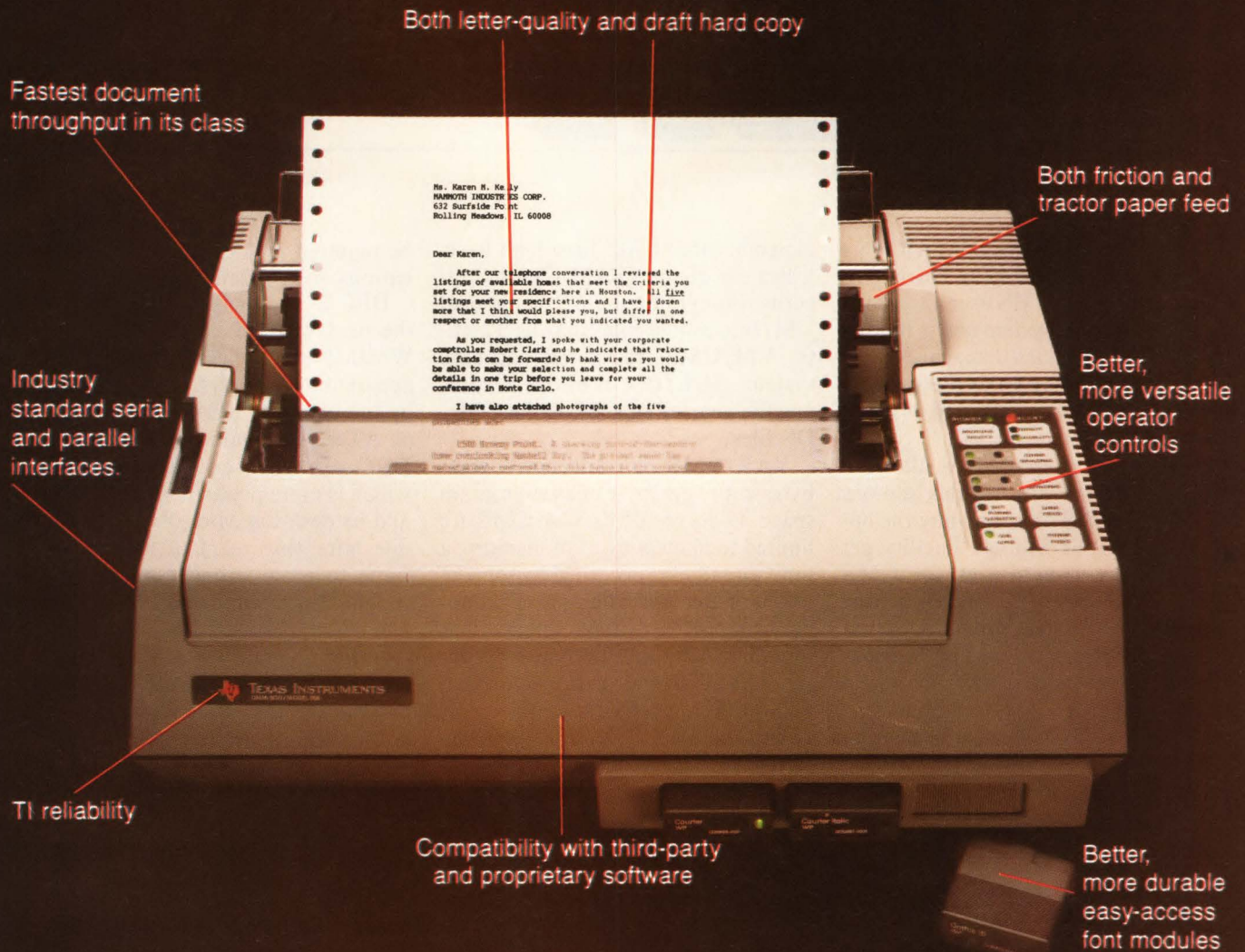
As a result, DEC defined many standards that have promoted an integrated, compatible approach to software. This has blossomed into benefits for both programmers and end users.

Win, place, show

Where does IBM rank in this lineup? VM/CMS has no built-in file- or record-sharing capabilities. File sharing is difficult because CMS originally was a single-user operating system.

VM/CMS arose from the merging of two systems. IBM's CP/40 virtual-memory system (CP for control program) was developed to compare other operating systems by running them as guests. The system relied on "virtual machine" segments of the control program (the VM in VM/CMS)—one for each guest.

In 1967, IBM merged CP/40 with the Cambridge Monitor System (CMS), simultaneously translating CMS into a multi-user system. That is, the users' CMS systems took the place of the guest operating systems. This arrangement contrasts sharply



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with VAX/VMS, under which users can effectively operate the entire computer. The VM/CMS user has a copy of the operating system and is limited to his or her assigned disk space on the system. This affects the file sharing, hardware requirements, and usage of the IBM system.

IBM has attempted to alleviate these restraints with various add-ons to VM/CMS. Users who buy the optional VM File Storage Facility get file-sharing capabilities for CMS files. A separate virtual machine stores a copy of the shared file so that another user can access and manipulate it. Users can't, however, edit and update the same copy simultaneously, and there is no locking or sharing at the record level.

VSAM, an optional file-management system, provides the key-access

capability that CMS files don't have. Users can share VSAM files and records through the use of the optional VM/Interactive File Sharing Facility. VM/CMS' relational database system, SQL/DS, provides record- and file-sharing capabilities for SQL/DS files.

VAX/VMS can address 4 gigabytes with 1 gigabyte of user-program space. Users of IBM's VM/CMS are limited to 16 megabytes of memory, a limit already far exceeded by some of the computer-aided design and manufacturing (CAD/CAM) applications for which VAX has become so popular. The AT&T system has a maximum of 12 megabytes.

DEC created VAX/VMS for long-term use. The architecture will accommodate future applications, such as the vast memory resources that will

be required with the advent of applications in artificial intelligence.

DEC is well-poised for success in the next wave of computer growth. Whether its strengths become more apparent to new users, or are obscured by the power of IBM—and perhaps, of AT&T—remains to be seen. If DEC can push ahead with VAX, which is more powerful than the 785, and its desk-top MicroVAX II (both due later this year), it should continue to grow stronger, reaffirming its No. 2 position behind IBM. □

Adolf R. "Sonny" Monosson is chairman of American Computer Group and publisher of Monosson on DEC, a monthly newsletter for users of DEC equipment. For information on subscribing to the newsletter, call (617) 437-1100.

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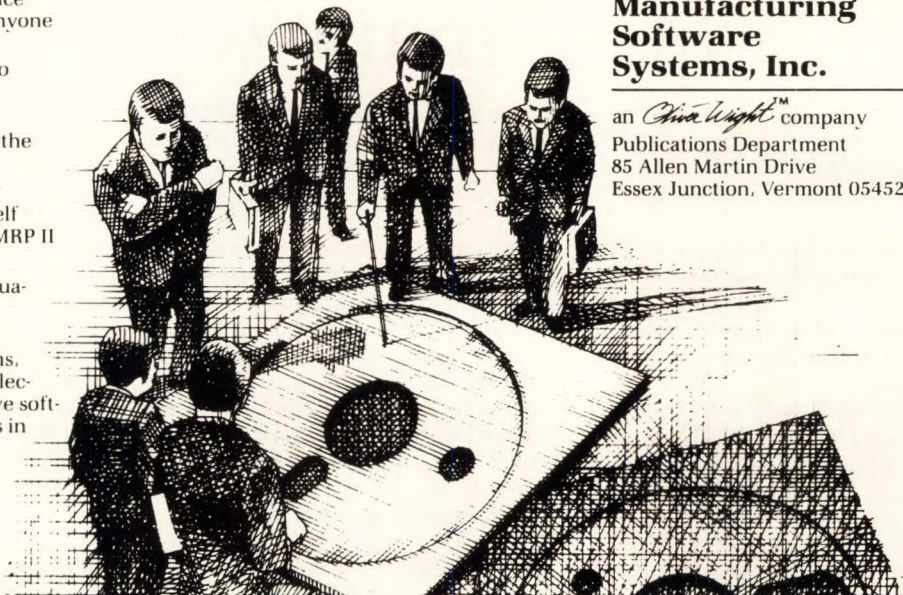
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Outstanding Data Center

About 800 cities with a population of over nine million would be "left in the dark" if not for Southern California Edison Co. This public utility provides electrical power for a 50,000 square mile region in central and southern California.

"For any utility, the largest use of its computers is dedicated to customer billing and accounting," says Jack VanPadden, manager of data processing. Southern California Edison has 3.3 million rate-payers, who are billed monthly. The utility accepts data from a meter to generate a bill for each account. The data center receives 160,000 metering documents daily, which are transformed into bills and mailed out. Material management is another major

Southern California Edison's main headquarters is located in Rosemead. The data center (above) was built in 1974 by Turner Construction, New York. G.P.R.A., an engineering firm in Anaheim, CA, designed the center. The center employs 600 people, 450 of whom are professionals. Rows of IBM 3350 disk drives (right) will soon be replaced by the newer, more commodious IBM 3380s located to the left. One 3380 disk drive has the capacity to handle as much information as four of the older models. The new 3380s take up 60 percent less space than the old drives.

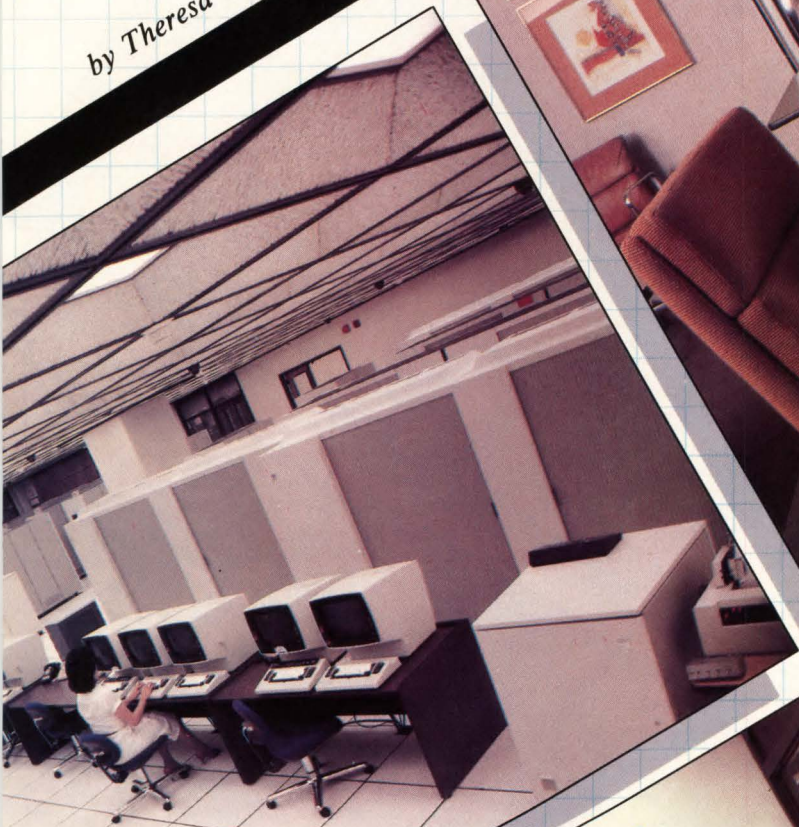


by Theresa Conlon, Staff Writer

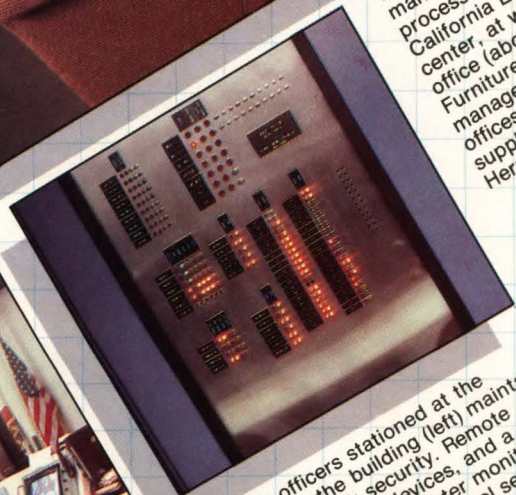
Photos by Pierre Kopp



Jack VanPaddenburg, manager of data processing at Southern California Edison's data center, at work in his office (above). Furniture for management offices was supplied by Herman Miller.



The data center (above) is equipped with two IBM 3084 mainframes and an IBM 3081. Almost all the equipment was made by IBM. Operators rarely need to sit at the master console because the equipment is monitored in the control center.



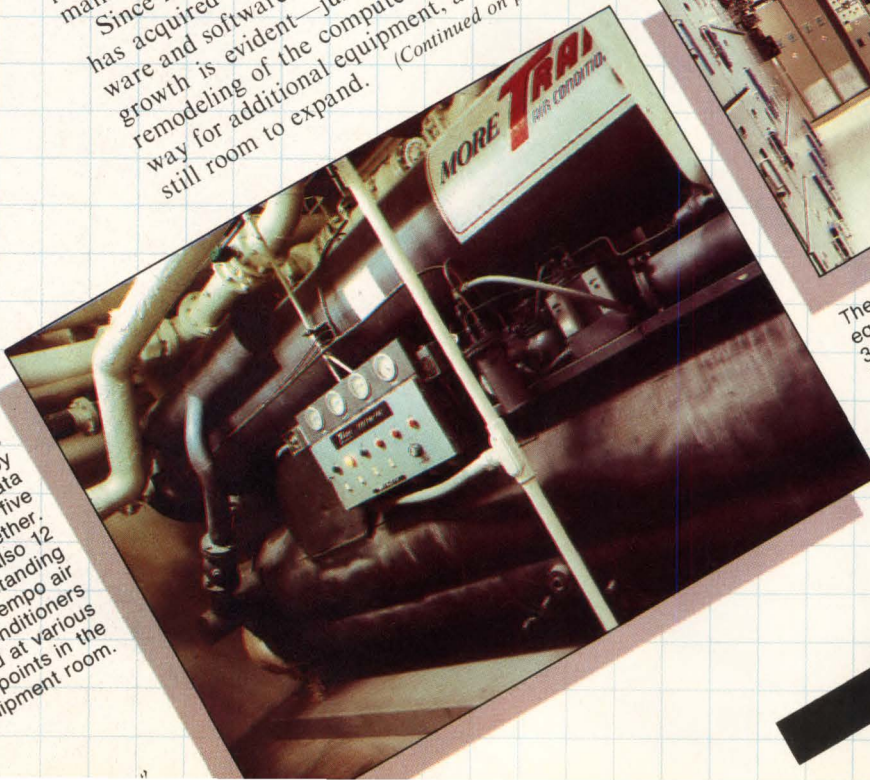
Security officers stationed at the entrance to the building (left) maintain round-the-clock security. Remote cameras, sensing devices, and a process-control computer monitor all activity. The August Control security and fire-control system (above), can sense if the chiller is down, automatically turning on a spare chiller.



Outstanding Data Center

(Continued from page 81)
function of the data-processing department. The utility has a \$100 million inventory of construction materials and spare parts. The dp department helps control this huge stockpile of resources. The data center also does all corporate accounting and operates the personnel and payroll systems. VanPaddenburg explains, "About a million times a day, one of our 16,000 employees enters a business transaction located anywhere one of the 3,500 terminals processed by one of the two IBM 3084 mainframes located in the data center. Since its completion in 1974, the center has acquired the state-of-the-art in hardware and software. The center's continued growth is evident—just recently a major remodeling of the computer facility made way for additional equipment, and there is still room to expand." (Continued on page 84)

The building is centrally air conditioned with chillers manufactured by York. The data center has five chillers altogether. There are also 12 free-standing Contempo air conditioners located at various points in the equipment room.



The 415Hz power-converter equipment that powers the two IBM 3084 mainframes, and one IBM 3081, is supplied by Avtel units. The data center is equipped with a pair of motor generators supplied by Atlas Energy Systems to protect the 60 cycle power against transients of up to 10 cycles in duration.

John Fielder, manager of services, studies a data-center status report (above). Southern California Edison has experienced tremendous growth in online systems the past several years.



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Outstanding Data Center

Continued from page 82

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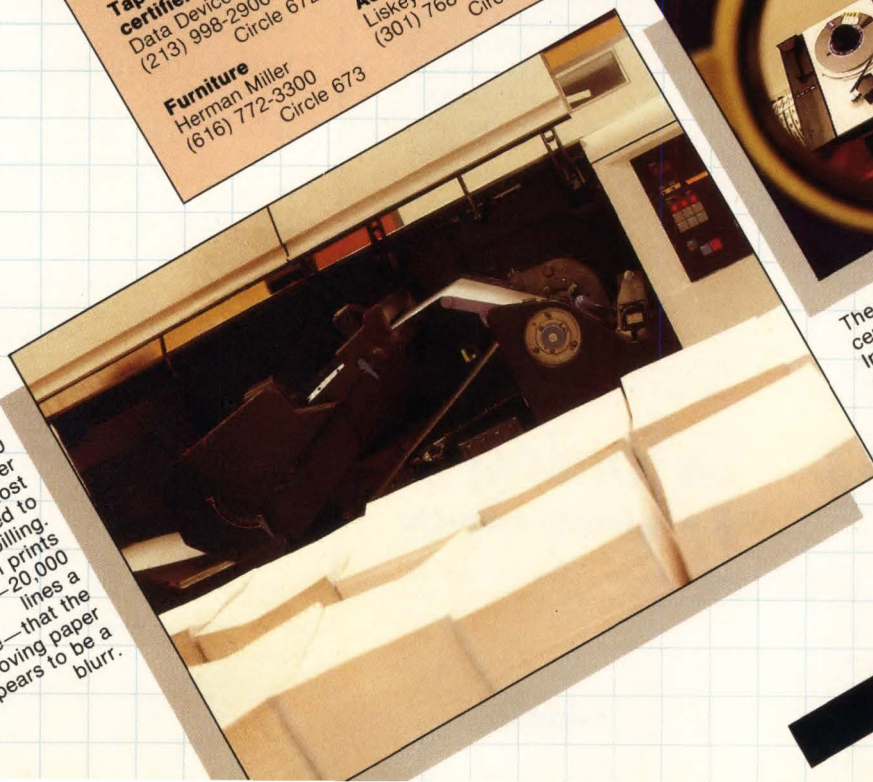


The network-control center services the communications network. There are 300 telephone lines that provide connections for 3,500 terminals throughout the utility's service territory. It provides non-stop services.

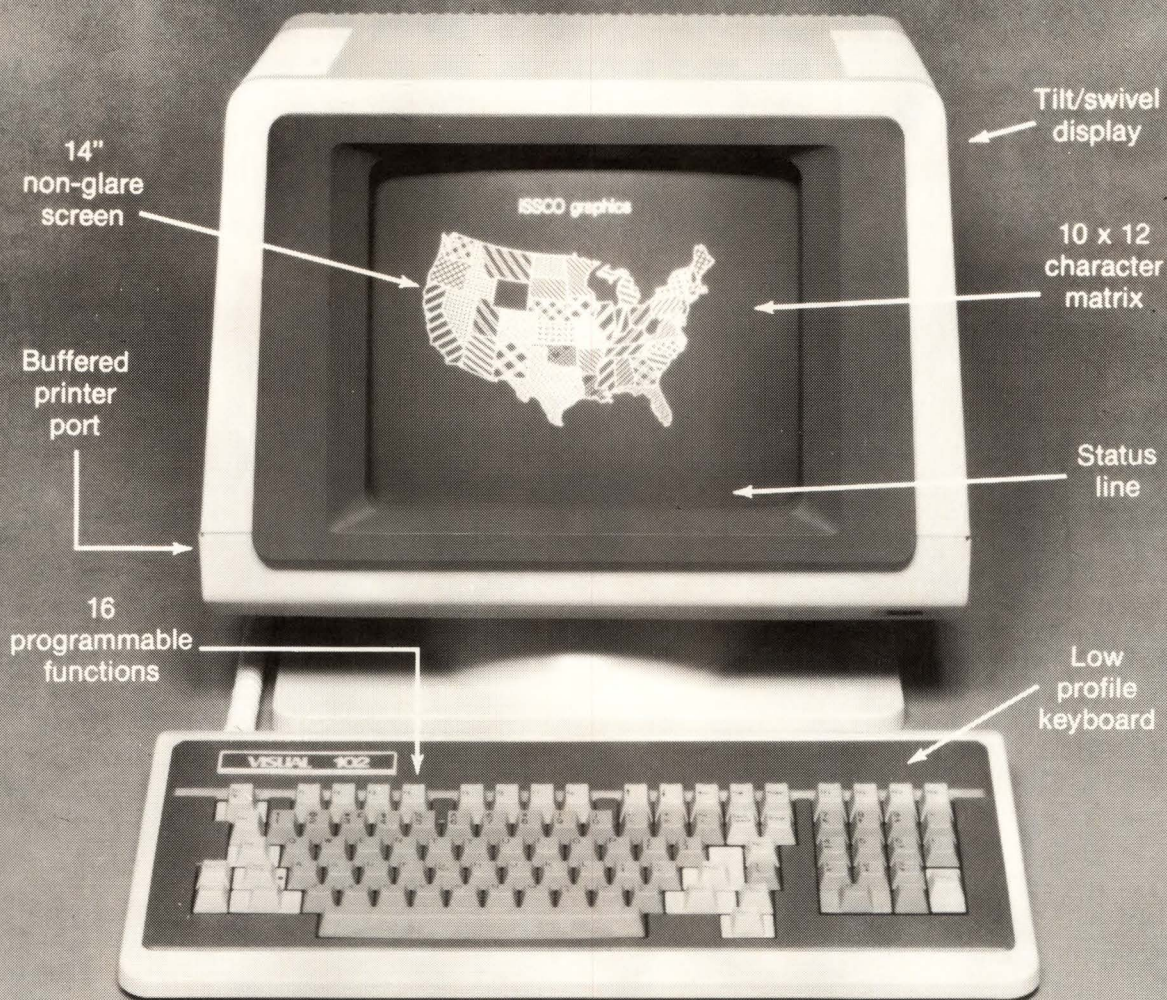


The Analyzer, a tape cleaner and certifier supplied by Data Devices International, carefully checks for any defects on magnetic tape before storing data on them.

Four IBM 3800 printing subsystems print out roughly 2,000 miles of paper every month, most of it related to customer billing. The system prints so fast—20,000 lines a minute—that the moving paper appears to be a blur.



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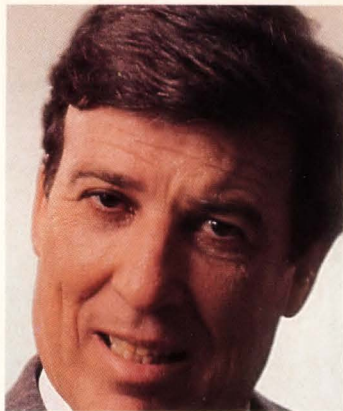
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THE TRAUMA OF PROMOTION: HIGH ANXIETY

by Mary Miles, New England Editor



You've just been offered that long-awaited promotion. Here's how to make the transition wisely, confidently, and with the least amount of anxiety.



It's 3 a.m. and you're wide awake. Once again, you recall the meeting that took place yesterday between you and your boss: "We've been watching you closely for some time. You're doing a fine job. . . . Tom Smith is retiring in a month, and we'd like you to take over his position as department manager. Let me know by next Monday if you'll accept."

It's the moment you've been waiting for. You think to yourself, "Wait'll I tell my family! Now we can afford that new car. Department manager—what a break!" You're on Cloud 9.

Once home, you tell your family the good news. Your thoughts are centered on all the gains associated with this promotion—career advancement, emotional satisfaction, recognition, more money. "Then why can't I fall asleep?" you ask yourself as you toss and turn the night away. "How come my stomach hurts and my muscles feel tight as a drum?"

"I've seen promotion do a lot of things to people," says Dave Johnston (pseudonym), a purchasing manager for a central Massachusetts industrial-valve manufacturer. "Everyone, from the sweeper to the CEO, has some anxiety about doing a new job well. No matter how long a person has been with the company, or how well he or she knows the product and the people, there's always a gnawing little voice that whispers, 'What if I blow it?' If you've got a head on your shoulders, it's likely you'll do OK, but I've seen people quit, have nervous breakdowns, turn to booze or drugs, or beg for their old position back, when the anxiety gets out of hand."

Some people embrace a promotion with gusto, successfully overcoming the initial feelings of anxiety while adjusting to their new responsibilities.

(Continued on page 90)

High Anxiety

(Continued from page 89)

Others suffer various levels of self-doubt, fear, and—sometimes—downright terror. Needless to say, when promotion becomes traumatic—a painful, emotional ordeal—job performance is likely to be seriously hampered. But is there any way to avoid becoming a victim of your own fears and apprehension?

Going up?

There's a good chance you'll have to address this question sooner or later. With the recent upswing in the economy, organizations are now thinking growth, expansion, and change. In some industries, a strong boom is already in progress. That's why business has picked up at employment and search firms. Managers who have been biding their time are now looking around, polishing up their resumes, eyeing the next rung on the career ladder with renewed interest.

All this movement increases the likelihood that you, too, will be changing jobs. Positions will be opening up; new slots will be created. If you're talented, lucky, ready, and capable, you may be on your way up. But will you merely be swept along, like the proverbial "leaf that's caught in the tide," or will your career strategy enable you to handle change with a maximum of equanimity and a minimum of trauma?

Madeline Klein, president of M.I. Klein, a Scarsdale, NY, consultancy, is a frequent seminar leader for the American Management Association on the topic of "Management Skills and Techniques for New First-Line Supervisors." She notes that "the higher you go up the ladder, the more risks you'll have to take. If you stay where you are, you risk being safe, secure—and bored. But if you plunge into a new job, you risk failure." How comfortable a person is with risk-taking will be an important factor in determining where he or she will be on the trauma spectrum, which ranges from a mild case of angst to outright terror.

In addition to the ability to take risks, there are many other factors that will affect the way you handle a



Rosalind Forbes, president of Forbes Associates, says the newly promoted should give themselves a break when they've worked especially hard.

promotion. One of these is your ability to perform. According to Roy W. Walters, whose personnel consultancy in Mahwah, NJ, specializes in addressing morale and productivity problems, "An employee may have mastered his or her particular field but, when offered a promotion, the person is being asked to take on responsibilities not yet mastered. This is why there is a fear of the unknown." It's clear that your ability to learn and do the new job, as well as your confidence in how well and how quickly you can achieve field mastery, will affect the emotions with which you regard your promotion.

Self-confidence is a highly personalized character trait. You may start out fairly self-assured, only to find your confidence eroded as a result of the "lonely-at-the-top" syndrome. (This syndrome occurs when you lose the support of previous peer relationships.) Once promoted, you're no longer considered "one of the gang." In fact, you may be called upon to lead that old gang.

You will have to walk a fine line of objectivity: You can't play favorites; you can't really be your old self; and, worst of all, your old chums may resent your new status—or even doubt your ability to handle it. Your authority and credibility will be under fire and will be hard-won, if won at all. All of these factors create stress that you have never experienced before, plus a sense of alienation that can easily sap your determination to feel and be worthy of your new job.

Boning up

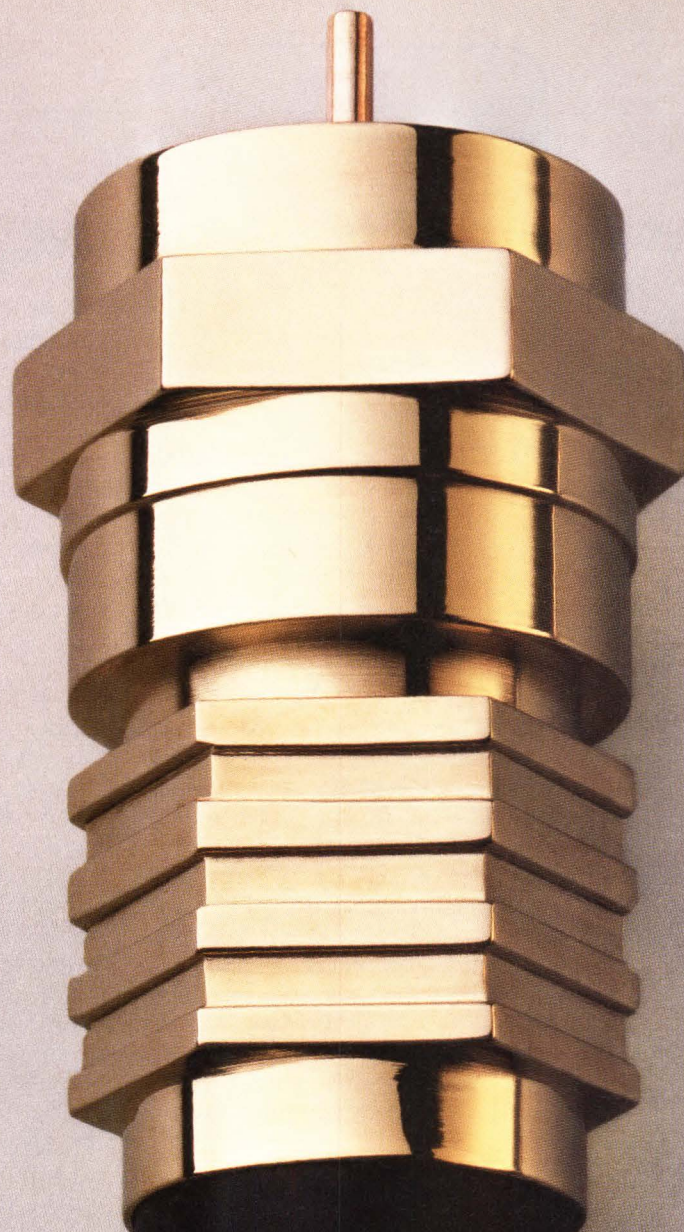
When your boss first broaches the subject of your promotion, there are two questions you should ask yourself: "Why is this promotion being offered to me?" and "Will it take me where I want to go?"

Al Viaggio (pseudonym), a veteran employee of a medium-sized marine-equipment manufacturer in the northeast, didn't ask himself these essential questions—or if he did, he didn't pay close attention to the answers. As a result, Viaggio bought himself some real problems along with his raise.

Viaggio explains: "I'm living proof that corporations don't necessarily follow careful, deliberate promotion policies," he says. "My promotion came at a time when a third of the workforce was being laid off. I guess the company didn't want to lose me because I've been there since it began 26 years ago. I was loyal during its first years of struggle.

"My old job involved a lot of travel, which I loved. And I knew all our overseas customers," he continues. "But I was so worried I'd be laid off during the recession that I grabbed my 'promotion,' breathing a sigh of relief that my job, pension plan, and medical benefits would be intact. I sat down at a big, disorganized desk and hardly got up from it for 14 months.

"The trouble was," says Viaggio, "I didn't really want the promotion. I had always worked very hard, and felt I was an effective part of the company. But the promotion nearly killed me with anxiety and a different



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High Anxiety

(Continued from page 90)

kind of overwork than I was used to. My subordinates at the main office, where I was made head of sales, hated me because I'd come out of nowhere to be their boss. The manager who reported to me was totally inept. And I hardly ever saw my family or friends."

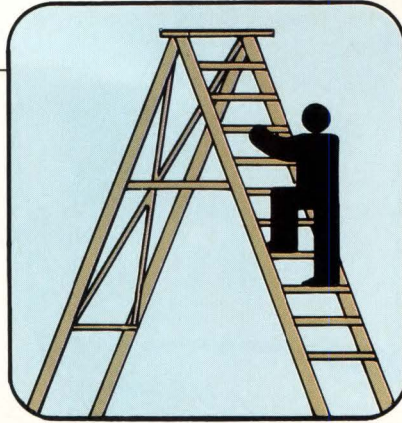
Viaggio's promotion was given for all the wrong reasons: because the "logical" in-house person couldn't hack it; because Al was a loyal, if relatively unsung, successful, long-time employee; because the company may have feared he would take his knowledge of overseas clientele to another company.

What were the results of this error in judgment? "Today, half of my associates think I'm a brave S.O.B.," says Viaggio, "and the other half think I've lost my marbles because I decided to resign. Now, I've got an iffy job as a travel consultant, but at least I won't die of a coronary at my desk!"

What are some of the *right* reasons



Helen McLane of Heidrick & Struggles believes that "when people are unwilling to assume the risks of a bigger challenge, they may find that they have incurred the biggest risk of all—reducing their own marketability."



people get promoted? At first blush, they would seem obvious: ability, skill at handling people, unusual promise. According to *The First-Time Manager: A Practical Guide to the Management of People*, by Loren B. Belker (Amacom, 1978), "In most organizations, you're not chosen for a managerial position because of your technical knowledge. You're chosen because someone has seen the spark of leadership in you." Even so, says the author, too many companies "don't go through a very long process in choosing those who are to be moved into managerial positions. Often the judgment is based solely on how well the person is performing in the currently assigned task. The best performer doesn't always make the best manager, although many companies still make the choice on that basis."

In the case of Dave Johnston, the New England purchasing manager, promotion arrived somewhat indirectly. "I took a job with my present company knowing it was somewhat of a backward step, but reasonably confident I'd get back on the management track in time," he explains. "I was just about to reassess my options when I got a terrific offer for a good management spot from *another* local company."

"I agonized over the decision, but finally gave my notice. Within two days, my company had made me a counteroffer. It was gratifying because promoting me entailed a good bit of shuffling. My boss, whom I replaced, had to be moved up and the man he replaced was also promoted. Although I knew what I wanted, I was more than a little anxious getting a promotion by demand rather than having it handed down to me."

There are various reasons a promo-

tion may not work out. Promotions are often offered to fulfill an obligation or favor; to get rid of someone; as a "reward" for some spectacular job-related accomplishment; because someone else quit, or retired, or died; or to fulfill a quota.

A potentially dangerous reason for promoting an individual is simply to find *someone* to cope with a messy problem. For example, the data-processing department of a small insurance carrier has been plagued for several years by high turnover and lukewarm employee performance. One day, the dp manager is run over by a bus. Forced by this unforeseen accident to hire a new dp manager, the vice president tells Mildred Capable to "get in there and clean things up!" She rises to the occasion, but not without giving birth to a small ulcer and incurring the wrath of her subordinates, several of whom she is forced to fire (see "When you have to play the S.O.B." in our June issue).

More positive reasons for promoting are that the person has a particular talent for a certain job, a capacity for creative and independent thinking, and a successful work record.

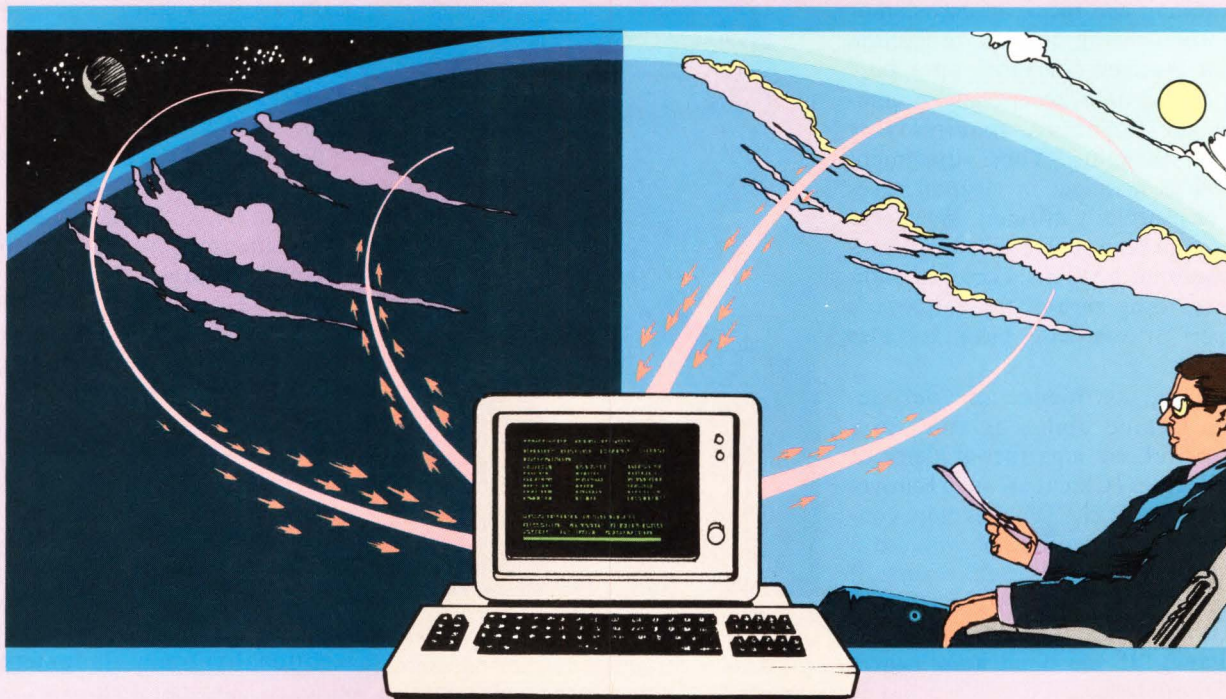
Certain insights should be emerging at this point. First, carefully orchestrated career planning can contribute to the success of both the individual and the organization. Second, whether or not the reasons for promotion are circuitous, mysterious, and haphazardly contrived, or plotted with precision and deliberation, each individual's response to a promotion is unique. To have a well-planned career strategy will lessen the chance that a slight touch of anxiety will blossom into full-blown panic.

Proving yourself . . . again

Sandra Kallman has been a successful manager of systems and programming at IBM, as well as at several New York-area universities and hospitals. "When you get promoted, you always wonder if you're going to measure up," she says. "You know you will be required

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CIRCLE 49

High Anxiety

(Continued from page 92)

to prove yourself all over again. These worries, in addition to the tension of your new duties, can make you somewhat anxious."

Kallman can recall an occasion or two when she agreed to a promotion which involved "cleaning up a bit." The decision to accept any promotion, she maintains, requires very careful thought. "Your adjustment period as manager in cleanup cases can be especially difficult. Whenever I chose to take such a job, I had confidence that I could succeed, in addition to being sure of my employer's support. It was tense, but it was also exciting."

Having confidence in your decision-making ability is vital, says Helen McLane, a partner at Heidrick & Struggles (Chicago), an executive-recruiting firm. "To develop confidence, it's essential to evaluate a proposed promotion in terms of where it's going to lead and whether you want to go in that direction," says McLane. "If you don't know where you want to go, you can't properly evaluate a promotion. You need to make a choice knowing the relative merits of all your alternatives."

Can you say no?

This brings up the sensitive matter of turning down a promotion. "I didn't dare refuse," says a very unhappy and harried office manager. "I didn't think I was ready for a move upward, but I felt turning down the opportunity would discredit me with the boss."

Another individual found his last promotion so traumatic that he quit working altogether. He blames a series of "whiz-kid" promotions for his present condition. "I was so bright, so driven, and at first, so successful, that every time I turned around I got promoted. I never had time to grow into a job, to learn it completely. I started doing drugs and drinking heavily—the pressure was horrendous. I wish to hell that I'd turned down a promotion or two."

According to McLane, there are ways to ward off such a dilemma. "You shouldn't feel so obligated to



Roy Walters of Roy Walters & Associates Inc. maintains that an employee's responses to promotion are based upon his or her perception of how the organization usually handles failure.

accept a promotion that you end up taking a position that's not right for you. A rejection is risky, but it's safer than taking a job you may not be qualified for," says McLane. "When you're offered a promotion, you have to look beyond the money and the scope of responsibility. You have to ask yourself questions like, 'Am I technically qualified for this position? Who are the people that are going to be important to my success? How effectively can I work with them?'"

Tact and diplomacy

Diplomacy may be your best defense. "There are so many factors to consider when offered a new job. In some cases, you just can't win, says McLane. "Instead of giving your boss a flat no, you should be able to assess (preferably with your boss' aid), why you feel it would be a negative move."

"There should be a way for the organization *and* the individual to win through tact, patience, and nego-

tiation," she continues. "Maybe it's the scope of the responsibility that needs to be changed, or the location of the job, or the level of support. It is possible to 'bargain' about your promotion. And it is advisable to occasionally turn one down."

What can you lose by turning down a promotion? Can it hurt your career, and do organizations tend to penalize those who say no? That depends, says Sandra Kallman. "In one case, I had mixed feelings regarding a promotion that was being urged on me by a vice-president. I felt terribly pressured, yet I believed it wouldn't be a good career move. In a situation like that, you have to think about your goals, as well as listen to your instincts. In the end I said no, and I've never regretted that decision. If the bosses understand your reasons for refusal, they may even applaud your courage."

Deciding to turn down a promotion may require astute management and exceptionally sound judgment on your part. But what if all your careful forethought is fruitless? In other words, what if your decision to refuse a job advancement turns out to be dead wrong? Or what if the person who initially offered you the promotion is angry or disgusted rather than patient and understanding? Most importantly, what if you suspect that your reasons for hanging back are the *wrong ones*?

Staying in the wings

We've all heard the co-worker who asserts, "I'm happy with the way things are. I love my job; it's challenging and I do it very well. I am making a real contribution to the company right where I am." Such people claim to have no interest in job advancement. In truth, these people may find promotion a disturbing—even threatening—experience. "There are probably more people who'd rather not think about promotion than who anticipate it eagerly," says Dave Johnston.

The reasons for rejecting or resisting promotion are varied and com-

(Continued on page 98)

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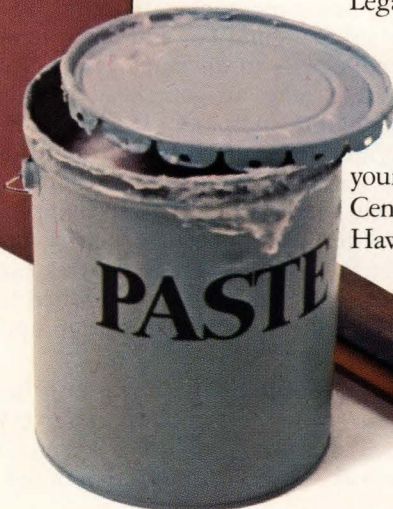
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High Anxiety

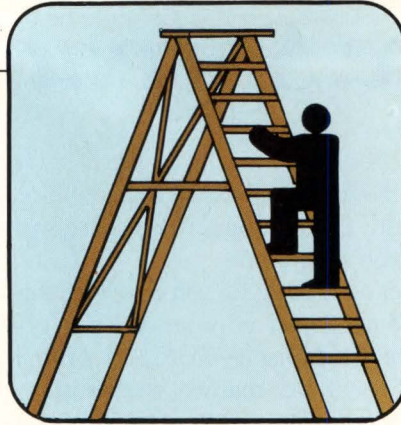
(Continued from page 94)

plex. A reluctant promotee may ask him/herself: "Is it against the 'rules' to be satisfied in my job? Is it abnormal to be without that almost-constant itch for the next rung of the ladder? Where is it written that I must keep pushing upward?" Where you stand on these issues has much to do with your personal-value system, your ideals, the goals you have set for yourself, and what stage of the life cycle you're in, says Rosalind Forbes, president of Forbes Associates (New York), a consultancy specializing in stress management. "One factor we can't forget is that our society—where we live and work—influences our behavior, our ambitions, and our motivation," says Forbes. And it's common knowledge that today's society prizes drive and ambition.

Johnston feels that people who resist or do not seek promotions are static, lacking a valuable degree of energy. "When someone decides not to move upward, it's bad for the company. A manager is a greater asset if he or she always has an eye on the next level; that's what keeps a person working to and above capacity.

"Most importantly," he continues, "you pass these attitudes along to your employees. If they know you intend to stay in your cozy spot for the rest of your career, they think, 'My boss is reasonably healthy—he's going to be able to work another 15 or 20 years. Where does that leave me?' Such employees will take one of two paths—they'll develop a complacency just like their boss, or they'll leave." The troops will work their hardest if they know it will result in a move up the promotion line for them as well as their boss.

"It's very hard to maintain a status quo in the business world," says Helen McLane. "In most instances, you're either moving forward, or slipping back. Many job seekers tell me they're looking for security. I always reply, 'Then look in your mirror, because security lies within your own abilities.' When people are unwilling to assume the risks of a bigger challenge, they're going to discover that they have taken the



biggest risk of all by reducing their own marketability."

The key to the relative "health" of disinterest, reluctance, or refusal to be promoted seems to be whether or not such an attitude is driven by strategy, suggests Madeline Klein. "In other words, does it result from a conscious, rational choice, or is it a reaction to fear? There has to be a good reason to refuse or avoid promotion," says Klein. "It's important that you know your own goals. What is it that you want to achieve? Often, it's best to raise such questions with your superiors so that you can balance out the pros and cons."

Maintaining a good line of communication with decision-makers about



Ann Evans of Management Analysis Center says that a company's promotion policies should send out direct signals to its employees regarding what it takes to get ahead.

your career direction can be a tricky business. "Most organizations," says McLane, "don't have a well-planned career-management system for their employees. Those that are more progressive, however, usually let employees know what appropriate jobs are coming up, and what they would need to qualify.

"This meshing of organizational goals with personal goals is an excellent way to recruit employees, and to get the best out of them. It also ensures that a company will be able to fill any vacancy that opens up.

"Unfortunately, such corporations are in the minority—and most people

"A rejection is risky, but it's far safer than taking a job you might not be qualified for."

McLane, Heidrick & Struggles

don't have a keen insight into their career direction. They simply sit and wait for things to happen instead of taking the effort to figure out where they want to be in five years, one year, or even in the next month. When organizations and individuals coordinate their goals, the potential trauma of moving up the career ladder is greatly reduced."

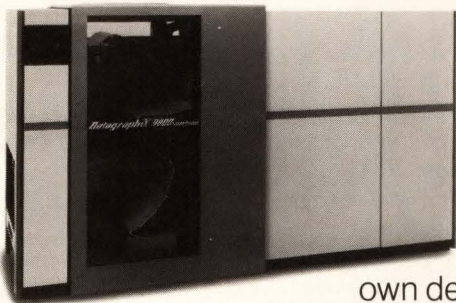
According to Ann Evans of the Management Analysis Center (Cambridge, MA), a company's promotion policies represent its organizational personality. These policies send signals to all employees about what it takes to get ahead in that particular company. If these corporate goals don't jibe with individual wants and capabilities, trauma is likely to take root. "It's important for the decision-makers to clarify organizational goals, so employees can judge whether they are interested in or capable of making that step up," says Evans.

Consultant Roy Walters also believes most organizations aren't very good at helping employees formulate forward-looking, career-manage-

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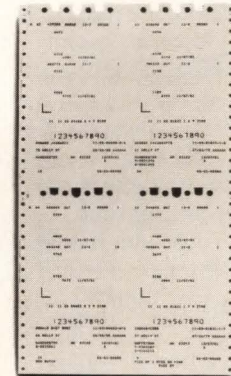
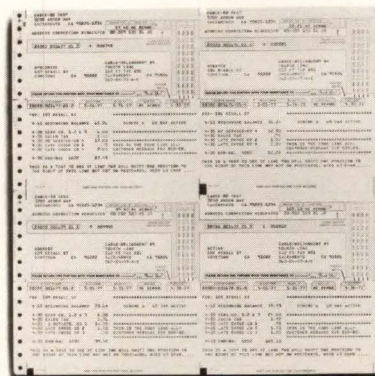
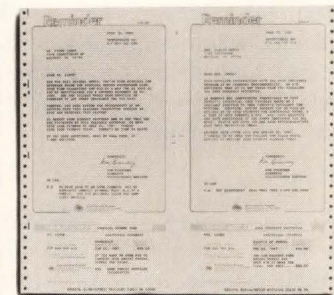
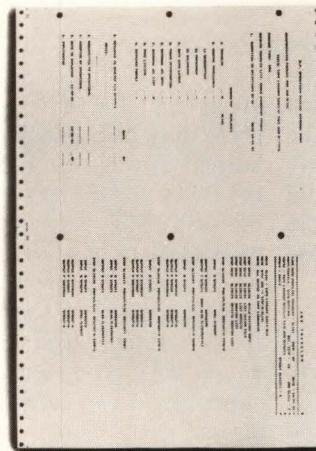
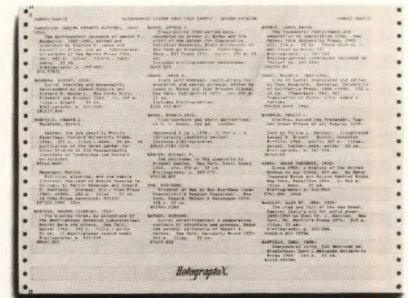
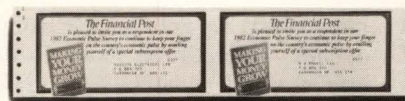
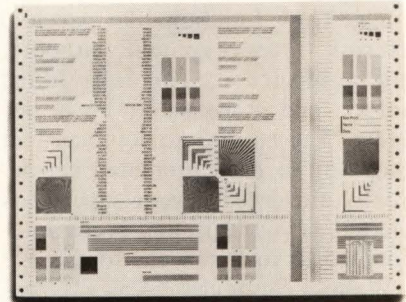
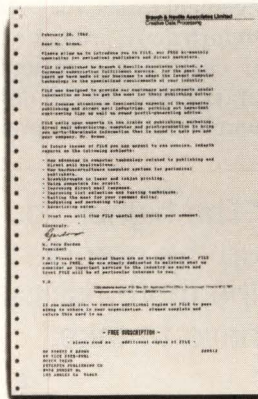
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High Anxiety

(Continued from page 98)

ment strategies. "It's still pretty much in the hands of individual managers to move subordinates along. They function like parents, offering encouragement, support, and guidance as the individual matures and grows within his or her career. The natural anxiety you feel when you've been promoted can be greatly alleviated if your superior is tolerant as you learn and become acclimated to your new environment."

Walters continues: "A newly promoted person needs to have some guarantee of support to soften their concern and allay the normal fears. It's the company's role to help that individual overcome feelings of anxiety—to keep them from becoming traumatic. If employees are

aware that this kind of encouragement exists, they will be less likely to turn down promotions. Remember, it costs organizations, both monetarily and psychologically, when employees refuse promotions. This

"The higher you go up the corporate ladder, the more risks you have to take."

Klein, M.I. Klein

means they've got to hire from the outside, which upsets those within, or hire someone who is less qualified and requires training."

Walters also believes many employees respond to promotion based upon their personal perception of how their organization handles failure. "I've seen people who have been badly hurt because they made one mistake. They've been demoted without being given a second chance, or privately or publicly castigated. People don't want to subject themselves to that sort of damage," says Walters.

"Most organizations handle failure miserably," he continues. "But it needn't be humiliating—it can be a healthy growth experience. However, if failure is improperly handled, the results can indeed be traumatic."

Johnston agrees: "Failures aren't fun—they are scary and can really

Before and after

Promotion anxiety can be classified by two basic stages: *before* the actual job change, when you have to decide whether or not you should accept; and *after* the promotion, when you're nervously surveying your new domain.

Before ...

If you're smart, this is the time to do some serious soul-searching. "Some people are so concerned with the gratification of a promotion and the additional salary that they don't spend enough time thinking about whether they are suited for the additional responsibilities," observes Loren Belker in *The First-Time Manager*. Here are some factors to consider during such an analysis:

- Do you understand the company's operations and overall objectives? Can you identify with them easily and are they in harmony with your own ultimate goals?
- Will you get the help and support you need, especially in the difficult adjustment period? Rosalind Forbes, president of Forbes Associates, a New York consultancy specializing in stress management, says people should realize that "in

about the fourth to sixth month, there may be a letdown, which is a normal aftermath of change. During this time, a lot of self-questioning will take place. After having worked extra hard to prove you can do the job, you'll probably start asking yourself if this is what you really wanted—if it's all worth it." If you have good rapport with your superiors, it can turn into "positive stress."

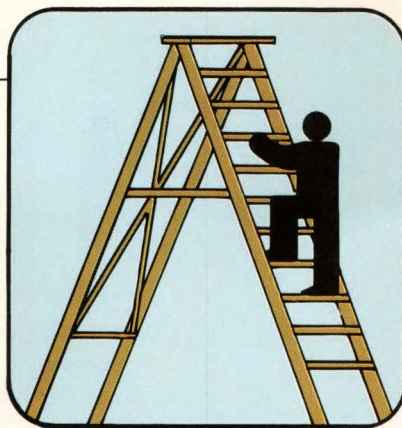
- Are you prepared to devote extra time and energy to stay abreast of your job and your field? Help from the top brass is essential, but you must also be willing to seek out education, training, and knowledge.
- Are you ready to develop a managerial outlook and approach? Ascending the career ladder implies a different mindset. This means you must keep some distance between you and your former peers—particularly if they will now be your subordinates. This can be difficult, alienating—even painful—and the way you handle it will greatly affect your credibility as a new boss.
- Are you willing to risk the inevitable mistakes and failures that go hand in hand with learning something new? Are you mature enough

to learn from those mistakes, rather than allow them to make you defensive or insecure?

- Can you delegate responsibilities? Patti McVay, president of Fifth Season Travel (Indianapolis), has increased her agency's growth by an astounding 10,000 percent since she took over in 1977. She believes that when people are promoted they often feel they must do everything. In some cases, they hold onto the old responsibilities for dear life, and try to field all the new ones at the same time." During the meteoric rise of Fifth Season, McVay has had to change her management style dramatically, relinquishing certain responsibilities she once feared losing in order to build an effective middle management.
- Do you understand the politics and power relationships that operate within your company and your department?
- Can you get along with a wide variety of people? If you're a loner and the proposed job requires a high level of interaction with superiors and subordinates, you could run into trouble. Constant cultivation of interpersonal and communication skills is necessary for most manage-

take you down. But, in a sense, they are a necessary evil. Whoever said, 'If you don't make any mistakes, you're not doing much' sure hit the nail on the head!"

Fear of failure is one major reason some reject promotion. Other trauma inducers include a disinclination to compete; a fear that subordinates won't take one seriously; a reluctance to accept responsibility for the actions and performance of others; difficulty in making decisions; knowing that the company has a history of shuffling people around without much direction; dislike or fear of leaving the security of one's "comfort zone"; lack of technical knowledge to handle a particular job; a persistent feeling that one is just not ready for change;



and a discomfort with increased visibility.

One way to decrease the anxiety of these varied trauma inducers is to make a careful assessment of your qualifications for the proffered job. Part of this assessment will include your knowledge of the company's management style. Part will involve asking your superiors some essential questions. For example: Exactly what

will your duties be? (If you sense any ambiguity, it's better to get it cleared up *before* you accept the position.) What will your relationship be to your superiors? Will they provide feedback so that you will know if they're happy with your work? Does the company and/or new department keep up with rapid technological change, so you can be assured of having the best tools to do the job? Finally, will you be able to pry yourself loose from your present assignments—or will you have to keep your finger in the pie because no one's ready to fill your shoes?

Make no mistake about it—success *is* within your grasp. But you must first know what you want and how to get it. Those who respond with envy to another's promotion don't have a solid

rial positions; these skills are inextricably linked to managerial success.

... And after

You've accepted the promotion, and several months later you're still fretting about whether or not you made the right decision. You worked so hard to get here—and now you find you have to work even harder to prove yourself all over again. It's a never-ending process, especially if you're already gearing yourself up for the *next* promotion. Here are some guidelines for settling into the new job with a minimum of trauma for you, your subordinates, and the company:

- Take care of yourself by relaxing and exercising regularly. Don't neglect your physical or mental health. You're probably under more mental and physical stress than ever before.
- Don't be too eager to institute sweeping changes. "Many new young leaders make their lives more difficult by assuming they have to use all their new-found power immediately," according to Belker in *The First-Time Manager*. "The key word is restraint. . . . You're the one who's on trial with your sub-

ordinates, not they with you."

- Make sure you develop good communication patterns with subordinates, as well as superiors. "Your subordinates will have more to say about your future than your superiors," says Belker. Remember, you'll ultimately be judged by how effectively your group performs.
- After you've been in the position for several weeks, Belker suggests you have a formal meeting with each of your subordinates. Your job in these sessions is to listen brilliantly.
- You will most likely run up against an employee or two who prefers the previous boss. Just remember you can't win over everyone. Good communications, objectivity, and patience will stand you in good stead and if you're a good manager, even the reluctant ones will come around.
- Make sure you follow the rules you set for your subordinates. A "do as I say, not as I do" attitude is sure to weaken your position with subordinates.
- Be prepared to pay attention to employee needs, even if it involves going to bat for them with your superiors. Your genuine concern will help establish a valuable team spirit.
- Transmit your loyalty on corporate

goals, policies, and decisions to your workers. If you find this to be a difficult task, you're probably working for the wrong company.

- Work at grooming your own replacement. Patti McVay believes that "the more important you make someone else, the more important *you'll* be." People have lost out on promotions because they haven't spent enough effort preparing someone to take their place. Even if the person who becomes your "understudy" is promoted out from under you, says Loren Belker, you'll be "establishing a reputation of being an outstanding developer of people, which will add to your own promotability."
- Have the courage to admit when you've made a mistake or gotten in over your head, and don't be afraid to ask for help. If, however, your company is intolerant of mistakes, ask yourself if you're in the right place.
- You can't manufacture self-confidence out of thin air, but it often helps to *act* as if you are a secure and capable leader. The way you speak, hold and move your body, your expression, the way you dress—all carry messages to those around you.

High Anxiety

(Continued from page 101)

conception of where their own success lies. Says Madeline Klein, "When people ascribe someone else's success to 'being in the right place at the right time,' 'getting all the breaks,' 'going to the right grad school,' or a million other excuses, they fail to realize that most successful people get ahead by setting goals and slowly, steadily

"When you get promoted, you always wonder if you're going to measure up."

Kallman, IBM

working toward them. If you fail to develop direction," she adds, "you may be presented with an opportunity only to throw it out the window."

A forward-looking organization that works with employees to get them on a solid career track is a great



bonus but, Klein maintains, you've got to navigate your own career. "You can't depend on someone else to tell you what you ought to do," she says. "Many people become traumatized by promotion because they are so out of touch with their feelings that they don't even know what they want, let alone how to get it."

According to Klein, when anxiety gets out of control, it's a clear symptom of a greater disease. Coping with the feelings of uncertainty and apprehension that come with promotion requires direction, maturity, and self-knowledge.

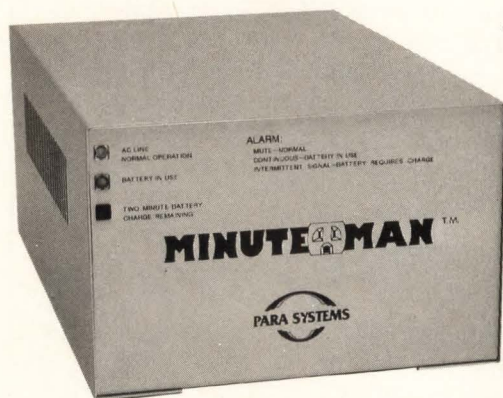
In the final analysis, are you ready

for promotion and success? "The fundamental requirements for succeeding at anything," counsel authors Margaret Henning and Anne Jardim in *The Managerial Woman* (Simon and Schuster, 1976), "include the drive to achieve, an orientation to task, the desire to be respected for one's abilities, the enjoyment of

Ask yourself: "Why is this promotion being offered to me? Will it take me where I want to go?"

competition, [and] a capacity to take risk. "If you possess all these attributes, chances are you already have a solid career plan. If not, these skills can be developed. So relax—don't let the thought of promotion throw you. You're going to go far. □

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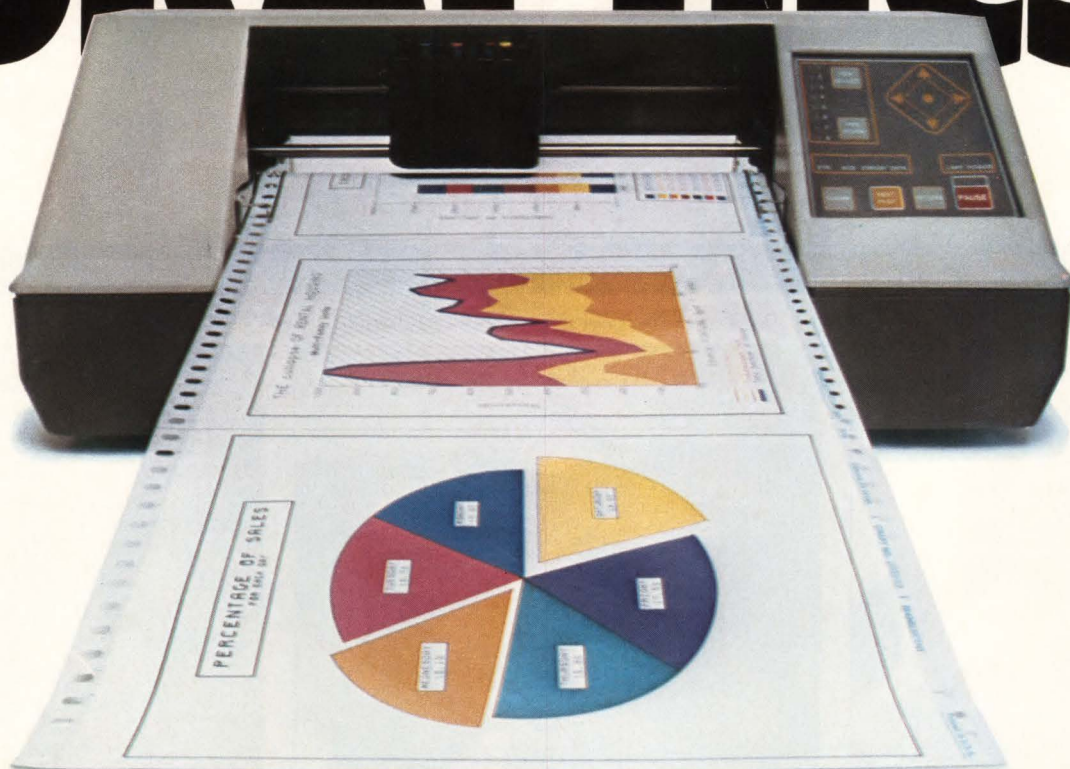
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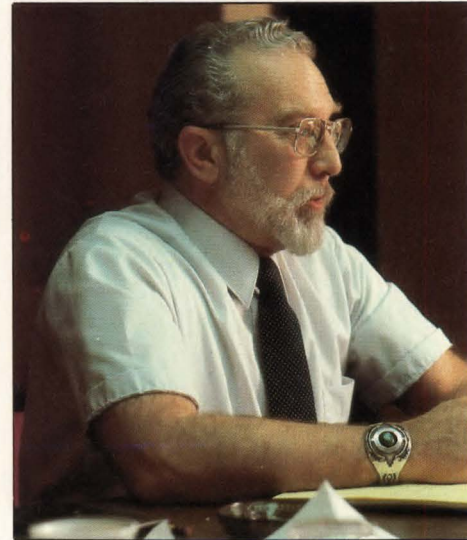
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MANAGING CONSULTANTS: GET YOUR MONEY'S WORTH

Fourth in the 1984 series of roundtables

Roundtable participants included (left to right) Richard Sorken, Sudha Pennathur, Louis Fried, Robert Campbell, Jack Prouty,



Like dry cleaners, hair stylists, and sanitary engineers, consultants are here to stay—their survival now assured by their apparent indispensability. Only one decade ago, U.S. businesses spent an estimated \$1 billion on their expertise, opinions, initiative, and hunches. Now the annual bill is up to \$3 billion—and that doesn't include all the specialized technical work.

If it were not for the crucial input of consultants, claims industry spokesman John Hartshorne, executive director of the Institute of Management Consultants, "the U.S. economy would collapse." Perhaps. But while you may not be able to live without them, the question still remains: How can you live with them?

While consultants are hailed as

saviors, they are also disparaged as opportunists, charlatans, and hatchetmen. Snide jokes abound, like the one that defines a consultant as "someone who knows a hundred ways to make love, but doesn't have any lovers."

There are even instances where companies end up testifying in court against their consultants. At this writing, such a case is pending in Massachusetts pitting the USM Corp., a division of Emhart Inc., against Arthur D. Little Inc. According to the suit, ADL, hired to computerize an inventory and billing system, botched the job so badly that it took Emhart four years to straighten out the mess. Emhart is suing ADL for \$12 million in treble damages. The claims are "grossly excessive and unjustified," say

ADL's attorneys.

Whoever may be right or wrong in this particular case, the question remains: How can such a catastrophe be avoided in the first place? How can managers and consultants effectively work together to ensure that the job gets done? To find out, Computer Decisions recently brought together a panel of experts—six consultants and four representatives from corporations that frequently use consultants. We told them we wanted to hear the real lowdown on how consultants can best be used, and how clients can best avoid being abused.

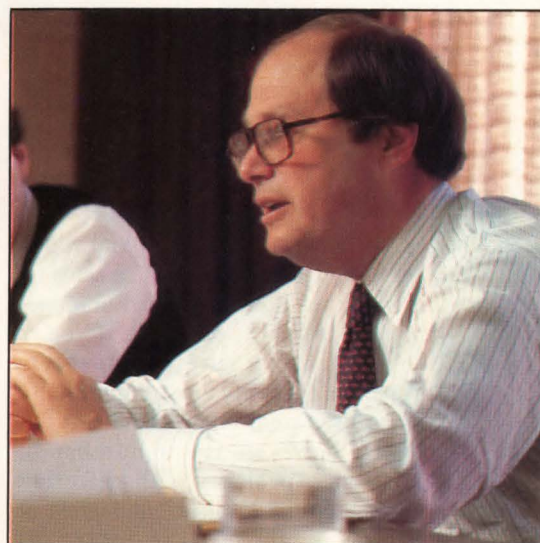
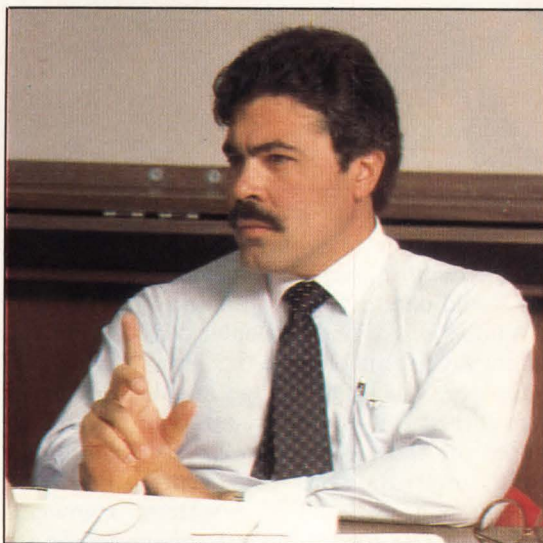
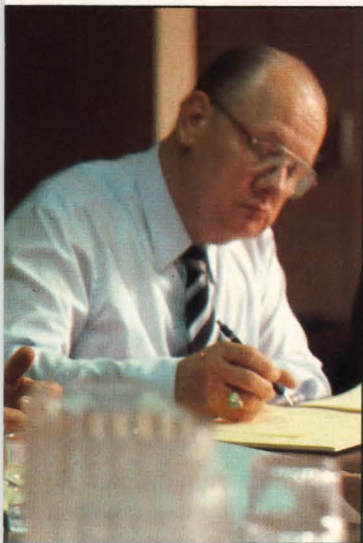
The discussion didn't proceed very far before the consultant's special status as an outsider was addressed. For better or worse, our panelists agreed, it was this status that affects

While the consultant can be a lifeline in times of crisis, you want to be sure just whom you're getting and what you're getting into.

by Martin Lasden, Western Editor

and Carl Jacobson.

Photos by Charles Moore/Black Star



everything else a consultant might say or do.

Tom Ahern: There's a big difference between being a consultant and being an employee. As a consultant you can play political games with great freedom, while maintaining your integrity. You're a lame duck. You don't have to run for re-election and you're not dependent upon a particular client for your daily bread.

Nicholas Ionoff: That's just a theory. In practice, consultants establishing long-term relationships play the game just as your employees do. In fact, some of these consultants stay longer than your regular employees. They know which side their bread is buttered on.

Sudha Pennathur: Once, at a department-store chain I used to work for, we brought in a consultant

to install a new point-of-sale system. The man, from a private consultancy in Philadelphia, didn't have much expertise. The technology itself was very new, and everyone had a different opinion about it—the project team, the MIS director, and the chief financial officer. The consultant, not knowing whom to please, took the side of the CFO. He sided with the person he perceived to be the one in power. And, in the process, he made a lot of bad decisions that ended up costing the company millions of dollars.

Carl Jacobson: Yes, there is some temptation for a consultant seeking a long-term relationship with a client to lapse into "playing the game." But the fact remains that a consultant is an outsider, and as an outsider he has and will continue to have a different

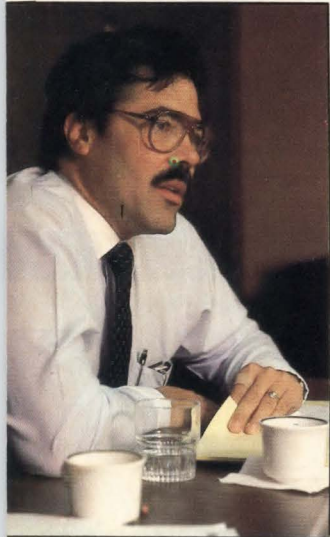
perspective. Consultants, for one thing, have more access to the executive suite than a regular employee would have. They aren't restricted to following an established pattern, and a good consultant will use this to his or her advantage. That's a good reason, by the way, for not hiring a consultant as a full-time employee. Consultants often make lousy employees. **Pennathur:** There is, however, another reason not to hire a full-time consultant. A consultant with a good reputation brings great credibility to a project. If you're paying top dollar for advice, you're more likely to listen. Once they become part of the organization, there's more of a tendency to ignore consultants.

Robert Campbell: It's the distinction between buying and renting. When you bring on a full-time employee,

Managing Consultants

(Continued from page 105)

Jack Prouty, Nicholas Ionoff, Sudha Pennathur, Gerald Long, Tom Ahern, and Charles Chapman debate the merits and pitfalls



you're buying expertise. And when you hire a consultant, you're renting. So, whether it's for general management or technical purposes, if you're working on a single long-term project, it probably makes more sense to acquire talent on a permanent basis. If, however, it's a number of short-term projects with different scopes, requiring different bodies of knowledge, then you're better off with a consulting organization.

Richard Sorken: When you hire a consultant to do a manager's job you often get into trouble—especially when your own staff reports to that consultant. It works out badly because a consultant is not as sensitive to employee needs and does not have their long-term welfare in mind. Moreover, it causes morale problems when an employee earning \$30,000 a year has to work alongside a consultant pulling in \$80,000 or \$90,000.

Jacobson: You have to keep in mind that when you subtract the space, staff support, and benefits a permanent employee receives, a consultant's fee is roughly comparable to the employee's compensation.

Ahern: I think one of the key points to be made here is that because consultants are outsiders, and they don't

know the corporate culture, they can ask the dumb questions that no one else would dare ask.

While I was at one particular consultancy, I did a job for the U.S. Postal Service. They had a huge imbalance in their contracting process that caused the staff to go crazy for six-month intervals every four years. They brought us in to build a system to help handle that six-month crisis period. We asked, 'Why don't you just stagger the workload?' They had assumed that there was a postal rule against it. Well, we checked all the rules and came up clean. They followed our advice, saving millions of dollars—and it was just because we asked a dumb question.

On one hand, the consultant is an alien, someone to be mistrusted, someone who's insensitive to the unwritten rules that bring harmony to an organization. On the other hand, though, that alien is a mover, a shaker—someone who's not weighed down by the bureaucratic baggage that thwarts decisive action. Such is the double-edged sword wielded by the "outsider"—a sword that can work for or against you.

So, we wanted to know, why do relationships between managers and

consultants sometimes turn sour? Why would the appreciation of a fresh perspective be overshadowed by the resentment of an outsider's opinion? Alluding to the pending suit between Emhart and ADL, we asked ADL consultant Jack Prouty that question.

Prouty: First of all, I can't and won't comment on that particular case. But let me say this: In any consulting assignment, it's Murphy's Law. Things can and do go wrong. And anytime you're in a relationship where trust is involved, you're bound to see some lawsuits. What you have to do is try and figure out what went wrong.

One of the most important ways to avoid such problems is to make sure everyone involved has a clear understanding of what their roles and responsibilities are. It's called managing expectations. For the consultant, there's the very distinct danger of overselling what he intends to deliver. This can cause problems.

Louis Fried: One failure I've occasionally seen on the part of a client is the failure to ask why. There's a tendency to accept what a consultant says without understanding the rationale behind it. This might lead a client off in the wrong direction, or

of using a consultant.



cause the client to accept results that might not be valid.

Charles Chapman: Either the consultant has created unrealistic expectations, or the clients haven't cooperated as fully as they initially promised. Whatever the case, it's the consultant who often avoids confronting management with the problem. It's like a construction project that's 95 percent completed. That last 5 percent is the hardest part to get through.

I can remember situations I've been in where the scope of a project was laid out, and then the budget got cut. What you have then is a conversion, and there's no funding to train employees or to follow up on it. Management has an albatross it can't get rid of so the bosses blame the consultants.

Prouty: We had a lawsuit against us over a consulting assignment we did for the Canadian government. The administration that hired us got boot-ed out of office, a new one came in, and there was a lawsuit. Part of the controversy simply boiled down to the old regime versus the new regime, but that happens in private industry as well. You could be doing work for a corporation, it gets bought out, new



management comes in, and all work stops. Nobody knows what's going on, and once again the consultants get blamed.

Campbell: Not being on the consulting side, my perspective is a little different, but I'm not as inclined to blame the consultant as you might think. Normally, when a consulting project is under way, there's a project

team composed of representatives from both the client and the consultancy. There is, however, usually someone paying the bill who is in charge of the project team. That individual is responsible for monitoring the progress of the project. He or she should be looking for measurable milestones throughout the course of

(Continued on page 110)

Roundtable participants

Moderator: Martin Lasden, western editor, *Computer Decisions*.

Thomas S. Ahern, president, Systems Careers, San Francisco.

Robert R. Campbell, director of information services, Sunkist Growers Inc., Sherman Oaks, CA.

Charles H. Chapman, partner, management information consulting, Arthur Andersen & Co., San Francisco.

Louis L. Fried, director, advanced computer-systems department, SRI International, Menlo Park, CA.

Carl Jacobson, senior vice president, Management Analysis Center Inc., Palo Alto, CA.

Nicholas Ionoff, vice president, Crocker National Bank, San Francisco.

Gerald P. Long, vice president, Network Data Base Systems Inc., Redwood City, CA.

Sudha M. Pennathur, general merchandise manager, Levi Strauss & Co., San Francisco.

Jack Prouty, consultant, Arthur D. Little Inc., San Francisco.

Richard D. Sorken, vice president and manager of development services, The Bank of California, San Francisco.

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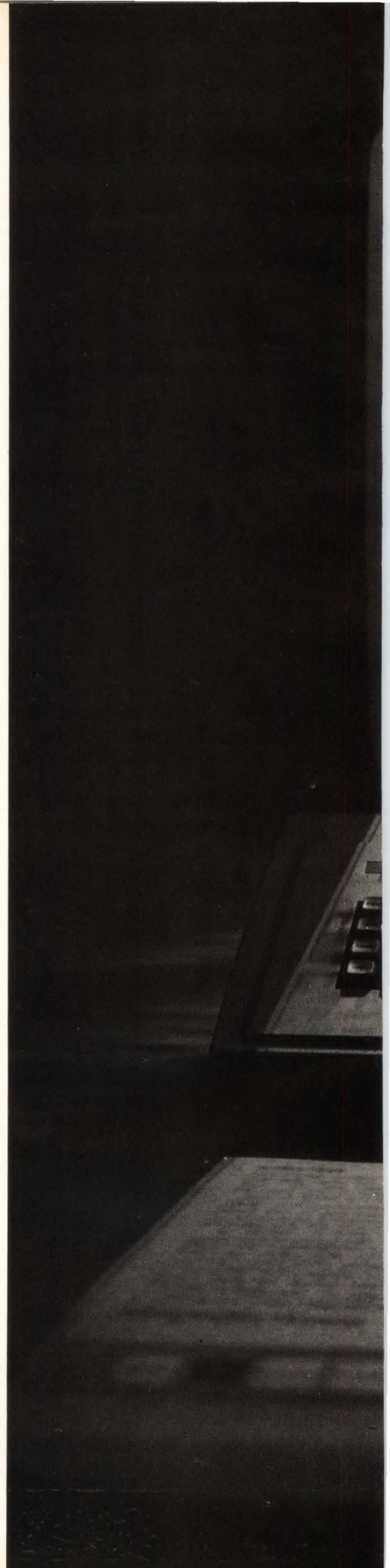
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In terms of capabilities, ease of use and overall value, the Xerox Star would definitely have to be considered the stellar workstation in the industry.



The three basic techniques used by computers to interface to the outside world are 1) interrupts, 2) programmed input and output (PIO), and 3) direct memory access (DMA). To describe these techniques, it is helpful to break down the internal organization of a computer into four functional units or blocks, i.e. the memory I/O arithmetic logic unit (ALU), and control unit. Figure 4 shows the functional breakdown for first, the von Neumann as well as the Eu-

As shown in both, interrupts are signals from external devices through the IO unit to the control unit. These signals indicate the occurrence of a specific event and usually affect the program currently being run in the computer. No data is transferred by the interrupt signal; only the presence of the interrupt is established.

IO is done by having the program explicitly transfer the data between the IO unit and either the registers in the ALU or the memory unit. On the other hand, DMA occurs when data is transferred between the IO unit and the memory unit without program intervention, except for initialization.

An interrupt is a signal from outside the computer that something has taken place. The general process of servicing an interrupt is that, first, the interrupt arrives at the I/O unit, which in turn informs the control unit. The program is stopped at the conclusion of the program if

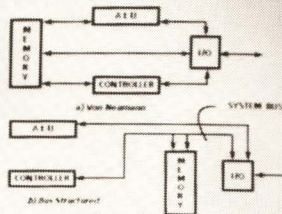
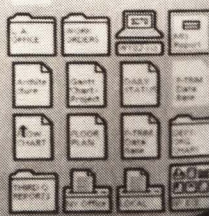
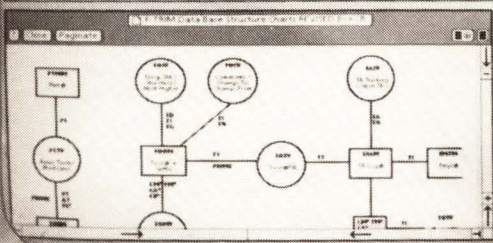


Figure 4. Computer architecture.



Managing Consultants

(Continued from page 107)

the project to ensure that both sides are pulling their weight. When expectations are not being met, the bulk of the blame should be placed on the client, rather than on the consultancy itself.

When one speaks of blame one invariably speaks about responsibility, and when one speaks of the consultant's responsibility, the question inevitably arises: Who is the consultant ultimately responsible to? Are consultants the servants of the particular manager who hires them, or are they answerable to a higher authority? On this issue, Louis Fried feels compelled to speak. He's a consultant with SRI International, a California-based think tank. But when he rails against the consultant who goes over a manager's head, he speaks from personal experience. He can remember the time he was a manager and a consultant went over his head.

Fried: What do you do if the particular individual who's hired you does not recognize the potential problems in the assignment? And what if this individual is very forceful in telling you not to talk to his or her boss regarding this matter? Do you go over this person's head or do you walk out? Personally, I think there is very little recourse for the consultant in such a situation except to make it very clear to that individual what the

problem is, and then offer to terminate the project.

Chapman: I disagree. If you have already accepted the company's money, you have no recourse but to tell the individual, 'I'm going over your head.' To walk away with nothing completed . . .

Fried: I've sat on both sides of the fence in this type of situation. A consultant went over my head because he felt that I wasn't making the right decision. From my point of view, the consultant was unqualified to present the recommendations he was making. He did not understand the total corporate picture.

Chapman: I agree with you on almost every point. You do lose in the long run if you go over someone's head, but I don't think quitting is the best recourse unless you have so few dollars involved that it won't make much of a dent.

Prouty: We'll be working with a client, encountering problems. We'll wrestle with the issue of whether or not to go over someone's head because there may be some issues that we don't know anything about. There may be hidden agendas that have never been revealed to us. Frankly, it's the toughest problem I've ever wrestled with.

Consultants as well as their clients would encounter less confusion if they told each other exactly what they meant. However, in the real world that's not always the way business is conducted. During a consulting assignment, the parties involved often come to the project with unarticulated objectives and agendas that remain hidden until the assignment

is well underway. That leaves both the consultants and their clients shadow dancing round each other.

Fried: There's a common thread running through this discussion: In many cases there is a hidden agenda to an assignment. Top management will bring in a consultant to appraise the performance of a function within the company. Many times, they've already decided what they want to do and they're just looking for a consultant to create the rationale to justify their actions. So, you get an assignment under one pretense and, after spending a few weeks in the client's environment, you get called aside for a private conference where you're finally told about the hidden agenda.

Jacobson: There's no question that there are many times an executive has a very difficult decision to make and wants to be second-guessed and backed up in order to have the courage to carry it through properly.

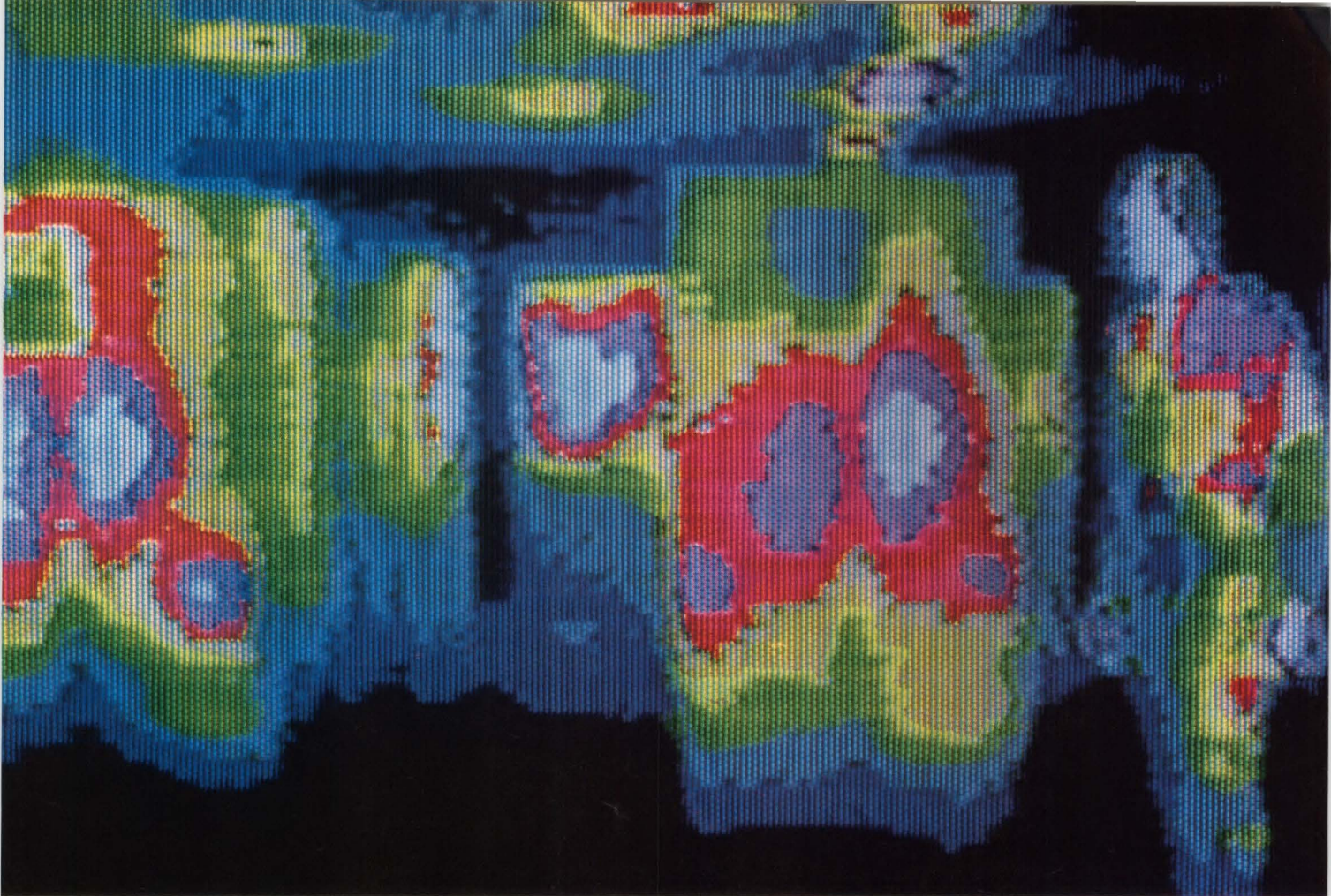
Pennathur: I remember one case where we brought in a consultant, and the issue was whether or not to move a data center from San Francisco to Dallas. We didn't want our employees to find out about the possibility of a move because a big bank down the street was hiring at the same time. We didn't want a mass exodus on our hands for no reason.

We had a three-man consulting team come in to do a survey. While they were there, we asked them to evaluate some of our personnel. This was done to help us figure out who we should try to keep if we did move. The point is, there may be hidden agendas but they're not always bad, and in sensitive matters, like when 200 or



"We didn't want our employees to find out about the possibility of a move because a big bank down the street was hiring at the same time."

Pennathur, Levi Strauss



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Managing Consultants

(Continued from page 110)

300 employees may walk out, secrecy is necessary.

Ahern: You shouldn't overlook the fact that the consultants themselves have hidden agendas—like trying to land a job. I know of many situations where consultants sold themselves in to full-time MIS positions.

Having worked for a Big Eight firm myself, I know that there is a lot of pressure on consultants to sell new business as part of the current assignment—they're being graded on that. And I've talked to a number of consultants who tell me that one of the reasons they left a Big Eight firm was the constant pressure to sell services that their clients didn't need.

Chapman: Well, speaking as someone who belongs to one of the Big Eight, I tell my clients to either give me enough time to do the job right or don't hire me.

Question: Chuck, just between you, me, and the 160,000 subscribers who read *Computer Decisions*, does the pressure that Tom describes exist for you, and if so, is it a problem?

Chapman: The pressure is there, but it's not solely related to selling as much as you can to a client. There is also the pressure to develop a long-term relationship with a client, but the only way you can accomplish that is by doing quality work.

Ionoff: Looking at my bank and the Big Eight firms we deal with, in many instances these consulting firms try to respond to a need whether or not they have the expertise. It seems like they can't say no to an assignment.

Ahern: Nick, I've been on the other side of that issue. When I worked for a Big Eight firm, we had a principal in charge of management-consulting services. He'd send us in for the first round of client meetings and tell us to act like we knew what we were talking about, say on some subject like industrial engineering. So, I would go to the bookstore and buy a book on industrial engineering, and the next morning I was an industrial engineer. If the next meeting was on operations research I'd become an overnight expert in operations re-

search. Since I left the company, they fired this same principal for unethical practices.

Choosing the right consultant is difficult, because the service is an intangible and the results are so hard to predict or measure. Given that, we asked our panel for shopping tips that executives might employ to increase their chances of getting the most for their money. Among our experts one point came through loud and clear: Beware of the bait and switch—the consultancy that hooks you in with its star roster only to send in junior executives to pinch hit.

Beware of the consultancy that entices you with its star roster only to send in junior executives to pinch hit.

Ionoff: In preliminary discussions with one consulting organization we were considering, its people seemed fully qualified to meet our goals. They had done similar work in the past. They had the methodology. So we signed on the dotted line and got rolling. Then we noticed something—the people we thought we'd be working with ended up coming in maybe a half or a third of a day every two weeks. Meanwhile, all these people were coming and going that we'd never seen before.

We wanted to know who these people were. They turned out to be very junior individuals, and the excuse was: 'Under our guidance, these individuals will deliver the product.' At that point we terminated the relationship.

Gerald Long: At a transportation company I once worked for, I saw a number of consultants coming through with the ink barely dry on their MBAs and their programming certificates just arriving in the mail. A client has to know what he's paying for. If you have an extremely tech-

(Continued on page 197)



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NEEDS ASSESSMENT:

FINDING THE RIGHT C



CHEMISTRY

by Mary Miles and John Rymer

A little alchemy will make personal computing the productivity enhancer it's supposed to be.

There are mistakes and then there are grave mistakes. There are decisions and there are good decisions. Nowhere are these distinctions demonstrated better than in the world of corporate personal computing. Careless choices can wreak havoc on information processing, while carefully considered implementation can enhance productivity and profitability.

At its root, a corporation's assessment of the best way to implement personal computing is a search for the right formula. The brass, or its designates, must study how a number of elements, when combined, can not only prevent misuses and mistakes, but produce the right results.

Where does personal computing fit into the existing corporate structure and procedures? Can it complement the corporate philosophy and goals? Who should be in charge? Only the brass, with its institutional authority and insight into the corporation's chemistry, can get the answers.

Assessing personal-computing needs is like preparing a business plan to enter a new market. Why devote such special effort to a workplace technology? Because as a business tool, the personal-computing device—whether it be a stand-alone microcomputer or a souped-up terminal connected to a mainframe—is as potentially destructive as it is powerful.

Any corporation that fails to assess its personal-computing needs risks buying short-lived systems—investments that can't be leveraged as technology improves. Worse, spontaneous flashes of innovation by employees armed with personal-computing tools may be unproductive or even coun-

terproductive. These tools can be catalysts in a prescription for improved effectiveness, but they can also be overpriced office machines. Many individual users—indeed, entire organizations—go wrong at the start by defining personal computing as the automating of manual tasks. That's not good enough, asserts James Haner, a former personal-computing honcho who is now a consultant. "Converting manual tasks into electronic equivalents—like putting accounting figures into an electronic spreadsheet—represents the thinking of 25 years ago," he says. "Personal computing is problem solving, rather than 'production' data processing, and that's a difficult concept for users to grasp."

Users need direction to realize the full potential of personal computing, and needs assessment gives management the insight to set this direction. The process calls for close scrutiny of the corporate culture and structure, opportunities to enhance or expand existing businesses or information systems, and a host of other factors. The products of this initial analysis should be a long-range plan and policies and procedures to govern individual purchasing and application decisions. Moreover, methods of promoting the corporate-computing plan should be considered during needs assessment. Although needs assessment is time- and resource-consuming, if handled carefully, the potential payoff is worth the price.

Unfortunately, many organizations miss this first crucial step. "A lot of executives talk about implementation plans, but needs assessment is the shadowy part of the pro-

Needs Assessment

(Continued from page 115)

cess," asserts John Gantz, editor of *Tech Street Journal*, a newsletter out of Chelmsford, MA. "In general, there's not much organized needs assessment going on."

It's easy to understand why Gantz' assertion might be true. Personal computers are such an inexpensive way to expand personal power. Why get excited about something that's so obviously good and, at the same time, so cheap?

"Big-buck analysis goes with big-buck computers," says Judd Robbins of Computer Options, a Kensington, CA, consultancy. "Micros are so inexpensive, and the hype from vendors has been so heavy, that needs assessment has been reduced to one statement: 'Go forth and buy.'"

In some cases, "revolutionary fervor" for personal computers is at the root of the tendency to leap with only a side glance at the consequences. "Needs assessment is contrary to the spirit of the microcomputer revolution," asserts David Geary, a management consultant based in Pittsfield, MA. "Any manager or executive—any employee—who believes he or she can do something intelligent or useful with a personal

computer should have the prerogative to do so."

A flood of personal computers, however, does not guarantee success, as many corporations have discovered. The tendency has been to view implementing personal-computing devices, particularly personal computers, as analogous to replacing old IBM Selectric typewriters with electronic models. But that just isn't the case. Even Geary concedes that microcomputers are best deployed in "an orderly, guided way, so that employees don't do inappropriate chores with them—like run a payroll system for anything other than a small business." Also, personal computers might not be the best way to implement personal computing. There are other options, like mainframe adaptations of microcomputer software.

After some trial and error, however, some corporations are belatedly taking up needs assessment. "The initial thrust in corporations was a kind of experimental approach to personal computing," says Thomas Samson, a consultant and former partner in the Dallas office of Arthur Young & Co. (New York), one of the Big Eight accounting firms. "Larger companies are beginning to incorporate personal computing into their strategic-planning process." Implementation is most successful if an organization does its homework, asserts Samson. "The tricky part of needs assessment is getting the tools in there when they're needed, and knowing when to say 'No' because they're not really needed."

The term *needs assessment* can be confusing. In one sense, it can mean a one-time study of the corporation, its needs, and how personal computers will serve them *before a single machine is purchased*. Ideally, a corporation appoints a high-level panel to study whether personal computing can be of value, and if it can be, how it will be implemented.

That's the ideal, however, and given the presence of thousands of personal computers in corporate America, it's also the exception. Every corporate assessment of per-



sonal computing is akin to a detached analysis. But most corporations can't start from scratch: They've got too many personal computers on hand. Doing a classic needs assessment would be trying to rewrite history. For these organizations, needs assessment is a game of catching up with users.

"Before last year, we were like everyone else," says John Hart, manager of office systems at Avon Products Inc., New York. "We had a few personal computers coming in here and there, and they caught on so well we knew we had to set up a procedure for specific requests."

The realization Hart describes really prompted a directive from Rainer Paul, Avon's vice president of information services. Hart recalls a meeting of Avon's information-services management team in early 1982 to discuss the phenomenon of personal computers. The team includes Hart, representing his office-automation group, and representatives from a separate personal-computing group, an in-house timesharing group, and central data processing. "We decided we couldn't let this phenomenon evolve on its own," states Hart.

Paul and the committee decided to take a "realistic approach"—they endorsed the use of personal computers and then framed procedures to both promote appropriate applications and control the influx of the technology. Says Hart: "As much as we didn't know about these machines, we did know that employees were latching onto them. We decided to set up a program to support them."

To help employees learn how personal computing might help in their jobs, the committee decided during the needs-assessment sessions to set



Proper attention to hardware, software, and usage standards from the outset will prevent wasteful decisions, says Rick Inatome, a computer retailer and seminar leader.

up a Creative Learning Center. It opened early last year. "The center gives employees hands-on training, but it also teaches them how personal computers can be useful and how that usefulness can be translated into return on investment," says Hart.

The committee made an unusual decision when designing the learning center. Rather than equip it only with personal computers that would be used in the workplace, the committee filled the center with all sorts of machines—even so-called home computers. Users can work with Atari Models 400 and 800, and the Commodore 64, a borderline business-home machine, as well as more business-oriented machines like the Radio Shack TRS-80, the Osborne 1, and Texas Instruments' Professional Computer.

"We decided to provide computers for any employees who were interested," says Hart. The home machines are an investment in the inventiveness of Avon's employees, he says. Indeed, the decisions that came out of the information-services committee's deliberations are built on faith in the ability of employees to make the technology pay—even if it takes a little time. "We wanted to provide facilities that would let people start at the

"Personal computing is not free, and the machines cannot be used as paperweights."

Hart, Avon Products

basics and move as far as they want," says Hart. "We even encourage them to do their own programming, with some limitations."

Avon has committed large chunks of time and money to personal computers, but Paul and the committee don't believe every application demands a personal computer. Indeed, the committee decided to dovetail the introduction of the corporate personal-computing plan with an existing review procedure for requests



The Creative Learning Center at Avon Products lets users experiment on a variety of machines, from Atari home computers to the portable Osborne 1 to the Texas Instruments Professional Computer.

to hook into its in-house timesharing system. (At the time, the system was less than a year old.) Requests for personal computers were added to the procedure, which is based on three criteria.

- Applications that require a high level of interaction with other computer systems, require a large number of transactions and inquiry/update requests, and have a big volume of input and output are assigned to *mainframes*.
- Applications that have only limited interaction with other systems and a moderate amount of records and transactions are assigned to Avon's *timesharing service*. These applications usually involve analytical processing.
- *Personal computers* are used for applications that aren't done better on a mainframe or a mini. These are usually independent tasks involving small numbers of transactions and records, and no interactions with other systems.

In case-by-case reviews, each request is judged by the committee against a list of criteria that was refined during the needs-assessment process to take in personal computers. The committee determined that some personal-computing chores are better done on bigger machines, says Hart, and proceeded accordingly.

"The committee gets involved when other solutions may be available for a particular application," he explains. "We might determine, for example, that giving a user an IBM 3278 terminal is a better solution than buying a personal computer."

Sometimes, of course, an employee's request is turned down. "We try to look for the *best* way, not necessarily the personal-computer way," says Hart. One user, for instance, recently asked for two personal computers for an office-automation project. "He wanted to integrate figures into text," recalls Hart. "In the course of the conversation, I learned that a large portion of what he wanted to extract was available on our in-house timesharing system. Timesharing seemed to offer the best, most economical solution." Of course, another simple solution might have been one personal computer with one integrated software package that combines text and numbers.

Heeding the corporate personality

Avon's peculiar circumstances—it already had a layer of personal computers, literate users, and a review procedure—helped to shape its assessment and implementation of personal computing. And therein lies an important point for executives: The touchstone of a needs-assessment

Needs Assessment

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strategy should be the corporate "personality." Heeding the organization's special needs and characteristics is a realistic approach. It also ensures that *someone* will examine the phenomenon of personal computing from a broad perspective.

Corporations that fail to frame a picture of themselves as they'll be, say, five years hence, risk painful consequences. Top management's most vital role in needs assessment and implementation is to outline its view of the corporation's philosophy and goals for the future, says consultant Judd Robbins. In the fast-changing world of information resources, a long-range view is an essential hedge against hasty purchasing decisions.

At Avon, the procedures, plans, and vision of Rainer Paul and his committee were the first steps toward Avon's systems of the future. The committee envisioned an integrated, almost invisible, utility of all-in-one workstations. Ultimately, Avon plans to use the personal computers it buys today as those workstations, says Hart. About 125 of the company's personal computers are already linked via a Digital Equipment Corp. VAX minicomputer, says Hart.

"As we install them as stand-alone machines, we're thinking that they eventually will be integrated into a network," Hart says. "Our challenge is to build that network, which will incorporate our existing resources and the systems that emerge during the next few years."

Evolutionary process

Often, this vision of the future develops gradually. At Bergen Brunswig Corp. (Century City, CA), one of the nation's largest distributors of pharmaceuticals and health-care products, a huge "invisible backlog" of mainframe applications was the seed for a program that introduced personal computing to the company. The program, in turn, became the nucleus of a comprehensive automation plan for the 12 top executives and their support staffers.

Eliminating the distributor's backlog of formal applications requests



and stillborn ideas for systems was the top priority of Anthony Vallario, vice president of information resources. "We had all these employees in various departments who couldn't get on our programming calendar," he recalls. Vallario brought the problem to the attention of a newly formed data-processing executive-policy committee three years ago. Robert DiMartini, corporation president, and Emil P. DiMartini, the chairman, encouraged Vallario and the committee to implement personal computing. Vallario's proposed solution was an information center giving users the power to prepare their own applications, mostly management reports, by plugging directly into the IBM 3081 mainframe at the heart of

a vast computer network.

This network had been installed years before, and only recently was upgraded. It links IBM System/36-Series/1 combinations in Bergen Brunswig's 40 distribution centers to the central mainframe. Terminals in about 6,500 retail pharmacies and hospitals access the system.

Bergen Brunswig's system processes daily order and inventory information, producing reports on the previous day's activities by the following morning. Those reports are essential to the running of Bergen Brunswig, but Vallario and the committee saw opportunities for all sorts of other reports from this wealth of information. Vallario's programmers were simply too backlogged to do all the programming necessary. The alternative was to give users direct access to information and the ability to display it or print it out in a meaningful form.

The information center was opened in August 1982. In its initial form, it let users design and get their own reports on IBM 3270 terminals linked to the 3081 running IBM's ADRS—A Departmental Reporting System. As such, the center provided only a small measure of the capabilities that have come to be associated with the



A key consideration in Foxboro Co.'s assessment of personal computers was the need to preserve the integrity of the manufacturer's database, says David Vigor, vice president of corporate-information services.

"For me, anything less than peak performance for your computer system is unacceptable."

Jane Jacauso

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Needs Assessment

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term *personal computing*.

ADRS, in some cases, is too rigidly structured to handle the kinds of ad hoc chores that users can do on stand-alone personal computers. So, last November, after 90 mostly inexperienced users had developed 200 new or improved applications on the terminals, Vallario installed an IBM Personal Computer XT to give them more power and flexibility. (Bergen Brunswig is standardizing on IBM equipment.) This was the logical next step for the users trained on the terminals, he says.

From that small beginning, Bergen Brunswig has installed seven IBM PC XTs, and has several more on order. The machines are shared by departments. However, a department manager can get exclusive use of a machine if he or she demonstrates it will pay for itself in six months, says Vallario. To date, one such machine has been approved, he says.

But Vallario and the committee still hadn't achieved the goal of putting instant information into the hands of the company's 12 top executives. Accomplishing that goal is the aim of the second thrust of Bergen Brunswig's efforts. As Vallario recalls it, during the committee's consideration of the corporation's personal-computing needs, the question was asked, "How can we save time for our executives?" The answer was threefold:

- By automating existing nitty-gritty "paperwork" like travel schedules, calendars, sales-contact lists, and address directories.
- By giving the executives access to corporate computer files at any time, wherever they are.
- By building an electronic-mail system that eliminates telephone tag and missed connections.

Eventually, Bergen Brunswig's executives, armed with Sharp PC 5000 portables, will have all of these capabilities, says Vallario. At the moment, they've been introduced to the first of these three functions. "The easiest thing to get an executive adapted to is the way he or she already works," says Vallario. The se-



A huge "invisible backlog" of mainframe applications prompted Anthony Vallario, vice president of computer services, to suggest a program that gradually introduced personal computing to Bergen Brunswig Corp.

cond and third capabilities will be phased in over the next couple of years. The entire package, dubbed "the executive time-management system," is being developed in-house.

You need a strong leader

Bergen Brunswig's undertaking is a substantial one, to be sure. And it arguably could not have been planned and implemented without a strong

Assessing needs for personal computing is like preparing a business plan to enter a new market.

leader. Vallario, a 35-year company veteran, has that role: he's guru, arbiter, and field general. Vallario's imprimatur is required before any piece of equipment or service is purchased. It was at his suggestion that Bergen Brunswig decided to give corporate staff personal-computing power at a deliberate pace in a unified program. "Robert and Emil DiMartini were the inspiration," he says, "I'm just the honcho who tried to tie all these re-

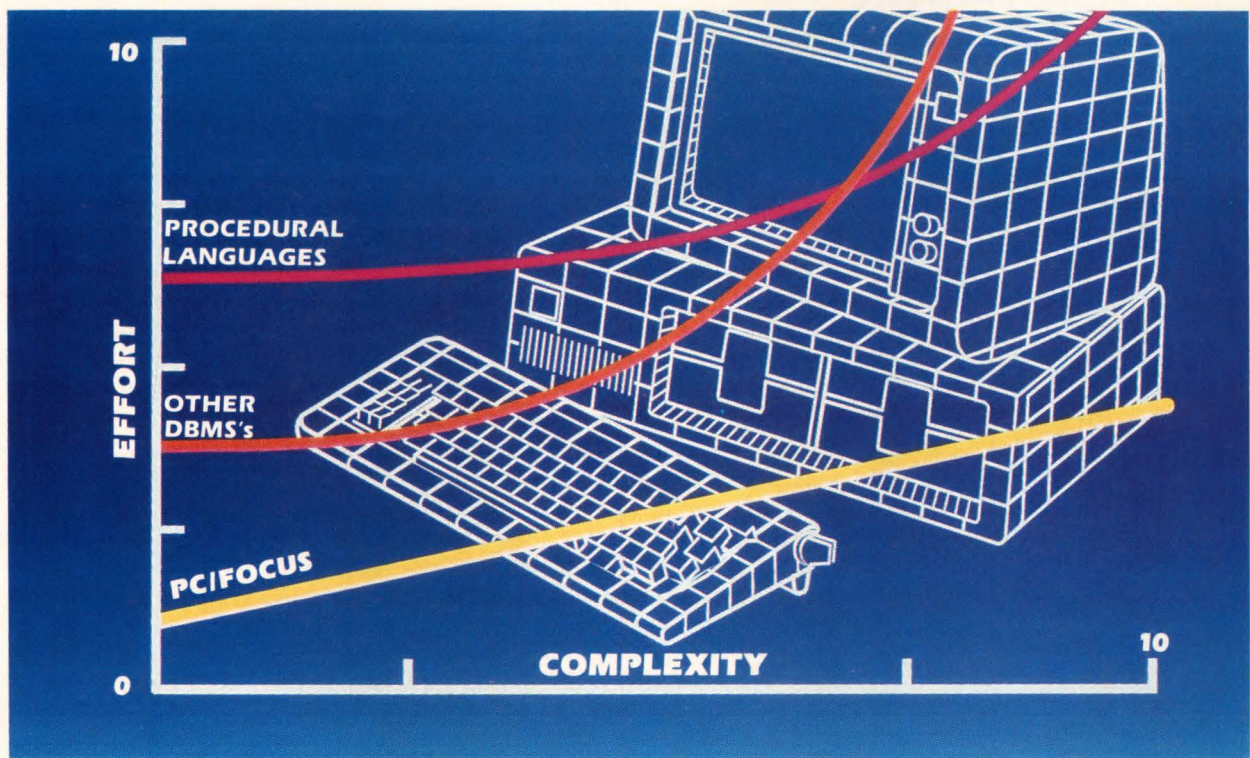
sources together."

Also, Vallario decided that the time-management system and other personal-computer applications should be written in-house, either by programmers or by users following clear standards. "We're concerned about building security, confidentiality, and responsibility into our system," says Vallario. "And we decided to do everything ourselves." Bergen Brunswig uses some packaged microcomputer software; users are permitted to choose from a list of approved packages.

Vallario's motivation: "We want to be sure that personal computers are not abused, that they're adequately supported, and that the cost is justified." Standardizing on the IBM PC XT and an approved list of canned applications packages, for example, makes user training simple and economical, he says.

Most observers and experts agree that only managers like Vallario—who have the support of a corporate-policy committee—can bring the necessary "global view" to personal-computing assessment and implementation. Policy committees are vital, says Thomas Samson. "The key to a successful needs-assessment pro-

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Needs Assessment

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"Micros are so inexpensive, and the hype from vendors has been so heavy, that needs assessment has been reduced to one statement: 'Go forth and buy,'" says consultant Judd Robbins.

cess is an organization—a structure—that is specifically charged with bringing in personal-computing technology," he says. Ultimately, a committee must have a leader in the field, a czar, if you will, to honcho the corporate computing plan and convince users that it's sound.

Who's best for the job?

But the agreement ends right there. Vallario comes out of the data center, Hart is in office automation, and Harry Mah, Avon's personal-computer manager, is one of the new breed of managers responsible strictly for personal computing. Which manager is right for this job, anyway?

The answer to that question, which invariably comes up early in the assessment of personal computing, is the subject of considerable controversy. The choice usually comes down to one of the opponents of the data-processing wars: someone from management-information systems or

data processing (MIS/dp), or a key user.

Many corporations look to their top MIS/dp manager to implement personal computing because controlling costs is their primary concern. MIS/dp, after all, has lived with system audits and cost-justification requirements for years. Besides, personal computing is just another form of end-user computing. Even Avon, which might be considered more user-oriented than many corporations, gives MIS/dp these monitoring responsibilities. However, John Hart asserts that this authority is not wielded like a big stick. "Personal computing isn't free, after all, and the machines can't be paperweights," he says. "MIS/dp must be sure personal-computing devices are used, and used *effectively*."

On the other side of the debate, Samson and Judd Robbins advance the key-user manager theory. "The leader's got to be someone without a vested interest in any one department, someone who understands the flow of business through the or-

ganization's various parts," says Robbins. Those qualities will give the czar credibility with users throughout the organization."

MIS/dp often isn't the best source of a needs-assessment-and-implementation czar, asserts Samson. "This executive has to be a missionary. He or she will be bringing about big changes in the corporation—and coping with inevitable resistance among employees," says Samson. "He or she has to be as much a marketing expert as a technical guru."

No issue brings a debate between these two sides to a head like cost/benefit analyses. Should users be required to justify the cost of personal computers? Or is such a requirement a subtle, harmful constraint on innovation?

Most MIS/dp-grounded managers argue in favor of cost/benefit analyses. At United Technologies Corp., the Hartford, CT-based conglomerate, for example, executives and managers are required to submit cost/benefit analyses with requests

MIS' role in needs assessment

MIS' proper role in the assessment and implementation of personal computers as corporate personal-computing devices is a subject of controversy. Input, a Mountain View, CA-based consultancy, identifies the following levels of potential involvement by MIS in needs assessment. (Used with permission of Input.)

Controller	MIS seeks to plan and control personal-computer use as if the machines were extensions of existing end-use computing facilities.
Specifier	MIS seeks to define what user departments can and can't do with personal computers and how departments should proceed with implementation.
Coordinator	MIS seeks to guide, not dictate, the direction personal-computer use takes in the organization.
Information Provider	MIS makes a conscious effort to become Provider involved in personal-computer assessment without dictating direction.
Informal Advisor	MIS, or individual MIS staffers, assist Advisor departments and users upon request.



"As much as we didn't know about personal computers, we did know that employees were latching onto them. We decided to set up a program to support them." *Hart, Avon Products*

for personal computers, says John Bennett, corporate director of data processing. He doesn't understand what the fuss is all about: "Our people know how to do a cost-benefit analysis," he says. "It's not a problem for them as long as they know what the equipment can do."

James Haner and some consultants, however, insist that the intangible benefits of properly implemented personal computing defy traditional cost/benefit analyses. "It's futile to try to quantify the cost of having better information and be-

A needs-assessment checklist

The investigation

—How do we define *personal computing*?

—Will personal computing enhance our business plan? How?

—Which departments or executives will profit most from personal computing? Which tasks are they likely to automate immediately? Which ones later?

—How will personal computing affect other procedures and personnel?

—How does personal computing fit into our overall information-management plans?

—How will we provide personal-computing functions? Through stand-alone personal computers? Can we provide personal computing on existing terminals and stand-alone word processors?

—How many of each will we need? Can users share?

—Who will be in charge of needs assessment and implementation?

—Who will monitor the progress of

implementation?

—Should cost justification and audits be regular practices?

—Who will train users?

—Who will provide support and service?

Personal-computer selection

—Should we standardize on one vendor's equipment? Why? What are the advantages of buying more than one vendor's equipment?

—Will the personal computers be linked to the corporate database? How? When?

—Should database access be restricted? How will restrictions be enforced?

—Should migration paths be built into our implementation of personal computers?

—Do our "back door" personal computers fit into our new plans?

—In five years, how will the personal computers we buy today be used?

ing able to manipulate data," says Haner. "Cost/benefit analyses put too much emphasis on time, and that represents outdated thinking."

Too often, adds Robert Freeman,

senior research analyst at Input, a consultancy in Mountain View, CA, cost/benefit analyses fail to account for the impact of personal computers on the entire organization.

Interestingly, every organization contacted declined to provide a copy of a typical cost/benefit analysis. These analyses are standard-operating procedure for big systems, but are they a myth when it comes to personal computers, as some consultants suggest? Even if organizations require users to do cost/benefit analyses, doesn't that invite some "creative" use of figures to achieve the desired result? Obviously, the possibilities are real in both cases, and should be considered.

Avoid duplication

Regardless of who is in charge, proper attention to hardware, software, and usage standards from the outset will prevent wasteful decisions,



"The tricky part of needs assessment is getting the tools in there when they're needed, and knowing when they're not really needed." *Samson, consultant*

Needs Assessment

(Continued from page 123)

says Rick Inatome, one of the country's leading computer retailers, who also conducts seminars on how to implement micros in businesses. "The most important challenge is to avoid duplicating the corporation's most expensive resource," he says. "That

resource is not computers, but employees." Personal computers should make work more efficient, not require more work to be done.

Establishing links to one or more databases, for example, is a much more efficient way to get data to

microcomputers than is hiring an input clerk for an executive. Standards can range from the "IBM Personal Computer Only" stance to standardized data-presentation formats to documentation norms for users permitted to write their own programs.

Not only do standards facilitate the building of links between systems, they can be a prudent security measure. "Fifteen years ago, we'd go to a meeting, and three managers would have different sets of numbers on any particular item," recalls David Vigor, vice president of corporate-information services for Foxboro (MA) Co., a manufacturer of mechanical and electronic instruments. "A central database has eliminated that problem, but personal computers can split the information up into little pieces again."

Foxboro has IBM Personal Computers, and plans to tie them to its corporate database by the end of this year, says Vigor. The linkage software Vigor plans to use—Persyst from Personal Systems Technology, Irvine, CA—will run on the corporation's IBM 370/168 mainframe and protect data integrity by providing users with standards. Persyst enables Personal Computers *only* to emulate IBM 3270 terminals.

The formula for success in needs assessment and implementation may be different in each case—even in different sections of the same corporation. At United Technologies, the corporate brass leaves needs assessment to the managers of its various units. This approach has a certain appeal to an organization as diverse as United Technologies.

Rather than risk handcuffing the managers of its divisions, United Technologies decided to help them make intelligent decisions. "Our philosophy is to provide executives with a secure understanding of what personal computing can do for them," says John Bennett. Thus, United Technologies invested \$5 million in training on personal computers for 1,100 executives and managers. "It will help them make appropriate decisions," Bennett asserts. □



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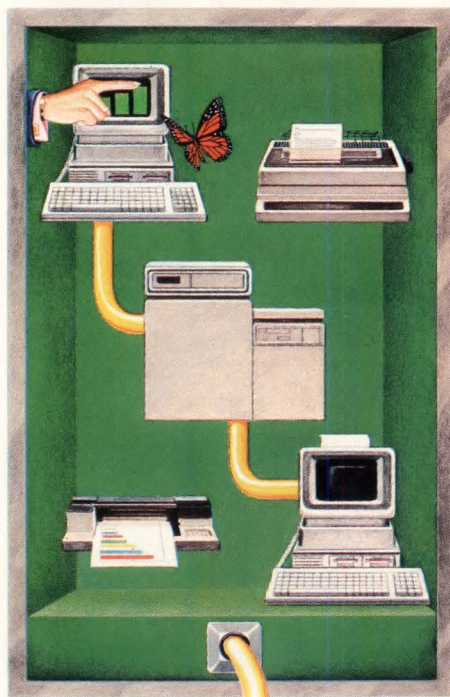
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CAPACITY MANAGEMENT

Part I: *It Keeps You Running*

The increasing emphasis on online systems to serve end users makes capacity management a necessity, not just a luxury.

by Joseph Braue, News Editor

Capacity management used to be like advice from your mother: You knew it was good for you, but you generally got along without it. That's no longer the case for a growing roster of corporations. As more and more batch shops are converted to online systems with heavy commitments to serve end users, capacity management has become more essential to the management of MIS/dp and the corporation as a whole.

The price of failure to plan for hardware-capacity needs may be unnecessarily large expenditures on dp resources. GTE, the Stamford, CT-based tele- and data-communications carrier, claims to have saved \$100

million over 10 years by more carefully planning for capacity increases. GTE's plan allowed it to get volume discounts and centralize its acquisition of hardware (see following article). In comparison, when two telephone companies each recently bought IBM mainframe systems, the one that didn't give its purchasing department enough time to negotiate a discount had to pay \$7 million more than the other company, according to one expert.

Capacity management has always given managers big cost-saving advantages, but until recently, they weren't critical to success. In the old days, many managers



Capacity Management, Part I

(Continued from page 129)

preferred seat-of-the-pants planning, or they bought the peace of mind that comes from stockpiling more equipment than needed as a hedge against unexpected leaps in demand. But the specter of hordes of terminal and personal-computer users waiting intolerable lengths of time for responses from the corporate mainframe has made capacity management a more critical factor in dp management. Moreover, an increasing number of industries—such as banks with automatic teller machines—are doing business with customers via computers, and they're even less likely to tolerate foul-ups and delays caused by capacity overloads.

Capacity management controls, measures, and plans for hardware, software, organization, and facilities to meet a corporation's current and future information-processing needs. It includes measurement of computer-system performance, forecasts of user needs, and plans that seek to define the dp capacity needed to support future corporate moves.

As more organizations recognize the importance of planning for capacity needs, capacity planning is expected to become similar to planning for other vital business resources. But capacity plans can't exist in a vacuum; they must take the business plan into account, according to proponents. For instance, if corporate planners don't tell dp-capacity planners about a new business venture on the drawing board, the capacity plan will be irrelevant.

Top management must be brought into the process if capacity planning is to be successful, say proponents. A complex planning process is useless if top management doesn't value it or know about it. Management must understand, support, and be periodically informed about the capacity-planning process. Instead of reporting to a low-level manager of technical services, the capacity-planning staff should be directly responsible to the MIS/dp vice president or director, experts say.

The picture of the ideal capacity-management setup is quite different



from the realities of most corporations. Only about one in five Fortune 1,000 corporations have serious capacity-management programs, say some experts. "Between 20 percent and 30 percent of the Fortune 1,000 corporations are attempting to do capacity planning," says David Vincent, general manager of the Institute for Information Management, Sunnyvale, CA.

A recent survey of 431 installations running under IBM's MVS operating system suggests that most corporations aren't set up to maintain effective capacity-management efforts. In the survey, by Morino Associates Inc., a software house based in Vienna, VA, most capacity planners said they didn't consider the corporate business plan when preparing for new user applications. The biggest beef of capacity planners in the survey was the lack of budgets for either staff or software tools. Finally, only 12 percent of the capacity planners surveyed report to the MIS/dp vice president; the remainder report to low-level operations managers.

H. Pat Artis, director of the Computer Measurement Group, a professional capacity-planning organization, estimates that about 90 percent of equipment purchases are the result of wing-and-prayer guesswork, vendor pressure, changes in a leasing arrangement, or sudden pressure from either higher-ups or the rank and file to increase service.

"Hardly any organization does capacity management well," asserts Maj. Stephen L. Horne of the Federal Computer Performance Evaluation

and Simulation Center (FEDSIM). "Some organizations attempt to do it only partially and many organizations don't do it at all."

Why aren't corporations leaping to capitalize on the benefits of capacity planning? Part of the answer to that question is cultural. Dp staffs have grown accustomed to being so busy fighting fires that they have no time to worry about serious planning for capacity needs, say Vincent and others. Many corporations that have capacity-management programs undertook them only after suffering through disasters brought on by unplanned capacity shortages.

End users hold the key

Some experts have touted the personal computer as the answer to soaring demands for central-mainframe capacity. Others assert that although personal computers often temporarily reduce mainframe-processing needs, micro users inevitably will demand access to the mainframe as a way of expanding their capabilities. When this hidden demand manifests itself, MIS/dp is in a no-win situation. A surprise spurt of user activity can degrade service, disillusioning end users and lowering the ability of the dp center to meet traditional commitments, says Ronald D. Emrick, information-management staff officer for GTE Service Corp. in Tampa, FL.

Forecasting end-user requirements is a key task in predicting capacity needs, says Emrick. He warns against accepting a user's estimate of his or her needs at face value, however. Users have limited perspectives and may not understand the corporation's long-term plans. The result can be what Emrick calls "user-forecast droop," or forecasts that are accurate only in the short run. Capacity planners must contact corporate officers with access to long-range plans to balance user estimates, Emrick says.

Charging users for dp services and resources is an effective way to stimulate more reliable forecasts at the outset. Chargeback systems hit user departments where it hurts—in the

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Capacity Management, Part I

(Continued from page 130)

budget—and usually prompt them to consider their requirements more carefully. Moreover, experts recommend that dp departments enter into service-level agreements (SLAs) with end users that clearly define levels of response time to be achieved in the future.

David A. Heim of IBM's Information Systems Management Institute believes SLAs help predict end-user transaction-volume and response-time requirements. For example, at the Kemper Group, Long Grove, IL, you run out of capacity when SLAs can no longer be met, not when a processor, network channel, or disk drive is busy, according to Henry Steinhauer III, the big insurance carrier's capacity planner.

Once again, however, what experts say should be the case and what most

corporations actually do are entirely different creatures. In the Morino Associates survey, only 23 percent of the respondents had both SLAs and service-level objectives. About 70 percent had only service-level objectives, according to the survey.

David Heim recommends setting up SLAs for "bread-and-butter" applications, or those deemed to be essential to the corporation. For example, among insurance carriers, an essential application would be delivering premium notices; for a manufacturer, it would be order entry, billing, and inventory.

In many corporations, end-user computing is organized according to IBM's concept of the information center, and that poses a sticky problem for capacity planners. Unlike typical mainframe applications,

information-center applications provide decision-support services to users responding to unforeseen business problems, says Leonard D. Lipner of BGS Systems Inc., a software house in Waltham, MA. Thus, these workloads are usually erratic. The fourth-generation languages commonly used in information centers compound the problem because they're more resource intensive than those commonly found in more conventional online systems.

To figure out information-center capacity needs, Lipner suggests the dp staff measure several representative user applications and use them to calculate the resources consumed by the user *per connect hour*. Each session should be described, transactions per hour should be counted, and resource consumption (including ag-

Capacity-management software

Vendor	Package	Requirements	Price	Circle
Applied Data Research (201) 874-9000	ADR/Look	IBM 370, 30XX, 43XX, and PCMs under DOS or OS/MVS	\$11,400/DOS \$32,500/OS/MVS	625
BGS Syst. (617) 891-0000	Capture/MVS and Best/1-MVS	IBM 370, 43XX, and 30XX under MVS, MVS/SE, or MVS/SP	\$36,000	626
	Capture/VM and Best/1-VM	IBM 370, 43XX, and 30XX under VM/CMS	\$34,500	
	Crystal	Best/1	\$20,000	
	Info/Base	Capture	\$10,000	
BI Moyle Assoc. (612) 933-2885	Best/1-SNA	IBM 370, 43XX, and 30XX under MVS/TSO or VM/CMS	\$34,500	627
	BIMMontr	IBM systems under CICS/VS	\$54/month \$540/yr. \$1,080/lease	
Boole & Babbage (408) 735-9550	CMF/Monitor	IBM 370 and up under MVS	\$12,500	628
	CMF/PDB	Same systems	\$39,500	
	CMF/Model	Same systems	\$30,000	
	IMF/Workload Monitor	Same systems	\$13,000	
	IMF/Workload Analyzer	Same systems	\$22,000	
	IMF/Resource Monitor	Same systems	\$13,000	
	IMF/Resource Analyzer	Same systems	\$20,000	
California Software (213) 829-0361	Netman	IBM 370, 43XX, 30XX, and PCMs	\$19,500 to \$37,500	629

gregate cpu, I/Os, and memory requirements) measured. Service-level objectives should be based on the performance requirements for each of these prototypes and workload forecasts based on the number of connect hours anticipated for each session.

The resulting plan should describe the number of concurrent prototype sessions of each type that can be supported at specific service levels. The prototype sessions should be used as a basis for service-level objectives.

Good measurement and planning mean nothing if the MIS brass and top executives don't support the process. "Corporations that embark on capacity-planning efforts that attempt to solve only technical problems run a high risk of irrelevant conclusions and failed programs," asserts Sidney Finehirsh, a New York-based consultant. Plans must not only be carefully compiled, but also effectively sold to top management, adds H. Pat Artis of the Computer Meas-

urement Group. Capacity planning that is not part of the corporate budget is doomed to ineffectiveness, Artis says. Yet, only about 10 percent of the capacity planners who attend his lectures have an allocation in the corporate budget.

The top MIS executive must get in on capacity planning for practical reasons. Only he or she has enough clout to make decisions that affect the planned life of dp equipment, experts note. In addition, only the brass can decide how much to spend on qualified staff and data-reduction and forecasting software. But there are other reasons for getting involved that are just common sense. Constant monitoring of the capacity-planning process by dp management is necessary to avoid the rude surprise of an unanticipated need for equipment, says Finehirsh. And huge outlays for capital equipment could hang in the balance of a capacity-planning effort.

Corporations with successful pro-

grams recognize that capacity planning is a high-level responsibility. Most have the capacity-planning department report directly to the vice president of MIS, notes David Vincent. If the capacity planner is seen as a flunky, executives who have custody of closely guarded future plans won't cooperate. "Capacity planning is really the vice president of MIS' job, and he or she is delegating that responsibility," says Vincent.

A highly placed capacity-planning department will also be better able to cut through corporate politics to get its work done, says Sidney Finehirsh. Capacity planners have access to sensitive information—about which department is hogging resources, for example—and fears that the information could fall into the hands of corporate infighters may cause some managers to hide it, Finehirsh says. The capacity-planning department must be above politics.

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Capacity Management, Part I

(Continued from page 133)

ties of capacity-management departments, the experts and the corporations once again part company. Most experts believe capacity planning and performance measurement require different skills. Performance measurement is a technical discipline, while capacity planners must be more people-oriented and familiar with business problems. However, most corporations either lump capacity planners in with performance evaluators or hold them responsible for both functions. In the Morino Associates survey, 42 percent of the responding corporations had assigned

professionals to both performance measurement and capacity planning, 36 percent to performance measurement only, and a mere 23 percent to capacity planning only.

Which skills and qualities should the ideal capacity planner possess? He or she must be able to create reports that are easily understood by corporate executives, not the technical managers under which many capacity planners serve. "In the last decade, we've seen an escalation of technical skills with little or no attention to communicating ideas effectively to management," says Artis.

When making presentations, capacity planners should shun litanies about how they arrived at figures—concentrate on the bottom line of the balance sheet, Artis says.

Performance measurement contributes to capacity planning, but combining the two functions often compromises a planner's ability to plan. A common complaint among capacity planners who have to do performance measurement and fine-tuning is that they don't have time to plan.

When getting started, it's a good idea to avoid promising to do too

Capacity-management software

Vendor	Package	Requirements	Price	Circle
Candle (213) 207-1400	Omegamon	IBM mainframes and PCMs under MVS or MVS/XA	\$23,500	630
	Omegamon/CICS	Same systems under MVS, MVS/XA, or DOS/VSE	\$19,500/MVS \$7,500/DOS	
Computer Assoc. Int'l. (516) 333-6700	CA-Jasper	IBM mainframes and PCMs	\$14,000/DOS \$17,000/OS	631
	CA-Jasper/XMF	Same systems	\$6,000/DOS \$13,000/OS	
	CA-Jasper/CICS	Same systems	\$5,500/DOS \$8,500/OS	
	CA-Jasper/IMS	Same systems under OS only	\$12,000	
	CA-Jasper/RT	Same systems under DOS only	\$5,500	
Datametrics Syst. (703) 385-8677	Torch PMS	Sperry 1100 under Exec Level 36 and higher	\$24,750	632
Duquesne Syst. (412) 323-2600	QCM Performance Monitor	IBM 370, 30XX, and 43XX under MVS	\$14,000	633
	QCM/SPM	Same systems	\$6,000	
	QCM/SPI	Same systems	\$6,000	
	QCM/PDB	Same systems	\$6,000	
	QCM/JAB	Same systems	\$6,000	
Gejac (301) 864-3700	SRF	DEC PDP-11 under RSX-11M or RSX-11M Plus	\$3,995 to \$4,495	634
Goal Syst. Int'l. (614) 888-1775	Explore/XP	IBM 370, 43XX, and 30XX under DOS/VS(E)	\$5,600	635
Johnson Syst. (703) 821-1700	Jars/OS	IBM 370, 30XX, 43XX, and PCMs under MVS, SVS, or VS1	\$12,500	636
	Jars/DOS	Same systems	\$7,500	
	Jars/CICS	IBM 370, 30XX, 43XX, and PCMs under OS or DOS	\$6,000/OS \$4,000/DOS	
	Jars/VM	Same systems	\$4,500	

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Capacity Management, Part I

(Continued from page 134)

much at once. "Start with simple techniques that will produce practical results relatively quickly and make it easier to establish credibility," advises Jason G. Shane of the Automobile Club of Southern California.

One of the failings of newly created

capacity-management departments is a failure to identify which data are pertinent to planning. Capacity-planning tools will generate scads of data on system performance, but planners will fail if they allow themselves to be buried. Shane recommends that MIS/dp managers pre-

vent planners from spending all their time analyzing data produced by tools like IBM's Systems Management Facility.

Which data should be gathered and analyzed? That question should be answered right at the outset, and the answers won't be the same for

Capacity-management software

Vendor	Package	Requirements	Price	Circle
IBM Contact local sales office	CICS/VS Performance Analyzer	IBM 43XX and 30XX under DOS/VS or OS	\$163/mo. (DOS/VS)	637
	SMF	IBM 43XX, 308X, and System/3 under VS1 or MVS	\$20/mo. (OS) \$29/mo.	
	SMF Trace Correlation Aid	IBM 308X under OS/VS or MVS/XA	\$125/mo.	
	SMF Geographic Analysis Program	IBM 43XX and 30XX under OS/VS, MFT, or MVT	\$200/mo.	
	SMF Job Data Compression Aid	IBM 43XX and 30XX under OS, OS/VS or MVS/XA	\$142/mo.	
	RMF Version 2	IBM 4381 and 30XX under MVS	\$380/mo.	
	RMF Version 3	IBM 4381 and 308X under MVS/XA	\$700/mo. \$2,100/license	
Macro 4 (201) 895-4800	System Accounting	IBM 370, 43XX, 30XX, and PCMs under DOS/VSE	\$200 to \$450/mo.	638
McAuto (314) 232-0232	IMS/Maps	IBM mainframes and PCMs under MVS	\$20,000	639
Morino Assoc. (703) 734-9494	MICS	IBM 370, 30XX, and 43XX under MVS or MVS/XA	\$28,600/license \$8,000/renewal fee	640
	TSO/MON	Same systems	\$16,700/license \$2,000/renewal fee	
	MICS-Basic Capacity Planning	Same systems	\$6,000/license \$2,000/renewal fee	
Pace Applied Tech. (703) 369-3200	Komand/DAF	IBM 4300 and up under OS/MVS or VS1	\$16,000	641
	Komand/RBS	IBM 360 and 370; Amdahl 470/V-6	\$6,000	
	Komand/DIS	IBM 4300 and up under OS/MVS or VS1	\$5,000	
	Komand/Dams	Same systems	\$9,000	
	Komand/OLC	Same systems	\$3,000	
	Komand/CCI	Same systems	\$2,500	
	Komand/ICI	Same systems	\$2,500	
	Komand/VMCI	Same systems	\$2,500	
	Komand/Basic	Same systems	\$9,000	
	Komand/OBM	IBM 370 under OS/MVS or VS1	\$8,000	
	Komand/VS1	IBM 370, 30XX, and 43XX under OS/MVS or VS1; Amdahl; NAS	\$2,500	

every corporation. There are, however, some important categories of system information. Workload data, for example, should reveal the timing of all workload cycles.

Once a capacity plan is compiled, it should be regularly updated and republished. Kemper's plan describes the corporate strategy to meet future service demands at a level acceptable

to users, says Henry Steinhauer. Kemper publishes updates of a 26-page capacity plan projecting needs during the next two years every June and November.

Vincent predicts that the emphasis of capacity planning will soon shift to increased demands for storage and memory by personal-computer users. The next priority will be networks

and communications, as end users gain access to huge amounts of information in corporate databases maintained on mainframes and big minis. As a matter of course, these users will want to maneuver the information around the corporation, he predicts. If your organization isn't planning for future capacity needs, by then, you may wish you'd listened to Mother. □

Capacity-management software

Vendor	Package	Requirements	Price	Circle
Programart (617) 661-3020	Strobe	IBM 370, 43XX, and 30XX under DOS, OS, MVS, VS1, SVS, MVT, MFT, DOS/VSE, DOS/VS, MVS/XA, or SSX/VSE	\$9,500 to \$25,000	642
Raxco (301) 258-2620	Rabbit-2	DEC VAX under VMS, RSTS, or RSX-11M	\$2,500	643
	Rabbit-3	Same systems	\$2,000	
SAS Institute (919) 467-8000	SAS	IBM 370, 30XX, and 43XX under OS, DOS-DSE, SSX, or PM-CMS	\$7,900/license	644
Software Corp. of America (703) 471-1545	Fast DASD	IBM 360, 370, 43XX, 308X, 303X, and PCMs under MVS, VS1, SVS, OS, or MVS/XA	\$6,500	645
SPSS (312) 329-2400	SPSS-X	IBM mainframes under DOS, OS, or CMS; DEC 20 and VAX; Prime; Sperry 1100; Honeywell under GCOS and Multics; and Data General MV 8000 under AOS/VS	\$7,000	646
Star (203) 529-7128	VSum	IBM mainframes under DOS or MVS	\$4,500	647
Systems Applications (415) 472-4011	Perform	Prime 50 Series under Primos Revision 19	\$1,950	648
Unitech Syst. (312) 986-0133	U/ACR	Any IBM mainframe under OS/MVS	\$12,000 to \$19,480	649
University Computing (214) 353-7100	UCC-9/R+	Any IBM mainframe or PCM under OS	\$17,500	650
Value Computing (609) 482-2500	Comput-A-Charge	IBM 370, 43XX, and 30XX under VS1, MVS, or OS	\$14,000	651
		Sperry Exec-8 and VS9; Honeywell 66 under GCOS	\$20,000	
VM Software (703) 821-6886	VMAccount	IBM 370 and up under VM	\$8,500	652
	VMSchedule	Same systems	\$7,500	
Xidak (415) 324-8745	Main PM	For Mainsail programs on IBM 370 and PCMs under CMS; DEC VAX and System 20 under VMS or Unix; 68000-based systems under Unix; Apollo; ELXSI Syst. 6400	\$800 to \$7,000	653

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These savings have been achieved in two ways. First, GTE has negotiated master agreements with vendors. Second, we have centralized hardware purchasing to take advantage of the leverage afforded by volume acquisitions, which sometimes gives us discounts of up to 20 percent.

GTE is a telecommunications and manufacturing conglomerate, employing more than 200,000 worldwide. Divisions of the corporation are overseen by major operating groups. For example, the GTE Telephone Operating Group embraces telephone companies in the United States, Canada, and the Dominican Republic. Each individual company, or "business unit," has substantial latitude in the management of its computing resources.

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CIRCLE 66

Capacity Management, Part II

(Continued from page 138)

an organic process and an integral part of business planning. Our activities include:

- Support of corporate planning.
- Capacity planning within each data center.
- Consolidation of individual plans into a corporate plan.
- Services for hardware contracts, purchases, and leases.

Reduced costs are only one chapter in this story, however. While saving millions, we've also never run out of gas—failed to provide enough computer power to meet the ever-growing needs of a corporation that grossed almost \$13 billion last year. In fact, the savings may be less significant to GTE than the benefits of providing our business units with enough computing capability to fulfill their commitments in a timely and cost-effective fashion.

GTE's operations are supported by about 50 medium- to large-scale mainframes with the combined ability to process more than 350 million instructions per second (MIPS). In addition, GTE uses many minicomputers and small mainframes. (The smaller machines pose a significant capacity-management challenge.)

Strategic support of all GTE business units is provided by the Information Management (IM) Services Group. IM Services explores alterna-

tives to satisfy the capacity requirements of individual data centers, while maintaining a corporate perspective. This perspective results in significant savings from computer placement, for example. New acquisitions can be delayed or eliminated by moving computers between the business units. A bird's-eye view of computing resources also makes it possible for us to negotiate more favorable purchase or lease terms with vendors. It is corporate policy that the IM Services staff must review all proposals for equipment purchases that exceed \$1.5 million. Our recommendation accompanies the proposal to top corporate management for final consideration.

Despite our considerable involvement in the purchase and management of computer hardware, IM Services is not in a position of authority in the hierarchy of business units. We cannot impose our decisions on the business units; they cooperate by choice. However, most of the business units choose to participate in the corporate-planning process for good reasons. First, the capacity-planning system has credibility based on a track record of accuracy. Second, capacity management provides business-unit managers with objective support for equipment upgrades. Third, acting alone, each business

unit couldn't achieve the savings made possible by the centralized management of hardware and software.

GTE began planning for computer-capacity increases in 1974, as several large data centers started individual plans to ensure they'd be able to meet the needs of their business unit(s). From this early experience, a formal capacity-planning process developed. This methodology is set down in manuals that describe guidelines for determining workloads and computer-capacity calculations. The manuals are periodically augmented by special reports and white papers.

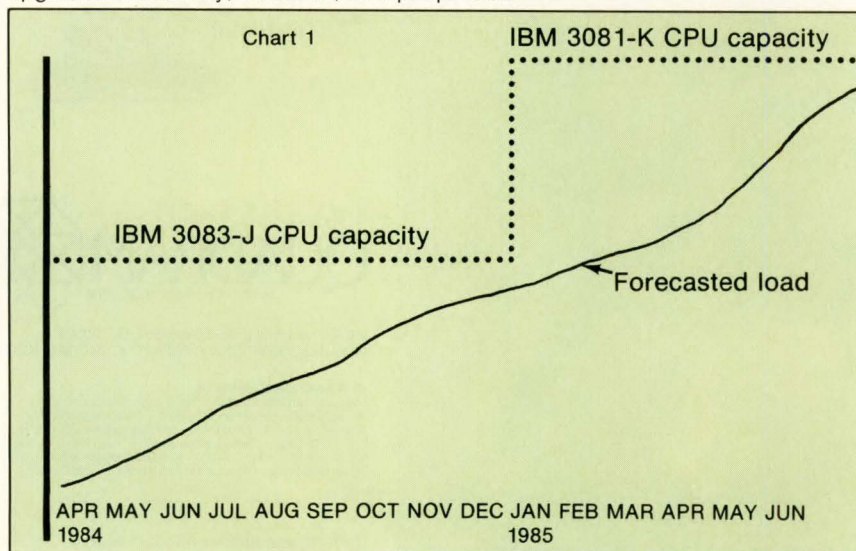
This system had deficiencies, however. Corporate support was given only to the large, established data centers. We didn't offer guidelines on how to plan the scale and makeup of new installations growing up around minicomputers being installed outside the big data centers. These deficiencies were remedied in 1982. The impact of personal computers on traditional data centers is currently being studied; we expect to formulate guidelines on micros this year.

How we plan

The corporate strategic-planning process is concerned only with the requirements of our large computing centers. We don't include data on the requirements of minicomputer-based centers at the corporate level, although contracting, purchasing, and leasing services are provided.

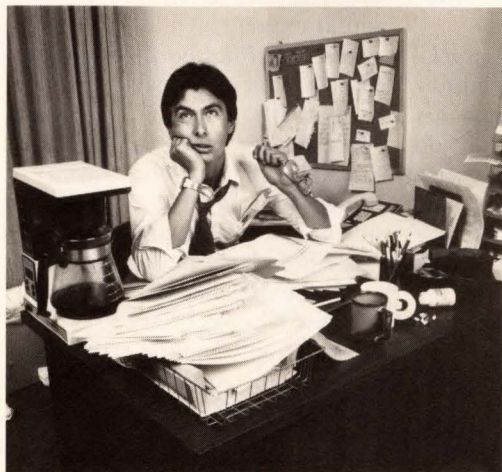
Resource-consumption tracking and computer-upgrade planning in the major computer centers are continuous. Each year, a new strategic five-year capacity plan is produced by each business unit, in step with the strategic-business-planning cycle, to reflect technological changes. Writing these five-year plans is a two-step process. Every spring, each major computer center prepares a five-year hardware study. IM Services' Computer Systems Technology Group then constructs from these studies a corporate hardware-placement plan. This placement plan attempts to fill requirements for computer upgrades

A load-line graph for two IBM mainframes. A similar process is used to plan upgrades of memory, channels, and peripherals.



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CIRCLE 67

Capacity Management, Part II

(Continued from page 140)

with equipment in GTE's inventory, rather than purchase new equipment.

If a data center needs an upgrade during the cycle, a hardware request is submitted to the management of the particular business unit, and then forwarded to corporate management for approval. If the equipment's cost exceeds \$1.5 million, the request must be reviewed by IM Services, and we check it against the appropriate business unit's five-year plan. In addition, the individual business units use their own projections to judge the need to make purchases of less than \$1.5 million. The request is also checked against current resource-usage figures and the most recent hardware plan. The timing and size of the upgrade should match the predictions.

The foundation of our capacity-management program is the annual Hardware Study Report, a compilation of reports from each data center. The consolidated report quantifies expected resource usage for the next five years, an obvious aid to us as we try to predict the computer equipment needed to cost-effectively handle the workload. Because in many business units these plans also form the basis for computing-hardware budgets, accuracy is imperative. To ensure consistency and accuracy in reporting, we've developed a six-step approach

to help planners in each data center prepare these plans.

Step 1—Quantify current workload: The data centers must quantify their current workload requirements and categorize applications into job groups based on growth. From several months' worth of data, an analyst selects a representative base month as a starting point for predicting future workloads.

Step 2—Estimate the impact of future development: Each applications-development group estimates the capacity needed for new applications and to accommodate changes in current applications. These estimates are given to capacity planners.

Step 3—Identify business growth: Growth must be determined for each application and translated into "natural forecasting units" (NFUs) that relate business growth to computer-resource consumption. For example, the number of employees is an NFU for the payroll system because additional computer resources would be required to process a larger payroll.

Step 4—Predict future resource usage: An analyst combines the current workload and the estimated application changes into a prediction of resource usage for the next five years. This usage is put on a "load-line graph" showing future load requirements. Load-line data are stored in a

database and compared to data on actual usage.

Step 5—Plan hardware upgrades: The "practical" capacity of existing hardware is calculated according to guidelines provided in our Capacity Planning Manual. The capacity of installed equipment is graphed alongside the load-line graph. If the two lines intersect, maximum capacity has been reached. A hardware upgrade will be necessary to prevent the degradation of online response times and the turnaround of batch jobs. (See Chart 1.)

"The foundation of our program is the annual Hardware Study Report, a compilation of reports from each data center."

Step 6—Select appropriate hardware: Planners order new equipment if a data center's graph warns of an impending overload. This may be necessary at many points during the five years covered by the plan.

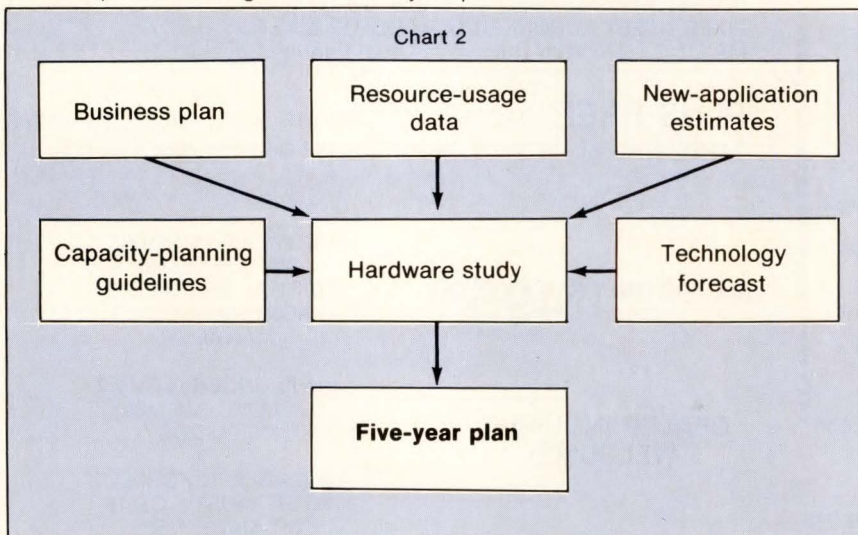
Each data center includes these figures and projections in the Hardware Study Report it provides to GTE Service Corp. for the consolidated corporate plan.

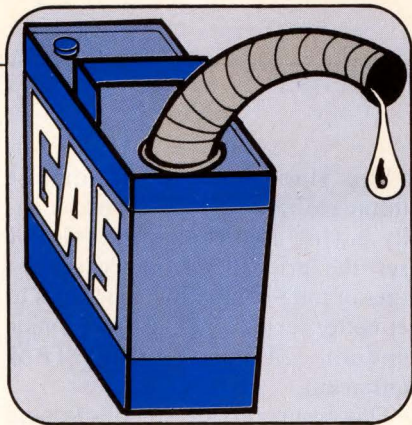
Planning in existing centers

We provide guidance and the tools necessary to follow this procedure. Over 10 years, our capacity-planning methods have evolved into a mature discipline, especially for existing computer centers. We believe several components are necessary to assemble a successful plan, and they're described in our Capacity Planning Manual. (See Chart 2.)

The guidelines include technical planning aids such as computer-power factors, recommended peak-utilization levels, overhead-cost standards, paging and memory guides, and various input/output-device guidelines. We update these standards and guidelines to keep them current, and allow deviations from

The components that go into the five-year plan.





the norms when they are justified. For example, the computer-power factors are based on an average administrative workload, which may not correspond to the workload handled by a particular data center. Teleprocessing requirements and estimated operational costs are also provided.

As noted, application developers are required to provide resource-requirement estimates of new systems under development. (We provide a four-page form.) These estimates are stated in terms of NFUs so that they can be dovetailed with an NFU forecast to determine resource requirements for a given data center. The figures for a new human-resource system may be: 10 IBM Model 3083-J hours, 60 Model 3420-8 tape-drive hours, and 200 cylinders of Model 3380 disk space per month to serve 5,000 employees.

The last two critical factors in our capacity plans are the long-range business plan and technology forecasts. Without taking in the business plan, a capacity plan will be meaningful for only one year. The business plan will yield information vital for planning, like workforce expansions or new business ventures. IM Services provides an annual technology forecast including the estimated dates of new-equipment announcements.

Each of our computer centers has a capacity planner. In most cases, however, capacity planning is only one of that employee's duties. The capacity planner usually also analyzes computer performance, for example. The capacity planner must take performance data and information on the other operational aspects described in our manual—some of which are imprecise and subjective—and combine them into a cohesive hardware study.

Selecting computer architectures for and determining the size of new data centers is an entirely different process. Many of our new computer installations spring up around minicomputers, mirroring an industry trend. While large mainframes may perform well with inaccurately scaled new applications, minicomputers are not as tolerant. (A mainframe's workload usually comprises many applications, diluting the impact of an error of scale in a single application.) Thus, mini-based computer centers must be more carefully planned. Where do organizations go wrong when planning these smaller data centers? We've identified three chief failings.

- Users and the application-development team fail to define or restrict anticipated uses of the system.
- Unexpected uses of the system after implementation exceed the capacity of a minicomputer or small mainframe.
- A minicomputer at the top of a vendor's line is selected, leaving no upgrade path.

IM Services attacks these pitfalls by specifically including capacity and architectural issues in the application-development cycle. These issues are often overshadowed by an application's functionality during development. We stress the importance of

applications modeling, prototyping, and formal estimates of resource consumption.

Our system also provides applications developers with an extensive list of questions that should be answered by the potential users. These questions probe the expectations of users and seek to stabilize them at a realistic level. The questions also seek to eliminate, or at least reduce, the possibility of unexpected changes that compromise the development and use of the application.

From a capacity-management standpoint, the major elements in a typical four-phase application-development cycle are shown in Chart 3. The procedure is designed to raise the consciousness of both designers and users at each stage of this process.

Support programs and tools

Our capacity-management program would be impractical and prohibitively expensive without automated tools. We've developed a comprehensive set of programs and software tools designed to help capacity planners put together their five-year plans. We also provide them with a variety of hardware- and software-performance monitors.

Our Hardware Resource Forecasting (HRF) software comprises

Many elements are required in a typical application-development cycle.

Chart 3

Feasibility study	Requirements analysis	Functional specifications	Detailed design
Build a business model	Service analysis	Complete general design	Complete detailed design
Identify possible users	Model the application	Refine model	Refine prototype
Define service needs	Select an architecture	Evaluate proposal	Evaluate design
Select possible architectures	Prepare request for proposal	Select hardware	Evaluate design alternatives using model
Frame joint user/design-group agreement	Refine operational estimate and joint agreement		

Capacity Management, Part II

(Continued from page 143)

several programs that consolidate current-resource-usage data; provide a five-year forecast based on current usage, future trends, and other events; provide comparisons of actual workloads and capacity forecasts; and automate selection of resources to satisfy the forecast.

We also use hardware monitors. These architecturally independent devices provide data that are otherwise unobtainable, like instruction counts, memory maps, and high-speed buffer-hit ratios. Hardware monitors are also very accurate. Hardware monitors have been used extensively in the GTE capacity-management process for the development and verification of our guidelines, calibration of software monitors, and measurement of benchmark results. The GTE Standard Benchmark gives our planners an indication of relative central-processing unit (cpu) power based on data collected by a hardware monitor. We maintain a table comparing 130 cpus (it is included in the GTE Capacity Planning Manual) based on these tests. The table is also used for price/performance comparisons and to devise chargeback systems.

Like hardware monitors, software monitors measure the activities of host computers. Because these monitors interact with the computer's operating system, they impose overhead on the host and their accuracy is less than absolute. However, they are easy to use and relatively inexpensive, and they provide software-dependent measures that hardware monitors cannot.

Our Computer Usage Database (CUDB) is an important tool; it was developed in 1980 and is now installed in most of GTE's largest installations. The database is based on SAS from SAS Institute Inc., with input from IBM performance-monitoring software. (See the vendor list that accompanies Part I of this article.) It is used for systems tuning, application tracking, productivity analysis, customer chargeback, database analysis, and validation of capacity-planning guidelines by indi-

vidual planners. (See Chart 4.)

The CUDB contributed \$185,000 to our overall cost savings by allowing most of our data centers to drop other software packages used for performance evaluation and operational management. Since the CUDB was developed, similar packages from independent vendors have become available. These packages offer a key advantage: They eliminate the need for programming support, an expense that must be continually justified. IM Services periodically reviews the commercial alternatives, but our in-house database has saved GTE more than \$400,000 over the cost of a commercial alternative.

Centralized management

The key to the cost savings we've achieved at GTE is centralized management and purchasing. We have a computer-inventory program featuring planned upgrades that reduces our vulnerability to technological obsolescence and increases our leverage with vendors and leasing companies. Even though each of GTE's business units is an independent profit center, IM Services' Hardware Management Group explores hardware-acquisition alternatives and negotiates all purchases and leases. This group's charter is to consolidate requests for computer equipment to take advantage of the benefits of volume purchasing and leasing. A separate corporate-contracts group has negotiated standard purchase contracts with major vendors of computer equipment.

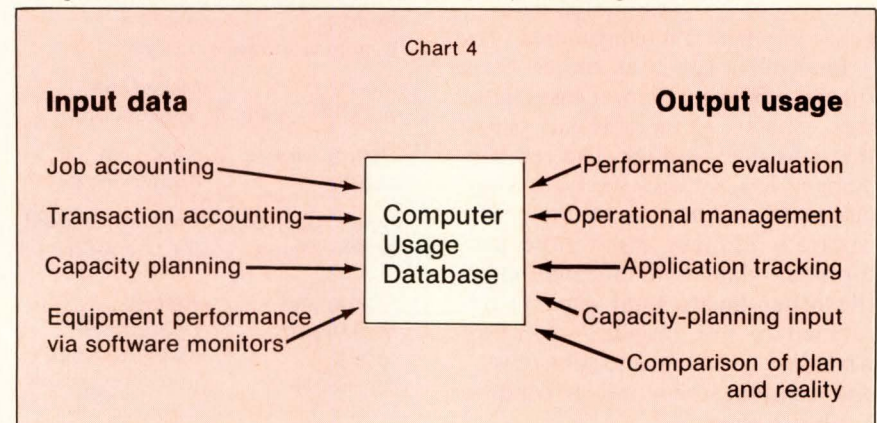
The generation of and results from GTE's Computer Usage Database.

The Hardware Management Group realizes savings by occasionally buying used equipment. Also, it uses the price/performance advantages of plug-compatible machines to get better terms for GTE from major vendors. GTE uses mostly IBM equipment.

This group also investigates leasing alternatives—from both the manufacturer and third-party companies. Bids are solicited from dealers and lessors under the terms and conditions of the GTE Master Lease Agreement. Favorable leases are sometimes obtained using GTE's purchasing power and by reselling equipment to a third-party lessor for leaseback. In the latter case, GTE purchases the equipment at a discount, passes the discount to the lessor, and receives a reduced rate on the leaseback.

GTE's many data centers are an advantage when leasing. More favorable long leases can be substituted for shorter leases when the short-term requirements of two or more data centers can be sequentially satisfied with the same equipment. As a center's use for the equipment ends, it is moved to the next center on the list. Although it costs money to relocate equipment, these expenses can be offset by the favorable terms of a long commitment. Corporate-level strategic planning lets us identify opportunities for these "consecutive installations" of equipment.

Even an extensive capacity-management policy will founder on





inaccurate information, and for that reason, we regularly check up on ourselves. In particular, the five-year hardware plans must be accurate. We evaluate the accuracy of ours by comparing the projected cpu usage to the usage of a "control group" of major installations that have participated in the system since its inception. The actual usage is measured in "MIPS months," or cpu power multiplied by the number of months the equipment has been installed or will be installed.

In addition, the Computer Usage Database lets us determine month by month whether our plans are on target. As each plan is prepared, the predicted resource usage is automatically included in the CUDB. Each data center compares its monthly resource-usage figures with the predictions. If a significant deviation occurs, the data center may have to revise its hardware plan.

So far, there has been only a slight variation between the projected and actual cpu usage over the first two years of each plan. However, the variation was significantly higher last year than the figures projected in 1981. The reason was the installation of the powerful IBM 308X-processor family, which accounted for big jumps in capacity. The 1981 plan assumed smaller incremental upgrades would take place two years down the road.

In such a fast-changing business, it's difficult to predict anything with certainty for five years hence. Only the first two years of our first five-year plans held up to comparisons with actual performance. Beyond that, unanticipated factors, such as new applications and changes in business requirements, were accounting for higher-than-expected increases in computer usage. In 1980, we began

adding 10 percent to our estimated cpu usage for each of the last three years of the five-year plans to compensate for these unknowns. The technique made the last three years of our plans somewhat more realistic. However, beginning with the 1983 plan, the contingency was expanded to 15 percent in the fourth year of each plan and 20 percent in the fifth year.

We add new factors to our five-year plans to reflect changing technology or market conditions. The 1983 plan included, for example, the anticipated impact of telephone deregulation on our computing needs. This plan also contained the first significant estimates of the impact of information centers on our capacity needs.

Limitations of our program

Our capacity-management program has paid handsome dividends, but it is not perfect. First, the IM Services staff doesn't have complete control over GTE's computing-equipment inventory, a limitation that is a by-product of the corporate structure. Were the various business units not decentralized profit centers, we could assert such control and achieve even greater efficiencies. However, absolute, central authority does not always result in the best service to all user communities. Because corporate-level capacity-management staffers work by consent of the business units they serve, they're more responsive.

Another limitation of our system is its indirect tie to service levels. Our recommended hardware-capacity limits are chosen to represent the utilization levels beyond which service degradation will occur. A system that directly related resource consumption and response time would eliminate some of the guesswork required by our procedure. However, a service-level-driven system would have to be more mathematically sophisticated than ours. Such a system would require that our capacity planners have more-specialized knowledge—for example, about queuing theory.

We're in the process of installing tools that automatically collect data on response times and put them in the CUDB, and we're reviewing commercially available response-time-oriented modeling techniques. These are the first steps in our evolution to a direct service-level-driven capacity-planning system.

Benefits to other companies

Can our capacity-management methods benefit other organizations? Absolutely! Not only are they applicable to information-management systems in general, but they're also useful for many other aspects of business planning. Consider the steps in capacity planning:

- Define the current workload.
- Define current capacity.
- Project changes in the workload via business planning.
- When the workload matches capacity, make an upgrade.
- Select a cost-effective upgrade.
- Project the workload against the new capacity.

This process can be applied to a cement mixer, a copying machine, a secretarial pool, or an entire factory. Organizations have used this planning procedure for years. Should information management be different from other business activities? We don't think so.

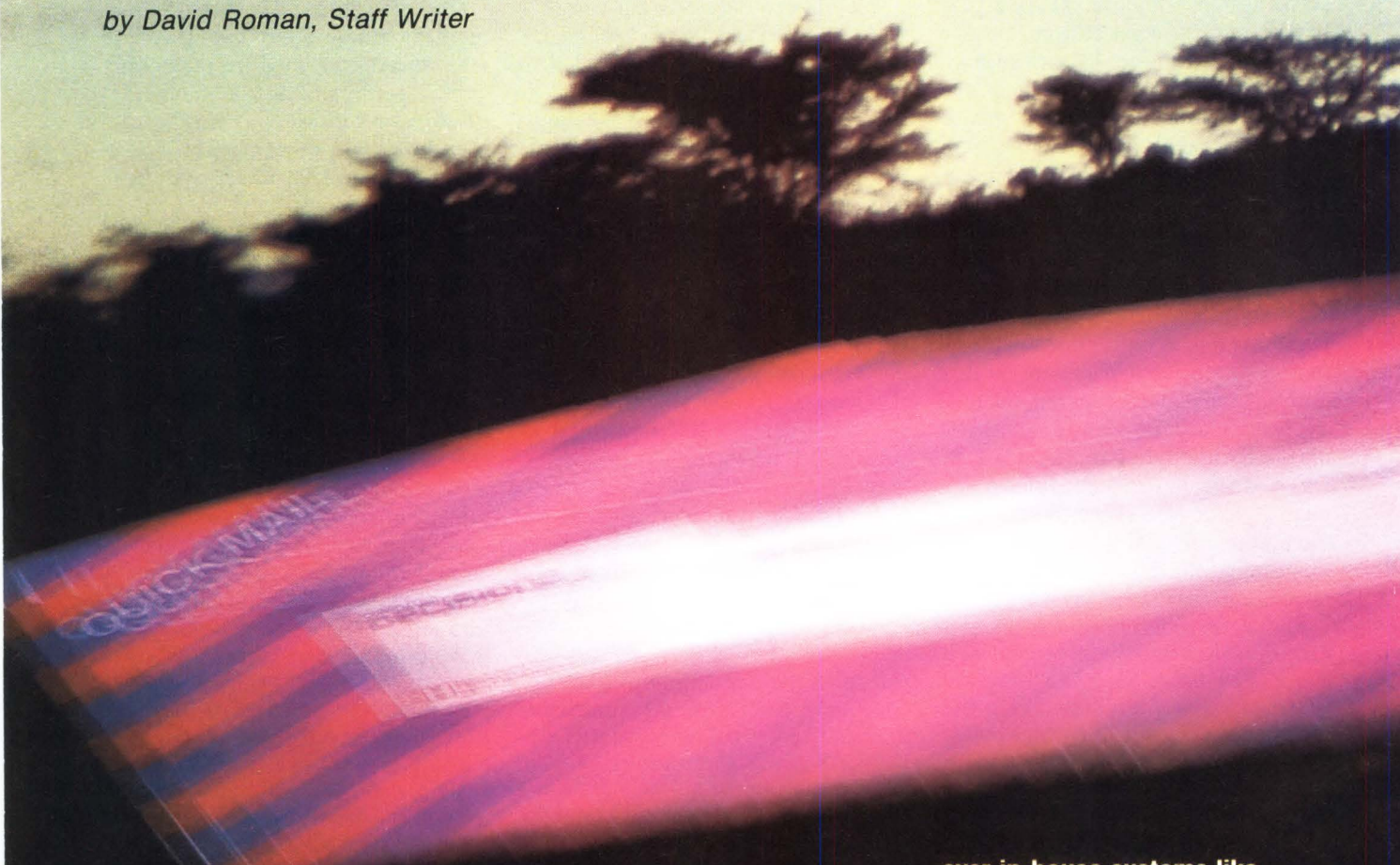
Not all the steps of GTE's capacity-management program are applicable to every organization. Obviously, a company with one data center will not need to consolidate separate capacity plans. Also, a smaller organization couldn't justify internal development and support of planning tools, rather than commercial alternatives. However, any computer installation, no matter how large or small, will benefit from a systematic approach to capacity management. □

The members of GTE's Computer Systems Technology Group who prepared this article are: C.L. Arnold, J.G. Busacca, J.R. Clary, R.D. Emrick, D.R. Johnson, I. Loffler, D.N. Meyer, W.E. Perry, and J.P. Robinson.

ELECTRONIC MAIL: FASTER THAN A SPEEDING BULLETIN

Electronic mail hasn't grown as rapidly as vendors and market researchers anticipated. Is that because networks aren't being put to the right use?

by David Roman, Staff Writer



Ron Jenks guesses that more than 80 percent of the traffic over Mailway, the electronic-mail network in use at Touche Ross & Co., consists of memos. The remaining traffic is made up of "reports, proposals, or staff-written articles" generally characterized as "rush documents" by Jenks, the Big Eight accounting firm's director of information services.

"It might be a final report for one of our clients," he offers as an example. "We can send it to another office for review, or to add finishing touches, or just to deliver it to a local client. We used to send these documents by courier, but it's far cheaper and, in many cases, far faster to send them over Mailway."

Electronic-mail networks are generally thought of and used as relay systems for short messages. However, a small but meaningful portion of the traffic

over in-house systems like Touche Ross' Mailway, and third-party networks like Tymshare Inc.'s Ontyme, is substantive, non-message information that is more a part of a specific organizational process than of informal communications. It is this portion of the traffic that will spur the oft-predicted but still-imminent burgeoning of electronic mail. So says Audrey Mandela, senior analyst with The Yankee Group, the Boston market researchers.



"Vendors are moving to where the real volume applications of electronic mail are," Mandela says. "For example, in transactions where employees report back to the corporate site daily with accounting reports or information on sales, but not simple messaging."

The Carrier Corp., the air-conditioning-equipment manufacturer in Syracuse, NY, has implemented such non-messaging applications on its electronic-mail network.

Every day, it sends shipping documents to its four distribution centers over the TOSS (Total Office Support System) electronic-mail system. The TOSS package, from National Business Systems Inc., runs on an IBM 3081 at Carrier.

"If we didn't have TOSS," says Ted Caron, senior business analyst, "we'd have to use regular mail service, which is slow, or express delivery service. That's also slower than

electronic mail and super expensive."

"A fraction, maybe one-fifth, of the traffic over electronic-mail networks is for non-messaging purposes," says John McQuillan, president of McQuillan Consulting in Cambridge, MA. However, that small amount of network use represents what is, to several third-party electronic-mail service vendors, the most appropriate use of an electronic-mail network.

"It's improper to present an electronic-mail network as a messaging system," insists

Electronic Mail

(Continued from page 147)

Joseph Porfeli, vice president and general manager of network applications and terminals for GTE Telenet Communications Corp. "Electronic mail will never survive if it is used merely as a memo generator.

"Look at the evolution of electronic mail," Porfeli continues. "Initially it was an additional application offered by computer-timesharing services. It was another feature of the remote-processing capabilities they were selling. The natural outgrowth of that would be applications that use electronic mail to gather information, not as a new way to provide mail service."

Application-related use of networks preceded their use as pure mes-

saging facilities, according to Scott Plakun, electronic-mail product manager for ADP Autonet, which offers an electronic-mail service called Automail. "Messaging evolved out of application-focused electronic-mail activities," he says.

The electronic mail offered by timesharing services like ADP Autonet was "very data-processing oriented," adds Audrey Mandela. Regular users of the service would be accustomed to this orientation and would have no difficulty integrating the electronic-mail capability into everyday applications, says Mandela.

Scott Plakun cites economic considerations in explaining why the first

electronic-mail-network uses were applications-oriented. "When corporate management would look at electronic mail," he says, "they'd want to know if they were getting their money's worth, or if they'd be better off without it. It's easier to measure the savings generated by an electronic-mail service if you say, for example, that all requests for purchase orders must be made through the service. Then you know how much time you're saving on an average transaction, how that translates into money saved, and whether or not it's worth offering the service to other departments."

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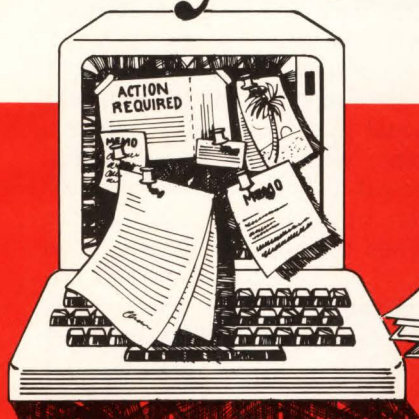
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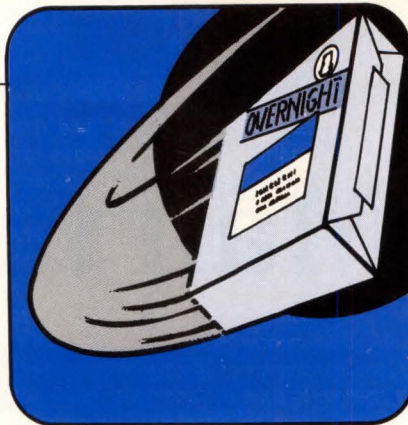
CIRCLE 68

Electronic Mail

(Continued from page 148)

population has helped expand electronic-mail networks. "The personal computer promotes electronic mail, not so much because it spreads familiarity with a keyboard or equipment, but because it makes that equipment available," says Tom Elliott, director of research for International Data Corp., the Framingham, MA, market-research group. "Fewer employees have terminals than have applications for electronic mail. The spread of personal computers, particularly those with communications capabilities, can only increase the number of devices people will use for electronic mail."

Ruann Pengov, general manager of



office-communications operations for GE Information Services, believes it will take more than communicating personal computers to encourage electronic-mail growth. "Electronic mail will take off when it's brought on as a production application in the mainstream of an organization's business," she says. "Electronic mail

will make major inroads when it's tied to an application."

Peat Marwick Mitchell & Co., the Big Eight accounting firm based in New York, uses ITT Dialcom Inc.'s electronic-mail network for several application-linked functions. Like Touche Ross, Peat Marwick shuttles reports back and forth between offices for review.

"We've gone through four revisions of a given report, going through both national and international offices, within a week," says Robert Gilges, principal-in-charge of information-system services. "The report can be reviewed by several professionals, so

(Continued on page 156)

Electronic-mail suppliers

In-house computer-based message systems

Executive Software
(213) 461-6688
Circle 446

Four-Phase Syst.
(408) 255-0900
Circle 447

H&W Computer Syst.
(208) 377-0336
Circle 448

Heuristic Developments
(703) 642-9333
Circle 449

Hewlett-Packard
Contact local sales office
Circle 450

High Tech Software
(405) 524-4359
Circle 451

Honeywell
(617) 895-6000
Circle 452

IBM
Contact local sales office
Circle 453

Infomedia
(415) 952-4487
Circle 454

Interactive Syst.
(201) 227-6511
Circle 455

Int'l. Teleconferencing
(303) 444-8877
Circle 456

Interprocess Syst.
(404) 257-1110
Circle 457

MAI Basic Four
(714) 731-5100
Circle 458

Nat'l. Business Syst.
(203) 677-8396
Circle 459

Nestar Syst.
(415) 493-2223
Circle 460

On-Line Software Int'l.
(201) 592-0009
Circle 461

Participation Syst.
(617) 729-1976
Circle 462

Prime Computer
(617) 655-8000
Circle 463

Softest
(201) 447-3901
Circle 464

Software Connections
(408) 988-3704
Circle 465

Sperry
(215) 542-4350
Circle 466

Sterling Software Mktg.
(916) 441-7234
Circle 467

STSC
(301) 984-5000
Circle 468

Systar
(408) 280-7066
Circle 469

Tandem Computers
(408) 726-6000
Circle 470

3M
(612) 733-1110
Circle 471

Top Down Syst.
(301) 251-9400
Circle 472

Transend
(408) 946-7400
Circle 473

TSR
(516) 487-0101
Circle 474

Vector Graphics
(805) 499-5831
Circle 475

VM Personal Computing
(212) 697-4747
Circle 476

Wang Labs.
(617) 459-5000
Circle 477

Warner Computer Syst.
(201) 692-9400
Circle 478

Xerox
(214) 689-6000
Circle 479

Communicating word processors

A.B. Dick
(312) 763-1900
Circle 490

AES Data Ltd.
(514) 744-6711
Circle 480

Algorithmics
(617) 237-7226
Circle 481

ATV Syst.
(714) 546-0119
Circle 482

Barrister Information Syst.
(716) 842-2700
Circle 483

Burroughs
(313) 927-7000
Circle 484

Compal Computer Syst.
(213) 652-2263
Circle 485

Compucorp
(213) 820-2503
Circle 486

CPT
(612) 937-8000
Circle 487

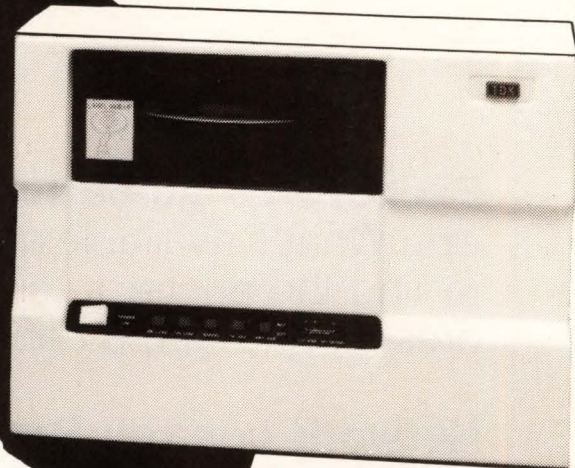
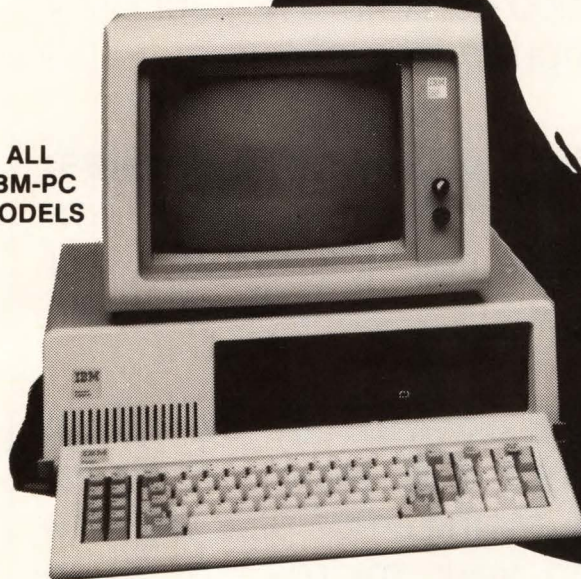
Datapoint
(512) 699-7000
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(714) 970-1515
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CIRCLE 75

COMING NEXT MONTH

Executive's guide to printers: What's available and how to find the printer to suit your present and future needs.

Network control: Don't get trapped in your own web: How to keep up with the most complicated and demanding aspect of computing—without going broke.

User-surly software: How to recognize unfriendly personal-computing packages.

Artificial intelligence: Out of the lab, into the workplace: Our fifth roundtable of the year examines how artificial intel-

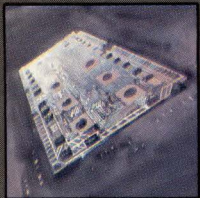
ligence can improve your daily computer operations.

Living with prima donnas: Star performers can be temperamental. How to keep your stars happy yet well-behaved.

Environmental control, Parts I & II: How to care for your mainframes plus ways to keep your micros operating smoothly and efficiently.

Outstanding data centers: A photographic tour through the Banks of Iowa computer-services department in Cedar Rapids.

**Isn't it about time for
the next milestone in
office information systems?**



1970

Four-Phase announces the industry's first all-LSI Central Processing Unit to give you increased performance in a smaller computer system.



1973

Four-Phase wins the largest-ever contract with the Federal Government for a data entry system.

Motorola/Four-Phase introduces The 6000 Series—a new milestone.

A milestone for new standards in office information systems from the company that started it all.

From the moment Four-Phase introduced the world's first all-LSI computer in 1970, we have consistently presented the industry with innovative hardware and software products to help make business more profitable and productive.

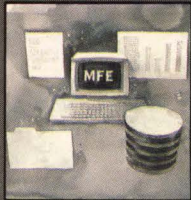
Today, as a member of the Motorola Information Systems Group, Four-Phase once again unveils another milestone in information processing—the new 6000 family of office information systems. Compact, powerful

processing units and flexible, capable software have been fused together into a family of systems that deliver maximum results today, with substantial expansion capabilities for tomorrow.

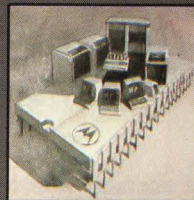
Technology for the real world.

Motorola/Four-Phase systems are tough enough and smart enough to deal with the real world—where speed, power, and reliability in a multi-user environment are prime considerations. The new 6000 systems feature the high-performance 32-bit Motorola 68010 CPU and an operating system derived from UNIX* System V under license from AT&T. We created





1978
Four-Phase announces The MULTIFUNCTION EXECUTIVE® (MFE), the first DDP operating system to allow multiple applications to run concurrently and independently.



1982
Four-Phase is acquired by Motorola Inc., combining our information processing expertise with one of the world's leading manufacturers of semiconductors and electronic equipment.

integrated system software that combines these two industry standards into a powerful, multi-user, multi-tasking environment that can stand up to practically any application.

There are two systems in the 6000 family. The 6300 supports 1-8 users, making it perfect for the smaller user or a remote office. The 6600 is a high-performance system designed to support up to 128 users. Both systems offer complete and integrated solutions—whether they're working in an operations-oriented environment where efficiency and precision are needed, or a results-oriented environment where flexibility and quality are key.

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At Motorola/Four-Phase, our commitment to you goes beyond providing quality, high-performance hardware and software. Support is just as important. Our award-winning Customer Support Operation is staffed with over 1,400 customer support specialists in over 175 cities across the nation. One phone call to our

Operations Center will ensure prompt response from the nearest available specialist. And you can call the Center 24 hours a day, 365 days a year.

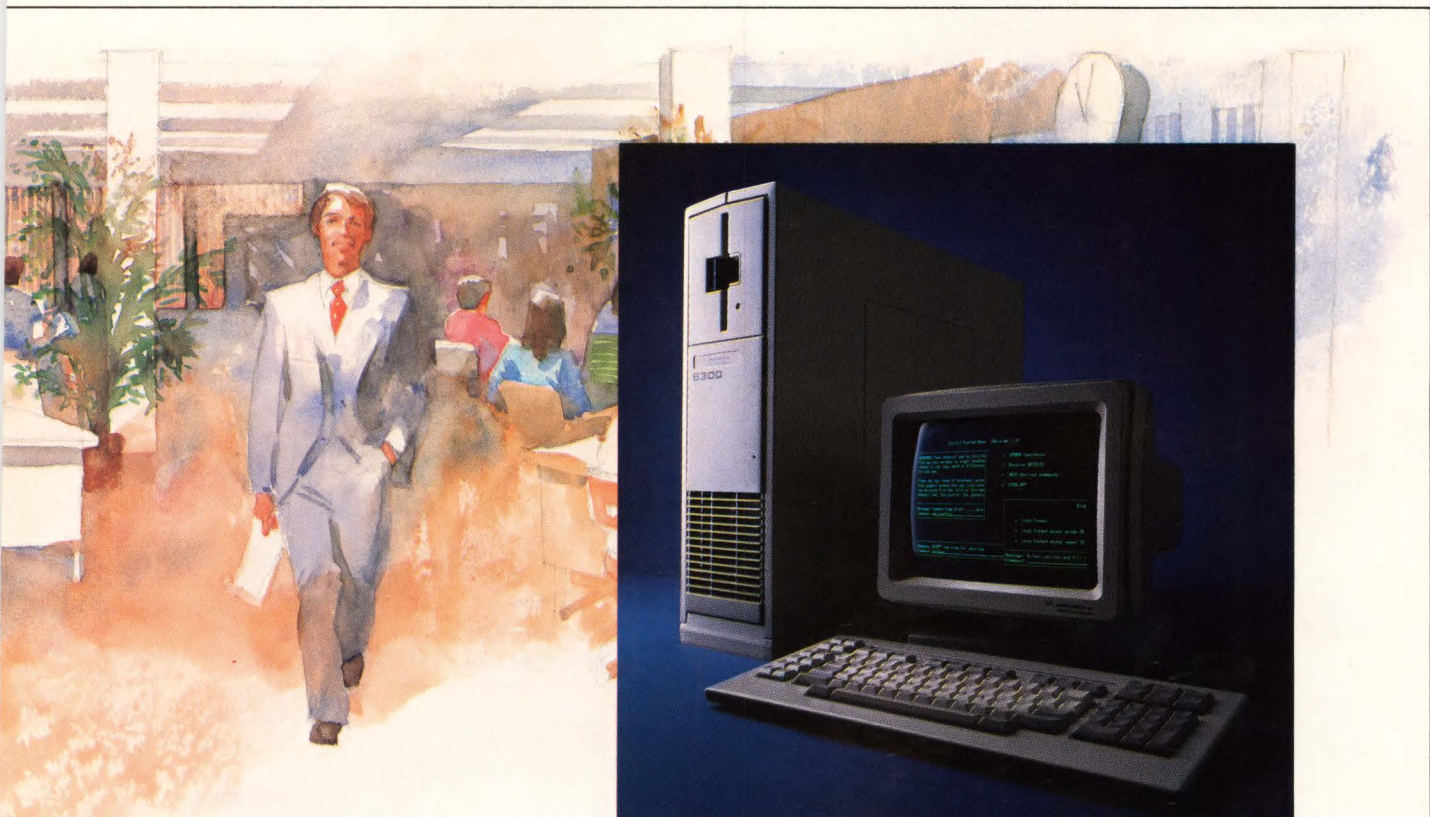
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1984

Motorola/Four-Phase announces The 6000 Series—a milestone in productivity that delivers information processing performance today, and expansion capabilities for tomorrow.

CIRCLE 73

Electronic Mail

(Continued from page 150)

that it's tailored to our particular needs."

The firm has also fashioned the Dialcom electronic-mail network into a talent-hunt facility. "If a job opportunity opens up, we can broadcast the kind of skills or work experience we're looking for over the network," says Gilges. "Say we need someone with experience in a particular industry. The system lets us search within the firm for someone with the right experience. We're better able to meet clients' needs when we can match personnel to a specific job."

Meeting agendas are also arranged with the help of the network. "We send out a working agenda to all employees who will attend—they are usually in different locations—and ask them for comments," Gilges says. "This helps get some agreement on

an agenda, and then everyone knows what we're going to talk about." Afterwards, summaries are sent to attendees the same way.

The electronic-mail networks of Touche Ross and Peat Marwick, though alike in some of their applications—particularly in report swapping and refinement—are considerably different. While Peat Marwick uses the network of a third party (ITT Dialcom), Touche Ross maintains its own in-house network by running Wang's Mailway software on a Wang OIS system. Both types of networks can handle extra messaging applications, as the practices of the two Big Eight firms attest.

Like Touche Ross, Carrier Corp. has an in-house system. The manufacturer's four distribution centers, 11 plants, and close to 100 sales and

service offices are all connected to the TOSS network. Service personnel at each location receive the latest technical information through TOSS. Regional sales managers can collect sales information from representatives on a daily or weekly basis, and then work that into reports sent to Syracuse headquarters.

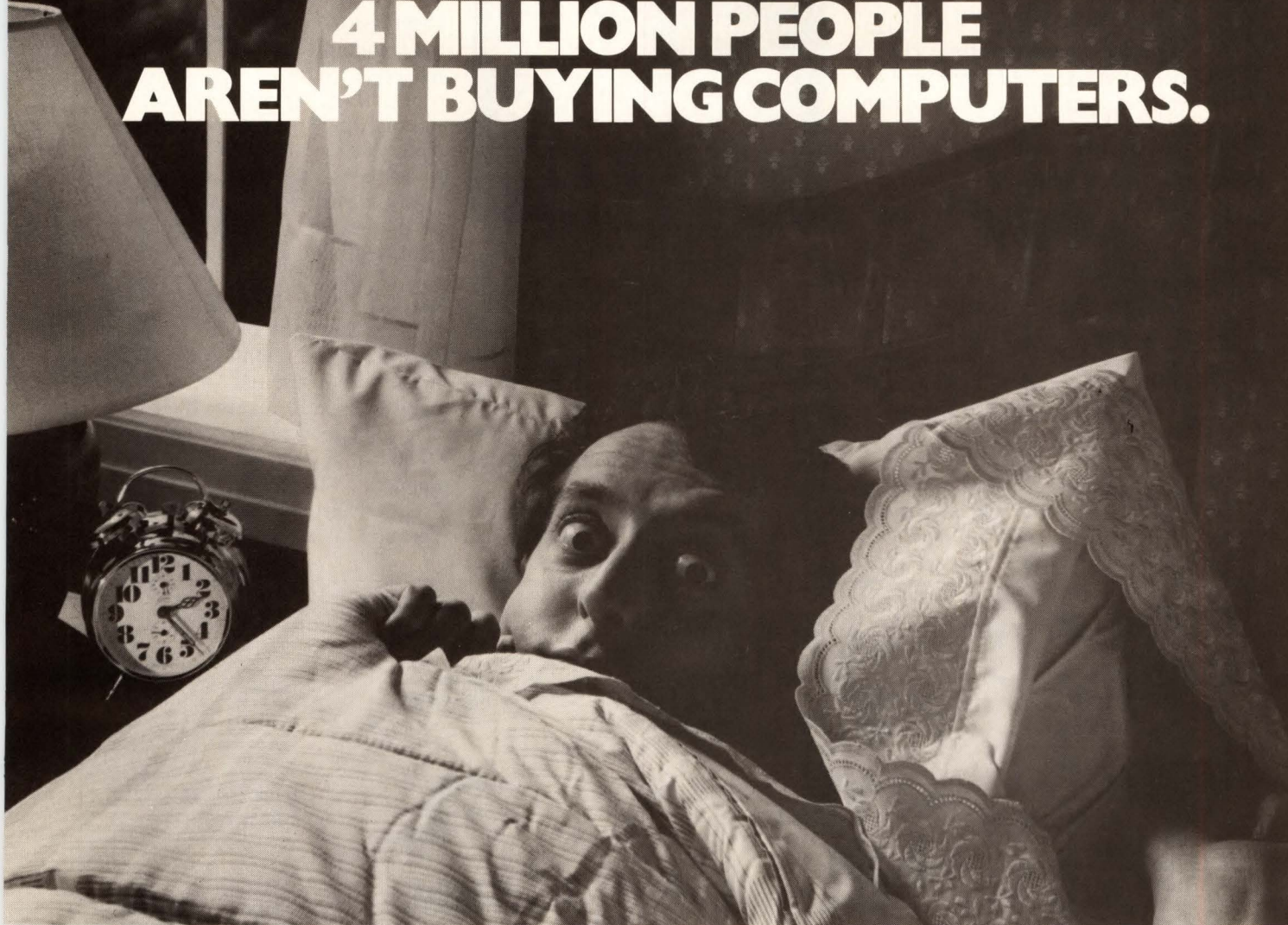
An electronic-mail network can always accommodate application-linked uses, even if none are originally intended or foreseen. Westinghouse Electric Corp., the Fortune 500 giant headquartered in Pittsburgh, is said to have one of the most extensive electronic-mail networks in use. It boasts some 5,000 users in almost 250 locations worldwide. About 100 new users are added every month. Under such circumstances, you'd think Westinghouse would be ripe for

Electronic-mail suppliers

Communicating word processors

Exxon Office Syst. (203) 329-5000 Circle 492	Megadata (516) 589-6800 Circle 499	Royal Business Machines (203) 683-2222 Circle 508	Wang Labs. (617) 459-9000 Circle 517	Canon USA (516) 488-6700 Circle 525
Four-Phase Syst. (408) 255-0900 Circle 493	NBI (312) 644-3900 Circle 500	Scientific Data Syst. (213) 396-5952 Circle 509	Wordplex (213) 889-4455 Circle 518	Exxon Office Syst. (203) 329-5000 Circle 526
Honeywell Information Syst. (617) 895-6000 Circle 494	Nixdorf Computer (617) 890-3600 Circle 501	Shasta General Syst. (408) 734-9360 Circle 510	Xerox (214) 689-6000 Circle 519	Infolink (312) 291-2900 Circle 527
IBM Contact local sales office Circle 496	Olivetti of America (914) 631-8100 Circle 502	Sony (212) 371-5800 Circle 511	XMark (714) 556-9210 Circle 520	Kentek Information Syst. (201) 825-8500 Circle 528
Interactive Computer Syst. (914) 358-0025 Circle 495	Ontel (516) 364-2121 Circle 503	Syntrex (201) 542-1500 Circle 512	Zenith Data Syst. (312) 391-8860 Circle 521	Litton Syst. (516) 567-7770 Circle 529
Lanier Business Products (404) 329-8000 Circle 497	Philips Information Syst. (214) 386-5580 Circle 504	Tandy/Radio Shack (817) 390-3011 Circle 513	Zentek (408) 727-7662 Circle 522	MCI Int'l. (914) 937-3444 Circle 530
MAI Basic Four (714) 731-5100 Circle 498	Q1 (516) 732-3800 Circle 505	Tech. Int'l. (305) 859-4170 Circle 514	Facsimile equipment	
	Raytheon Data Syst. (805) 499-5911 Circle 506	3M (612) 733-1110 Circle 515	Alden Electronic (617) 366-8851 Circle 523	Mitsubishi Electronics (213) 515-3993 Circle 531
	Rothenberg Information Syst. (415) 965-7380 Circle 507	Vector Graphic (805) 499-5831 Circle 516	Burroughs (203) 792-6000 Circle 524	Muirhead North America (201) 233-6010 Circle 532

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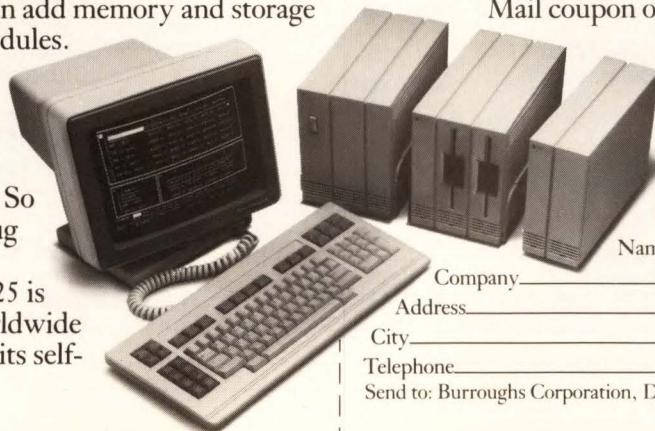
And you can build a B25 network just by adding workstations. It's the only network designed to share data simultaneously. So entire departments can plug into the same data bank.

Needless to say, the B25 is backed by Burroughs' worldwide service and support. Plus, its self-

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Company _____

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City _____ State _____ Zip _____

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Electronic Mail

(Continued from page 156)

application-linked uses. Yet, it emphasizes that the network (ITT's Dialcom) is to be used only to send short messages—with a few exceptions.

"If the message is long, then you don't send it by electronic mail ... unless it's urgent," says Bonnie Staley, training administrator. "If it's so long that it can't be read off the screen and has to be printed out, then it probably should be sent as hard copy anyway, unless time is of the essence. If it can wait out the time it takes to go through the regular mail, then it should be sent that way. A stamp is a lot cheaper than connect time."

A special-case scenario was set up in 1982 when Westinghouse renegotiated contracts with all its major unions. Negotiations took place at



corporate headquarters, but it was important for negotiators to stay in touch with their contacts, the personnel-relations managers at each of Westinghouse's domestic locations. "All our major communications were carried through electronic mail," Staley says. "Information was getting to the locations much faster than it had in the past."

It was also arriving at the various destinations almost simultaneously, an important benefit as negotiations

progressed, and an impossibility if the communications had been left to the Postal Service. "We arrived at a contract and wrapped up our negotiations much quicker because of the electronic mail," Staley says, "and we saved thousands of dollars."

In the past, when contracts had to be duplicated and sent through the mail, reproduction expenses and the cost of overtime for clerical employees were high. The contract negotiations brought electronic mail's benefits to the attention of Westinghouse executives, and Staley says the network's performance "helped sell electronic mail to the corporation."

That may be true, but to say that application-linked usage is needed to "sell" electronic mail to every corporation, as some of the big service

(Continued on page 160)

Electronic-mail suppliers

Facsimile equipment

NEC America
(516) 752-9700
Circle 533

Panafax
(516) 364-1400
Circle 534

Pitney Bowes
(203) 356-5000
Circle 535

Rapicom
(201) 575-6010
Circle 536

Stewart-Warner
Datafax
(312) 292-3000
Circle 538

Telautograph
(213) 641-3690
Circle 539

3M
(612) 733-1110
Circle 540

Xerox
(214) 689-6000
Circle 541

Facsimile services

Air Couriers Int'l.
(602) 955-9710
Circle 542

Graphnet Syst.
(201) 569-7711
Circle 543

Syndifax
(212) 732-2252
Circle 544

WUI-Int'l. Facsimile
Svc.
(201) 825-5316
Circle 545

Microcomputer enhancements

Advanced Micro
Techniques
(415) 349-9336
Circle 546

Candela Electronics
(408) 738-3800
Circle 547

Computer Mail
Services
(313) 559-3266
Circle 548

Cornerstone
Computer
(703) 385-7373
Circle 549

Digital Marketing
(415) 947-1000
Circle 550

Intelligent Tech.
(415) 328-2411
Circle 551

Microcom
(617) 762-9310
Circle 552

Howard W. Sams
(317) 298-5400
Circle 553

Software
Connections
(408) 988-3704
Circle 554

Sumicom
(714) 730-6061
Circle 555

Systar
(408) 280-7066
Circle 555

Teleface
(212) 477-6802
Circle 557

Videodial
(212) 307-5005
Circle 558

Intelligent telephone workstations

Cygnat Tech.
(408) 734-9946
Circle 559

GTE Telenet
Communications
(800) 835-3638
Circle 560

Mitel
(613) 592-2122
Circle 561

Northern Telecom
(615) 883-9220
Circle 562

Sydis
(408) 945-1100
Circle 564

Minicomputer/E-Com interface

Software
Development &
Maintenance
(919) 552-5662
Circle 563

Three Syst.
(206) 842-6065
Circle 565

Electronic blackboard

Optel
Communications
(212) 741-9000
Circle 566

Optical character readers

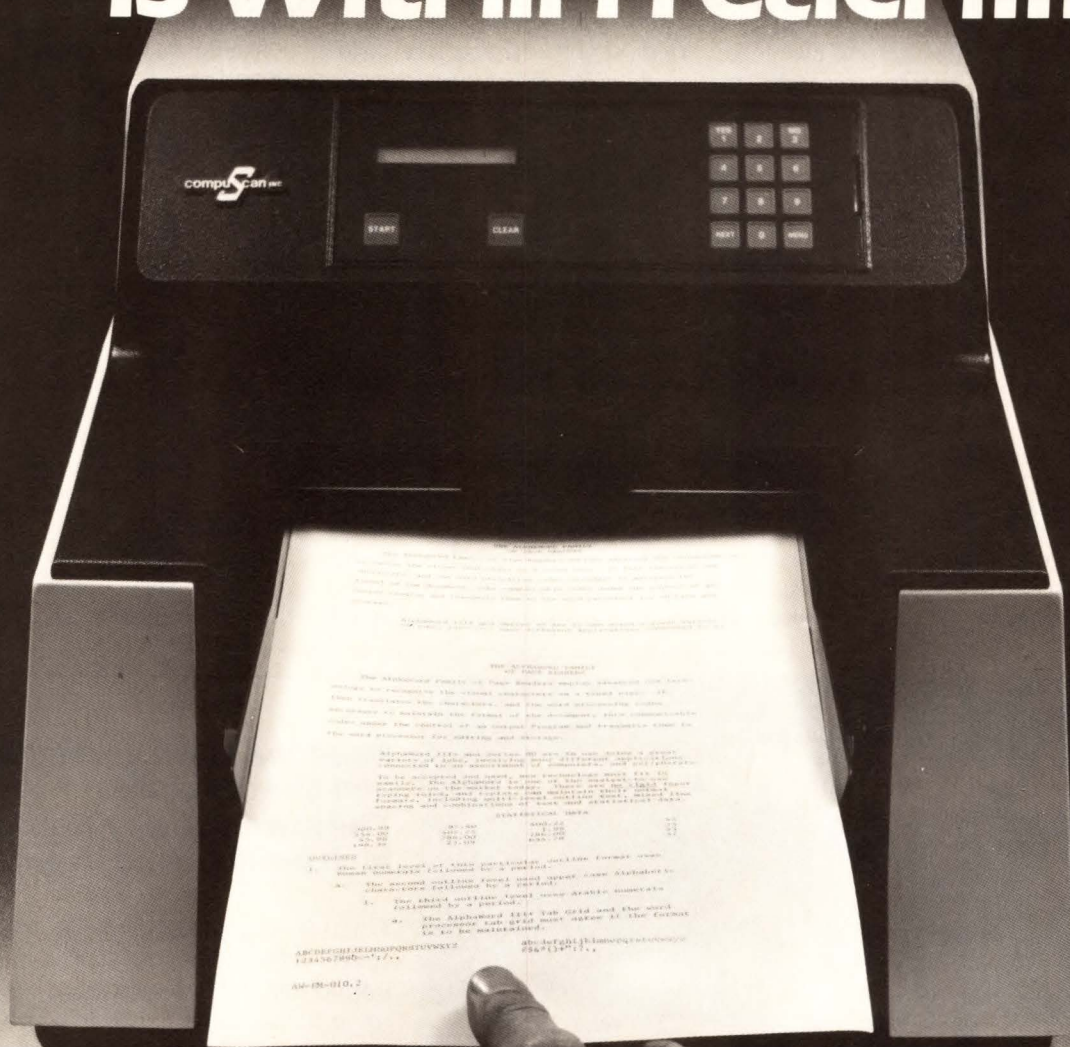
Compuscan
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Circle 567

Hendrix
(603) 669-9050
Circle 568

Teleprinters

(See 1984
Teleprinter
Comparison Guide
in April issue)

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CIRCLE 71

Electronic Mail

(Continued from page 158)

bureaus have claimed, may be an overstatement. The electronic-mail market has grown steadily over the past few years (at 20 percent to 65 percent annual growth rate, depending on whose figures you consult, and how expansive their view of electronic mail), but it has yet to catch fire. On the other hand, says consultant John McQuillan, it would be wrong to tie that less-than-spectacular growth to the non-application-linked use of electronic mail. "There's a place for application-oriented electronic mail," he says, "and there's also a place for pure messaging. If electronic mail hasn't caught on, it's for a lot of other reasons."

The communications catch

"Office-automation vendors have been so preoccupied with the personal computer that their attention has been diverted from communicating office equipment and electronic

mail," offers Ken Bosomworth, president of International Resource Development Inc., a market-research firm based in Norwalk, CT. "The problem is, there are no real communications standards," adds Leone Pease, a market analyst with the office-automation division of Venture Development Corp., Wellesley, MA. "You're unable to send a corporate-wide memo to Wang wp terminals and IBM dp terminals, unless you have some pretty expensive cabling. Most users can't even link their existing systems. That's what's held electronic mail back."

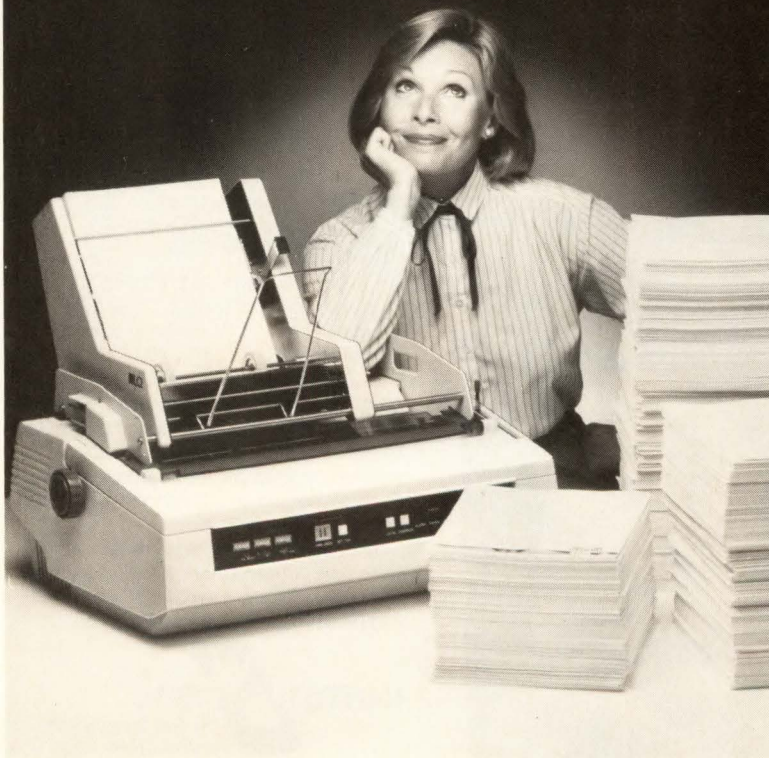
Vendors now pushing for the adoption of communications standards are basically pushing for the adoption of their *own* communications standards. However, if vendors and service companies did agree upon and implement message-handling standards, the door would open not only for different equipment to exchange messages, but for companies

that conduct business with each other to do so. "If electronic mail moves from intracompany to intercompany messaging, then you'll have broad market acceptance," says GTE's Porfeli.

Ruann Pengov doesn't believe the adoption of standards is likely, however. "A standard will develop if the market demands it," she says, "but it won't come quickly. There's no immediate incentive for one vendor to connect to another vendor's network."

For the moment, that leaves intracompany messaging, and for many organizations, that is enough. Ron Jenks says Touche Ross has considered having clients on its electronic-mail network, "but right now the primary communication is with people in the firm." A network with intercompany-communications capabilities would be nice, he says, "but it's still very beneficial without them." Who could argue? □

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MICRO-TO-LINK

Which micro-to-host computer communications solution makes the right connection for your organization?

A year after the personal computer displaced the "Man of the Year" as "Machine of the Year," the spotlight is shifting away from it just a bit. The links between host computers—mainframes and minis—and micros are the rage now. Judging by the intensity of the hype and hoopla, "Family of the Year" may be the next honor hung on computers.

The products that forge these links are seductive:

Micro-to-host communications open corporate databases and powerful peripherals to personal-computer users, distribute data to employees who need them most without

compromising security, and give micros lines to communicate with one another. The promise to bridge so many of the gaps in automated systems at one time is compelling. But before you move, recognize two dangers. First, make sure you get the kind of micro-to-host connection you need. Second, don't let overblown expectations about a "preannounced" product blind you to another product's potential. Early announcements are nothing new in the personal-computing business, but some of the micro-to-host

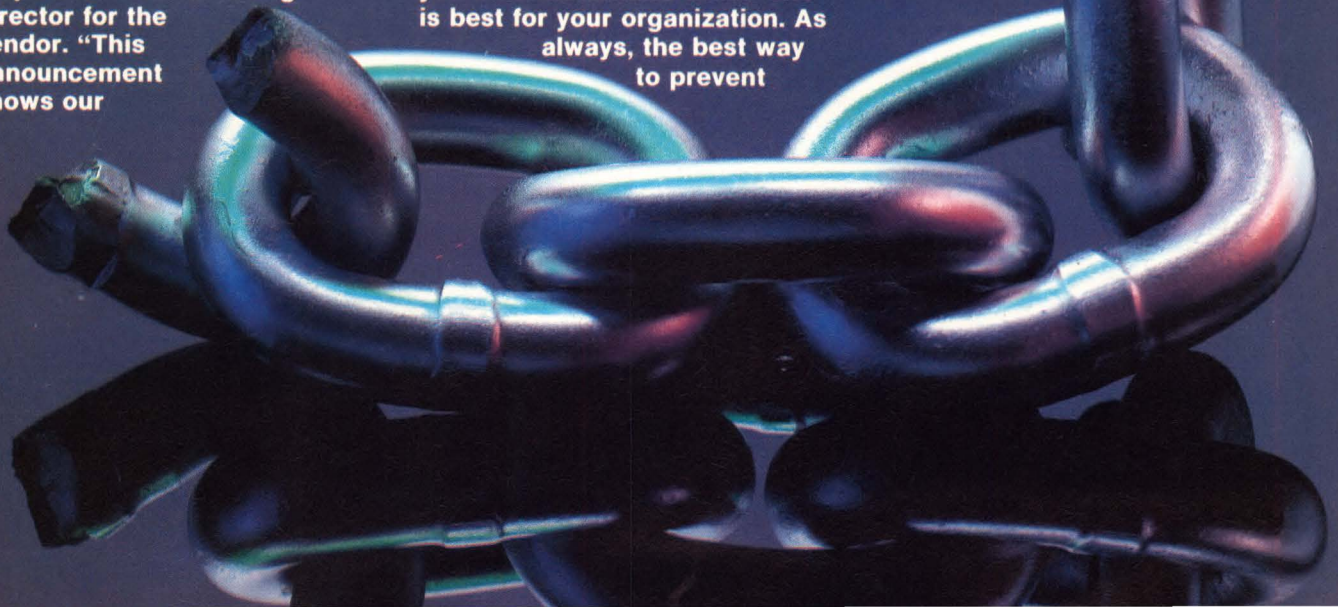
MAINFRAME LINKS

by Susan Foster Bryant, Microsystems Editor

products have been announced when they're not much more than *ideas*. Others become the subjects of excited speculation before they're even out of beta tests. For example, one mainframe-software manufacturer, when announcing a new link, conceded that the product wouldn't be ready for a year, at minimum, and possibly longer. Why not hold off on an announcement until the product is ready? "Because our customers don't want products today that won't have a micro counterpart tomorrow," responded the marketing director for the vendor. "This announcement shows our

customers that we're moving in that direction."

Giving customers a line on future products is fine, but there's something to be said for product reality, too. Which ways of linking micros and hosts are available now? There are four ways to connect micros and host computers: terminal emulation, "families" of micro- and large-system software, protocol converters, and specialized micros with built-in communications and terminal-emulation capabilities. All of these methods work, but you must determine which one is best for your organization. As always, the best way to prevent



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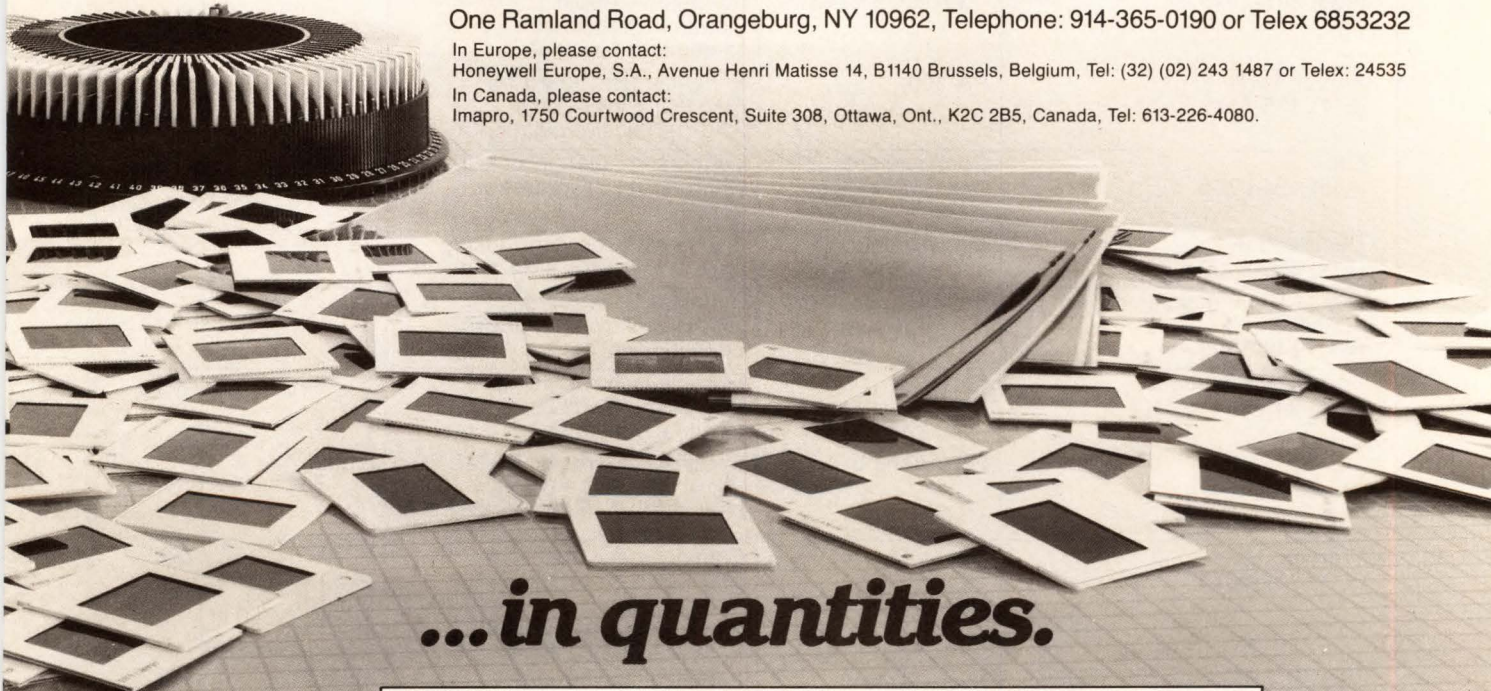
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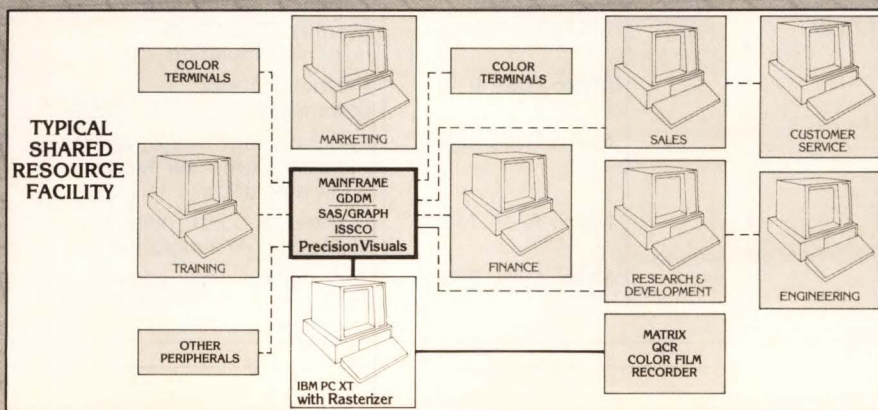
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SIGGRAPH
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CIRCLE 76



Micro-to-host Links

(Continued from page 163)

a major purchasing mistake is to arm yourself with knowledge.

Terminal emulation is far and away the most widely used means of linking personal computers and host computers. This method allows a personal-computer user to access mainframe databases, for instance, as if he or she were using a terminal specifically designed for the mainframe. Special boards or software allow the personal computer to disguise

itself as a terminal. The alternative is to have two machines on the user's desk: a personal computer and a terminal.

Terminal emulation offers important advantages. It is easy to do; many of the major personal-computer manufacturers offer packages for their machines. Some vendors, like IBM, Digital Equipment Corp. (DEC), and Data General sell personal computers with built-in emula-

tion capabilities (see vendor list). And terminal emulation is relatively inexpensive. Terminal emulation usually takes three forms in corporations, says David Ferris of Ferrin Corp., a San Francisco-based consultancy. They are:

- *Host transaction processing:* Micro users are given access to databases associated with important mainframe systems, like accounts payable and receivable, general led-

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
Boards and hardware/software solutions				
ABM Computer Syst. (714) 859-6531	3270 Personality Series	Front-end-processor boards for IBM PC that support 3270 bisync communications	\$1,295 to \$2,685	624
Apple Computer (408) 996-1010	Communications Protocol Card	Enhancement board that allows Apple Lisa and Macintosh to emulate terminals	\$700	569
Avatar Tech. (617) 435-6872	PA 100	Enhancement board for IBM PC; allows 3278/3279-terminal emulation	\$895	570
CXI (415) 424-0700	Connectware 3278/79 PC	Terminal-emulation board with control program for IBM PC	\$1,145	571
Decisionlink (714) 835-9100	Decisionlink	Front-end processor linking micros and IBM S/34 and /36	\$3,900	572
Digital Communications Assoc. (404) 448-1400	Irma	Enhancement board for IBM PC; allows 3278/3279 emulation	\$1,195	573
Forte Data Syst. (408) 945-9111	Forte/PJ	Expansion board for IBM PC; allows 3278/79-terminal emulation	\$1,195	574
	Forte/Graph	Daughter board for Forte/PJ; allows IBM PC to emulate 3279 graphics terminal	\$1,395	
Frontier Tech. (414) 964-8689	Adcom 2	Enhancement board for IBM PC; supports async, bisync, sync, HDLC, ADLC, and X.25 communications	\$275 to \$1,075 (board) \$40 to \$695 (software)	658
Gateway Microsyst. (512) 345-7791	Micro Gate 2780/3780	Enhancement board; permits 2780/3780-terminal emulation	\$895	575
	Micro Gate II	Bisynchronous-communications subsystem	\$895	
	Micro Gate 6530	Enhancement board; allows Tandem Computer Model 6530 emulation	\$895	
	Micro Gate 742	Expansion board; allows TI Model 742 emulation	\$395	
	Micro Gate 940	Expansion board; allows TI Model 940/931 emulation	\$195	

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Micro-to-host Links

(Continued from page 166)

ger, and order entry.

- *Host personal computing:* The mainframe or mini becomes a vehicle for personal computing as micro users plug into large-system financial-planning packages or database management systems (DBMSs).

- *Proprietary databases:* Employees

use personal computers as terminals to specialized databases stored on the mainframes of service bureaus, like Dialog from Lockheed Corp. (Burbank, CA) or the financial-information databases offered by Dow Jones, New York.

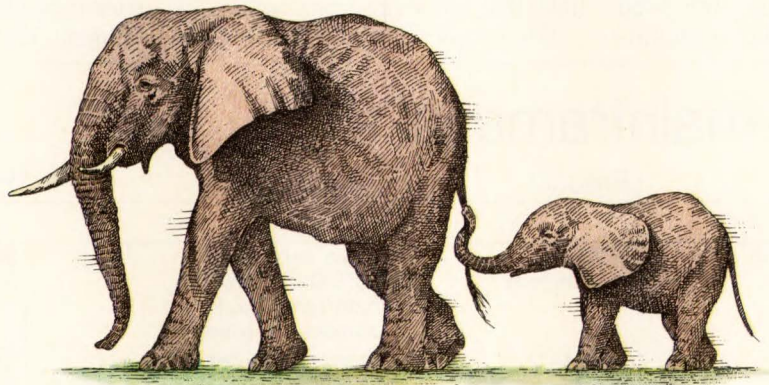
Terminal emulation also has an im-

portant limitation: You can see the data but you can't have them unless you print them. Terminal emulation allows a micro user to call up information on his or her video-display terminal or print it, but users can't download the data to manipulate or store them. Of course, for security

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
Boards and hardware/software solutions				
Information Tech. (602) 998-1033	Linkup family	Communications co-processor; supports 3270-bisync and SNA communications, and permits async-terminal emulation	\$850 to \$1,175	576
Microlog (914) 368-0353	Baby Talk	Enhancement board for IBM PC that supports bisync and SNA communications and allows async-terminal emulation	\$695 \$895 (including modem)	577
	Baby Blue II	Enhancement board for IBM PC that allows terminal emulation	\$695	
NEC Information Syst. (617) 264-8461	APC-Com 1	SNA/SDLC 3270-emulation board for NEC APC micro	\$795	578
	APC-Com 2	3278 terminal- and 3276 controller-emulation board for NEC APC micro	\$1,295	
Pathway Design (617) 237-7722	Communications Adapter	Expansion board (RS-232 connection) that supports async, bisync, SDLC, and HDLC communications	\$295	579
Persyst Products (714) 660-1010	DCP/88	Enhancement board for IBM PC; allows 3780/2780 Hasp and 3270 bisync communications	\$695 to \$945	580
	MPC	Enhancement board for IBM PC; supports async, bisync, SDLC, or HDLC communications	\$299	
Quadram (404) 923-6666	Quad 3278	Enhancement board for IBM PC; allows 3278-terminal emulation	\$1,195	599
Seattle Telecom & Data (206) 883-8440	PC 286 Card	Enhancement board that facilitates simultaneous IBM PC-to-mainframe communications and local processing; requires communications software	\$2,395	581
Winterhalter (313) 662-2002	Data Talker I and II	Front-end communications processors; allow 3270 and 2780/3780 emulation	\$695 to \$995	582

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Micro-to-host Links

(Continued from page 168)

reasons, you may value this restriction on users. Clericals, for example, will still be able to plug into high-powered mainframe peripherals, like laser printers, plotters, and mass-storage devices, but they won't be able to monkey around with im-

portant files.

However, if an executive wants a link between the host and his or her personal computer, you may have to look beyond terminal emulation to links that allow file transfers.

File-transferring links allow users

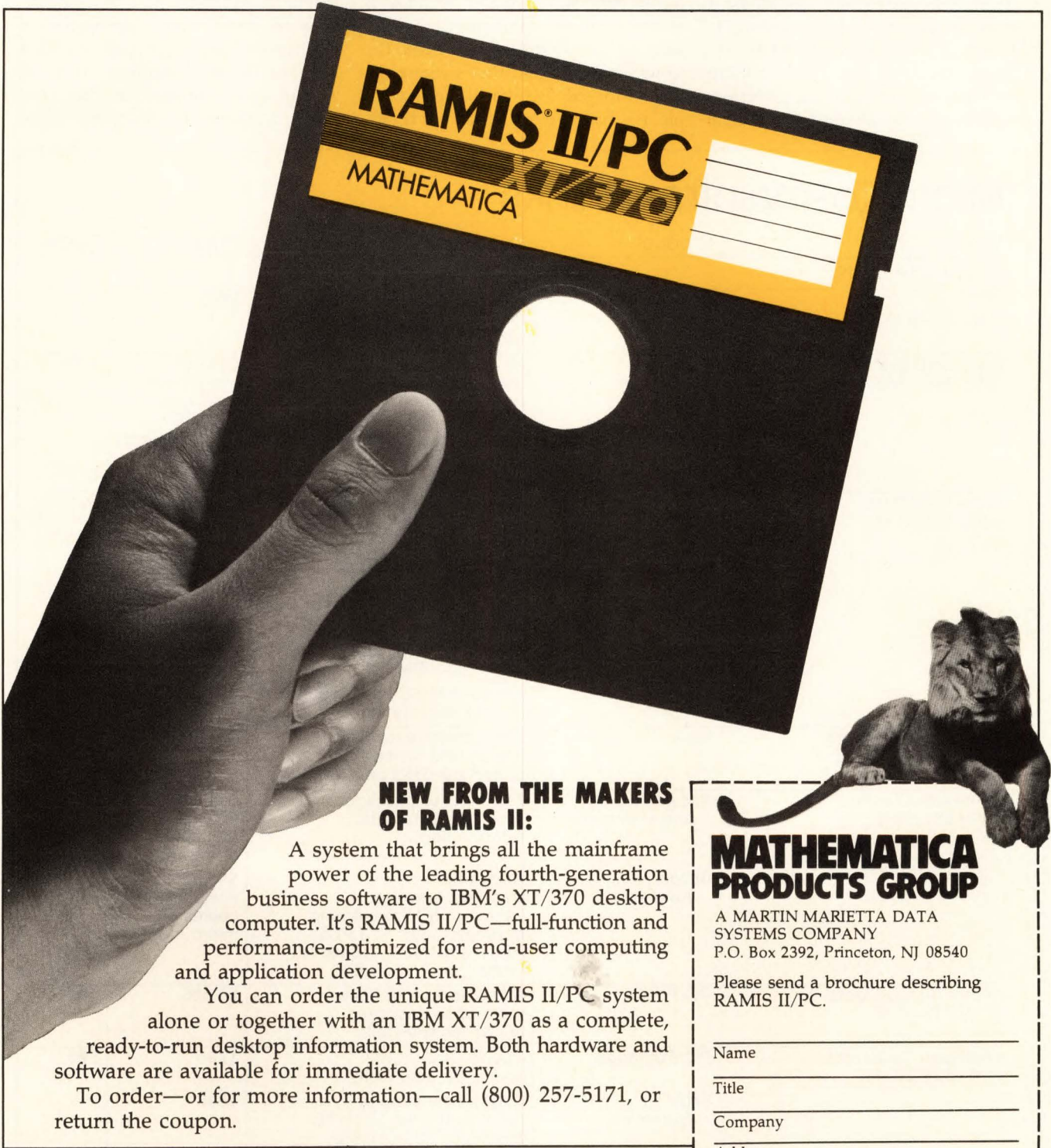
to download and store host-computer files. These products allow a personal computer to talk back to a host computer, not just display what it's fed by the larger computer. File-transfer packages, like PC Exchange from Intelligent Technologies and PC/Focus

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
Software links				
Applied Data Research (201) 874-9000	ADR PC/ Datacom	Micro version of ADR/Datacom/DB mainframe package; enables file transfers	\$400 to \$900	583
	ADR PC/ e-Mail	Micro version of ADR/e-Mail; enables file transfers	\$400 to \$900	
	ADR PC/ Empire	Micro version of ADR/Empire; enables file transfers	\$400 to \$900	
	ADR PC/PTE	Enables file transfers between micro and ADR/Roscoe and ADR/Vollie mainframe packages	\$400 to \$900	
Applied Microsystems (404) 475-0832	PC Profs	Software interface between IBM PC and mainframes running IBM's Professional Office Syst. (Profs)	\$295	584
Aton Int'l. (408) 554-9922	Micro Remote 3270	Allows 3270, bisync-terminal emulation	\$100 (100-unit minimum)	585
	Micro Remote 2780/3780	Allows 2780/3780, bisync-terminal emulation	Same price	
Cincom Syst. (513) 662-2300	Personal Computer Support System	Allows async-terminal emulation, file downloading, and database calls between NCR mainframes running Cincom's T-Com software and NCR Decision Mate, IBM PC, and Wang PC Same package without T-Com software base	\$5,000 \$3,000 (emulation component only) \$7,000 \$5,000 (emulation component only)	586
Communications Research Group (504) 923-0888	Blast	Supports async, SDLC-like micro-to-mainframe communications; X.25 compatible	\$2,490 (mainframe component) \$495 to \$895 (mini component) \$250 (micro component)	587
Computer Corp. of America (617) 492-8880	PC/204	Micro version of Model/204 mainframe DBMS; enables file transfers and 3270 emulation	\$17,000 (includes mainframe package and 10 micro packages)	588

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CIRCLE 79

Micro-to-host Links

(Continued from page 170)

from Information Builders, function like terminal emulators by allowing a personal-computer user to request a file stored on a host. But the similarity ends there: Requested files are actually given to the user. Transfers can also move in the opposite direction, enabling a personal-computer user to

upload files to the mainframe.

Many file-transfer utilities are actually personal-computer versions of mainframe or minicomputer software. The two packages speak the same language, and that's where the link is forged. PC/Focus, for example, is a scaled-down version of Focus,

a DBMS for IBM mainframes.

PC/Focus, Answer/DB from Informatics General, and other packages are tied to report generators or data-query programs that make it easy for personal-computer users to zero in on the information they need in the corporate database. For exam-

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
Software links				
CXI (415) 424-0700	Connectware PC/SPF	Micro version of SPF mainframe software; allows file transfers	\$895	589
Execucom Syst. (512) 346-4980	IFPS/ Personal	Micro version of IFPS package; allows file transfers	\$64,000 (mainframe package) \$40,000 (mini package) \$1,500 (micro package)	590
Forte Data Syst. (408) 945-9111	TSO/Fortenet	File-transfer utility for IBM systems under TSO and IBM PC	\$1,000 (license)	591
	CMS/Fortenet	File-transfer utility for IBM systems under CMS and IBM PC	\$1,000 (license)	
	CACS/Fortenet	File-transfer utility for IBM systems under CACS and IBM PC	\$15,000 (license)	
	Forte/Call	Allows IBM PC to emulate remote workstation	\$295	
Info Center Software (914) 255-8925	iLink	File-transfer package linking IBM mainframes under VM/CMS and IBM PCs	\$12,500	592
Informatics General (213) 887-9040	Answer/DB and Visianswer	File-transfer packages providing automatic reformatting	\$45,000 (includes 50 copies of Visianswer)	593
	dBase/Answer	Allows file transfers between variety of IBM mainframe databases and IBM PCs running dBase II, dBase III, Friday!, or Framework	\$45,000 (includes 50 copies of micro module)	
Information Builders (212) 736-4433	PC/Focus	Micro version of Focus mainframe package; allows file transfers	\$1,595	594
Intelligent Tech. Int'l. (415) 328-2411	PC Exchange	Allows DEC VT100 and VT52 emulation	\$795	595
	SNA/Exchange	Allows emulation of 3274 controller, 3278/79 terminals, 3287 printer, and 3770 remote workstation in SNA linkup	\$895	
	PC Exchange with SNA	Combination package	\$1,295	



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Micro-to-host Links

(Continued from page 172)

ple, if an executive wants to study sales data on four new products for three months in two territories, he or she can extract the pertinent data

only, avoiding the time-consuming chore of culling the information from overall sales records.

When weighing the advantages

and disadvantages of these packages, security provisions are vital. Most of the packages that allow file transfers include security provisions that let

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
Software links				
Management Decision Syst. (617) 890-1100	Expressmate	Allows file transfers between mainframes running MDS' Express and micros running Lotus' 1-2-3, dBase II, Multiplan, or Visicalc; allows terminal emulation	\$450	596
Marsha Hanes & Assoc. (404) 587-3325	Pro	File-transfer package linking IBM S/34 or /36 with IBM PC	\$625	597
	Pro	Same package for S/38-PC link	\$750	
McCormack & Dodge (617) 655-8200	Interactive Personal Computer Link	Allows file transfers between mainframes running Millennium/ CICS and micros running Lotus' 1-2-3	\$25,000 (mainframe component) \$2,500 (micro component)	598
Micro Decision Syst. (412) 276-2387	Loadcalc	File-transfer package for DEC Rainbow, Wang PC, Burroughs ET 2000, IBM PC, and MS-DOS-based micros	\$95	600
MSA (404) 239-2000	Executive Peachpak	Data-transfer facility for IBM PC and mainframes	\$3,000 to \$6,000	601
NEC Information Syst. (617) 264-8461	Async 86	Async-emulation and file-transfer software for NEC APC micro	\$245	602
	Acculink	Async 86 package for NEC APC III micro	\$245	
	Bisync 86: 3270	Bisync-emulation software	\$990 (APC) \$695 (APC III)	
	Bisync 86: 3780	Bisync-emulation software	\$990 (APC) \$695 (APC III)	
	Bisync 86: Hasp	Bisync-emulation software for APC III only	\$695	
On-Line Software Int'l. (201) 592-0009	DB/Link	Allows file consolidation and downloading from IBM S/34 or /36 running Easytrieve to IBM PC running Omnimicro	\$3,500 (includes one copy of Omnimicro)	603
	Omnilink	Allows file transfers between IBM mainframes and IBM PCs running Omnimicro	\$35,000 (OS) \$28,000 (DOS) \$400 to \$1,200 (micro component)	
Oracle (415) 854-7350	Oracle	Allows downloading from IBM mainframes running Oracle DBMS to micros	\$12,000 to \$96,000 (mainframe component) \$1,000 (micro component)	604

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 6. The DCF looks up and dials the telephone number associated with the user ID.
 7. The user answers, and the DCF prompts, "ENTER HOST PASSWORD."
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Micro-to-host Links

(Continued from page 174)

you bar users from sensitive files or restrict a particular user's access to data he or she needs to perform specific functions.

These packages offer other features that may be beneficial to your operation. For example, some packages take users step by step through

the formulation of requests, sending and receiving, displaying data, and naming and renaming files. Some receive files unattended and others

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
Software links				
Pathway Design (617) 237-7722	SNA/3270	Allows 3278/3279 emulation and supports SNA	\$595	605
	SNA/3770	Allows remote-workstation emulation and supports SNA	\$595	
	BSC/3270	Allows bisync-terminal emulation	\$595	
	BSC/2780-3780	Allows bisync-terminal emulation	\$595	
Peachtree Software (404) 239-3000	Decision Manager	Allows downloading from IBM mainframes to IBM PCs	\$625	606
Performance Software (804) 794-1012	Masterlink	File-transfer software linking IBM PCs with IBM/370, 43XX, or 30XX under CICS and MVS or CICS and DOS/VSE	\$2,500 (single-user license) \$5,000 (multi-user license) \$15,000 (unlimited-user license)	607
Phaser Syst. (415) 434-3990	m3278/SPS	Allows IBM PC to emulate 3278 terminal and transfer files with mainframes running IBM's SPS	\$1,595	608
Software AG (703) 860-5050	Natural/Connection	File-transfer software linking IBM PCs and IBM mainframes running Natural package	\$40,000 (Includes 10 micro packages)	609
Software Int'l. (617) 685-1400	Smartlink	Allows file transfers between IBM mainframes running Software Int'l.'s General Ledger and Financial Reporting System (online) and IBM PCs	\$2,995	610
Sterling Software Mktg. (916) 441-7234	PC-Tracs	Supports bisync communications	\$950	611
United Information Svcs. (913) 341-9161	Vista Com	Allows terminal emulation	\$200	612
University Computing (214) 353-7100	UCC/MBA	Allows micro to download data from mainframe running TSO/Roscoe or other text editor via modem	\$695	613
	Corporate MBA	Allows file transfers and 3270-terminal emulation using Irma board	\$1,000	
VM Personal Computing (212) 697-4747	Relay	Allows async-terminal emulation and file transfers between IBM mainframes under VM/CMS and micros; can be used with VM's Please mainframe software	\$149	614



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the shoemaker."**



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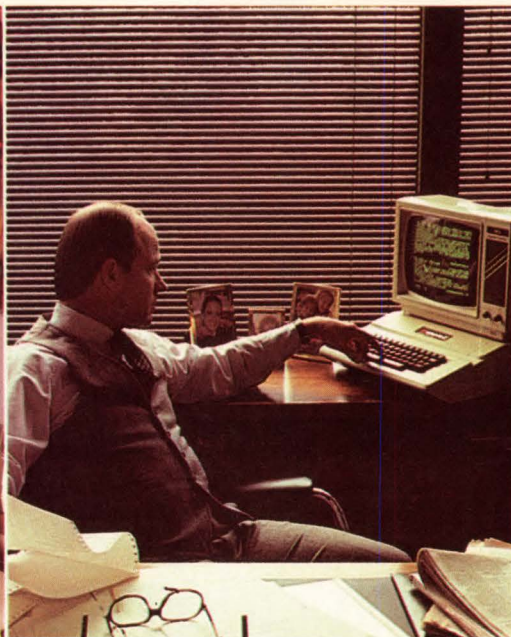
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Tasks like simultaneously receiving, printing and storing data—completely unattended—are easily managed with Smartcom II, because it takes full advantage of Smartmodem's capabilities.

The program reduces lengthy dial-

up and log-on sequences to a single keystroke. It stores communications parameters for 25 remote systems.

Plus, there's an on-line help feature that explains prompts, messages and parameters.

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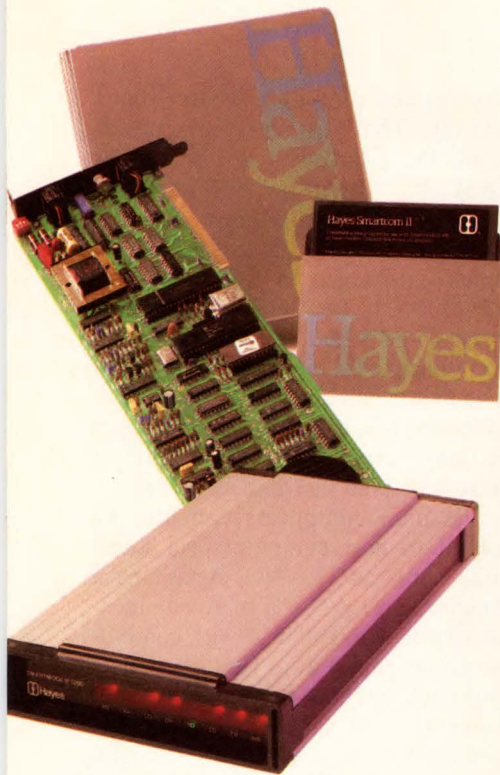
If you're involved in linking micros or setting standards for configurations, remember this. Everything your people need to know about communications can be summed up in one word: Hayes.

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Smartcom II communications software, currently available for IBM PC, DEC Rainbow 100, Xerox 820-II and Kaypro II.



Smartmodem 1200 for all computers with an RS-232C interface; Smartmodem 1200B plug-in board for the IBM PC.

Smartmodem Specifications:

Low Speed Data Format: (Smartmodem 1200 and Smartmodem 300) Serial, binary, asynchronous: 7 or 8 data bits; 1 or 2 stop bits; odd, even or no parity (0-300 bps).

High Speed Data Format: (Smartmodem 1200) Serial, binary, asynchronous: 7 data bits; 1 or 2 stop bits; odd, even, or fixed parity or 8 data bits; 1 or 2 stop bits; no parity (1200 bps).

Dialing Capability: Touch-Tone® and rotary-dial pulse dialing.

Command Buffer: 40 characters.

Commands: (unnecessary with Smartcom II software)

A: Immediate answer. A/: Repeat last command. C: Transmitter Carrier. D: Dial command, including simple dialing, waiting for second dial tone, auto-dialing and other features. E: Local echo. F: Full/half duplex. H: Switch hook. M: Audio monitor. O: On-Line. P: Pulse dialing. Q: Quiet mode. R: Reverse originate/answer mode. S: 17 "Set" commands speed, escape code character, number of rings to answer on, etc. S?: Checks operational parameters above. T: Touch-Tone dialing. V: Verbal result codes.

Result Codes: (can be numerical/verbal): 0/OK: Command line ok. 1/Connect: Carrier detected. 2/Ring: Phone is ringing. 3/No Carrier: Carrier lost or never heard. 4/Error: Error in command line. 5/Connect 1200: Carrier detected at 1200 bps. (Smartmodem 1200 only.)

Audio Monitor: Two-inch speaker with volume control.

Rear Panel: On-off switch, power jack. RS-232C connector, modular phone jack connector, volume control.

Operation: Full or half duplex.

Data Rate: 0-300 bps and 1200 bps for Smartmodem 1200; 0-300 bps for Smartmodem 300.

Interface: RS-232C.

Intelligence: Z8™ microprocessor with 4K byte control program for Smartmodem 1200; Z8 microprocessor with 2K byte control program for Smartmodem 300.

Modem Capability: Bell System 103 or 212A compatible originate or answer mode for Smartmodem 1200; Bell System 103 compatible originate or answer mode for Smartmodem 300.

Receive Sensitivity: -50dBm for Smartmodem 1200; -45dBm for Smartmodem 300.

Transmit Level: -10dBm.

Registration: FCC registered for direct-connect to the nationwide phone system. Connects with modular jacks RJ11W, RJ11C, RJ12W, RJ12C, RJ13W, RJ13C.

Power Pack: U.L. listed 120VAC, 60Hz, 13.5VAC output.

Size: 1.5" x 5.5" x 9.6"

Micro-to-host Links

(Continued from page 176)

store different sets of communications parameters. The latter feature relieves one of the key complaints about micro-to-host communications. Setting up a micro with the proper parameters before communicating with another system can be a complex and frustrating task. Stored parameters, however, eliminate the need to repeat setup procedures.

Some products provide for both terminal emulation and file transfers. Technical Analysis Corp.'s Irma board, for instance, is a widely used add-on for personal computers. Some of the new software-based links require Irma boards before they can be used. IBM's 370/XT, a special micro designed to run 370-mainframe applications as well as micro programs, is really an IBM Personal Computer XT (the PC with a hard disk) with three additional boards that provide for file transferring and terminal emulation.

Even if you install a product that gives you both terminal-emulation and file-transfer capabilities, you may still face a larger problem: user acceptance. Some micro-to-host links produce little more than cold sweat on users' brows, at least initially. Because so many employees don't have computer expertise, an investment in a difficult-to-use solution carries the hidden additional cost and burden of extensive training.

The ideal micro-to-mainframe connection would eliminate the cumbersome strings of commands necessary for a personal-computer user to communicate with a host computer. Such a connection's chief attribute, from the user's point of view, would be transparent operation. An employee would be able to ask for certain data and sit back and watch them fall into place on a micro spreadsheet, for example. The micro-to-mainframe link would work for the user, rather than the other way around. Executives and managers would have the power to work with all of the corporation's computer resources like never before, making them more productive and effective and their work more timely and accurate.



Unfortunately, micro-to-mainframe communications aren't that easy, although big software developers are taking positive strides by forging links between mainframe (or mini) software systems and packages for personal computers. McCormack & Dodge, Management Science America, and Informatics General have been leaders in these efforts, but most major vendors already offer or are developing host-to-micro products. Informatics General has been particularly active, concluding cooperative deals with the micro-software vendors Visicorp, San Jose, CA, and Ashton-Tate Inc., Culver City, CA.

Informatics General's relationship with Visicorp produced a two-stage micro-to-mainframe solution: Visianswer, which runs on the IBM PC, and Answer/DB, a mainframe database. The combination of these two packages exemplifies the advantages and the promise of joint mainframe-and-micro software solutions. At bottom, software vendors hold the key to the ultimate link because only they can standardize software codes for data formatting. Using some packages, a user can pull files out of a host computer, but when the data arrive at the micro, they're meaningless until mainframe codes are replaced with micro equivalents. With standard codes, computers can speak the same language.

Many new arrangements, like Answer/DB and Visianswer, automatically reformat files downloaded from the mainframe so that they are immediately usable on micros. But beware of vendors claiming to have solved the formatting question by standardizing on DIF (Data Interchange Format) files. DIF was developed by Software Arts (Wellesley, MA), inventors of Visicalc. In fact,

Micro-to-host Links

(Continued on page 179)

Visicalc is the only program that uses DIF without revision. Other programs, like 1-2-3 from Lotus Development Corp. (Cambridge, MA) and Multiplan from Microsoft Corp. (Bellevue, WA) can accept DIF files only with programming revisions. If you want to take advantage of DIF as a means of reformatting files and use those packages, you'll have to enlist the support of the corporate programming staff.

Solutions like Answer/DB and Visianswer also address one of the big questions MIS/dp has about mainframe-to-micro links: security. Although the two packages are designed to make the micro-to-host link easy to achieve, they also give MIS/dp the tools to control access to mainframe or mini files.

Answer/DB provides a facility to set up user profiles that specify which parts of the host database should be accessible to each user. For example, you can give the personnel director

access to salary data but prevent the same sensitive files from falling into the hands of other employees. The user profiles also help you show each user which information he or she is authorized to retrieve. The profiles can store common names and descriptions of data, defined in a data

Terminal emulation is the most widely used means of linking personal computers and host computers.

dictionary, that simplify database queries. Users can download their own glossaries of these names, see which data are available to them, and format their queries accordingly. The system also makes for faster, easier file searches.

A copy of Answer/DB and 50

Visianswer packages costs about \$45,000. That's rather pricey, considering the relatively low cost of the IBM PC. Other options are even more expensive. The Interactive Personal Computer Link from McCormack & Dodge, for example, costs \$25,000 for the mainframe component and \$2,500 each for a micro component that includes Lotus 1-2-3. The link is being tested at Pizza Hut, Wichita, KS, and General Electric's Schenectady, NY, office (GE is headquartered in Fairfield, CT).

Personal computers can also be linked to host computers via local-area networks (LANs). Attaching a micro to an LAN is a relatively inexpensive way to endow it with communications capabilities that allow it to interact with a host and its peripherals. LANs are still relatively new, and as they evolve, they're beginning to be viewed as communications utilities integrating micro-to-mainframe links.

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MasterLink is a comprehensive software system that provides the complete solution for transferring data between an IBM Personal Computer and an IBM mainframe (DOS/VSE or MVS).

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The LANs that can link micros and hosts are intelligent, unlike those that function merely as conduits. Intelligent LANs can perform the translations between communications protocols and file formats necessary to complete a link. An intelligent LAN can also store the parameters for communications with each device attached to it. By signaling the network that you want to download a file from the host, manipulate it, and then send it to a laser printer, for example, the LAN will automatically set up the links needed to handle all of the conversions.

However, be forewarned that LAN communications may not be as easy as they sound. Transmissions may founder if the character set you're using is wrong, for example. You can't transmit from a system using ASCII characters to one using EBCDIC (IBM's set). Also, all sorts of protocols are used for communications by computers, value-added net-

works, and even phone companies. They can be cumbersome to work with, and translations can slow communications.

Protocol converters are another way to link diverse micros to host computers. Like translators at the United Nations, they automatically translate the protocol of each device. There are dozens of protocols—mainframes and minis use synchronous standards and microcomputers use slower asynchronous protocols. Indeed, protocol converters can answer the need for communications links between personal computers regardless of their location or brand name.

Microcom, a Norwood, MA-based software house, has come up with an alternative you might find in future products. The Microcom Networking Protocol (MNP), released last year, stands a fair chance of becoming a standard protocol. Microcom did what no other vendor had done be-

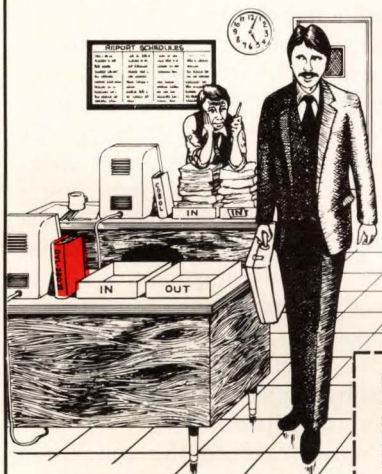


fore: It separated its protocol from its communications software and offered only the protocol to hardware and software manufacturers. Surprisingly, MNP took off, gaining the endorsements of IBM, Apple Computer, Tandy Corp. (Forth Worth, TX), Visicorp, GTE Telenet (a Vienna, VA-based packet-switching service), and AT&T (New York).

Why, in a business that shuns standards, has MNP attained the status of a de facto standard? Some say the protocol is technically sound, being modeled after the design standard of the International Standards Organization. Others argue that MNP

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Micro-to-host Links

(Continued from page 181)

was the right product in the right place at the right time. Whatever the reason, sticking with MNP-based products may alleviate one of the major headaches of remote micro-to-host communications.

The major computer vendors have

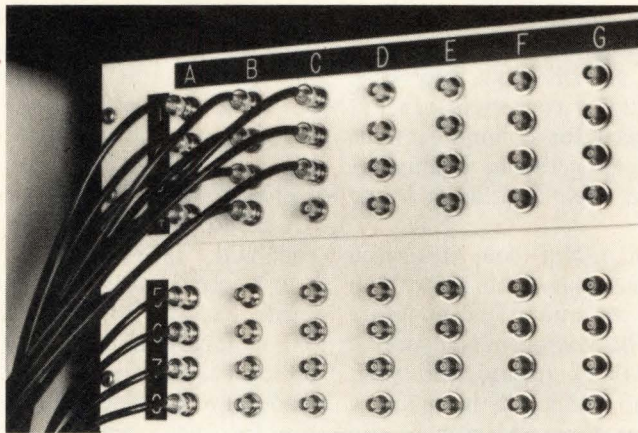
not been caught napping by the groundswell of interest in micro-to-host communications. They're offering specialized micros with built-in links. IBM's 370/XT, as noted, is designed to run some of the applications written for Big Blue's 370 line of

mainframes. It runs both the VM/CMS mainframe operating system and PC-DOS, the operating system that drives the IBM PC. It can up- and download data to and from a 370. IBM also offers the 3270 PC, a special micro that communicates with IBM 4300, 308X, and 370 mainframes by emulating an IBM 3270 terminal. The 3270 PC can run four interactive mainframe applications in separate windows on its monitor; a fifth window is reserved for a PC-DOS application.

DEC has built terminal-emulation, file-transfer, and Ethernet network-communications capabilities into its new MicroVAX 1 personal computer. MicroVAX 1 runs modified versions of VMS, a minicomputer operating system, and Ultrix, DEC's version of Bell Labs' Unix operating system for the VAX line of minicomputers. Data General offers three micros with integrated communications capabilities—the Desktop Generation Models 10SP, 20, and 30. These micros run Data General's AOS/DS operating system for the MV Series of super-minicomputers, and they can emulate Data General and IBM terminals.

Mohawk Data Sciences has come up with a twist on the same idea with its Hero personal computer. Hero micros can be linked in clusters supported by MDS' Super 21 communications processors. The Super 21 handles micro-to-micro communications and also streamlines interactions with IBM host computers via Intelligent 3270, a programmable interface. The advantage of this system is its ability to handle communications not only with a host computer, but also with mass-storage devices shared by a department and other micros on the network.

If you've reached the conclusion that the most prudent stance on micro-to-host links is to wait and see, you don't necessarily have to defer action altogether. Timesharing service bureaus have begun offering software programs that let you hook into their mainframes, download data, and work with them on micros. Control



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Data Corp. (Minneapolis), General Electric Information Services Co. (Rockville, MD), Data Resources Inc. (Lexington, MA), and Comput-

er Sciences Corp. (El Segundo, CA) offer such services. An investment in such an arrangement could buy your organization valuable experience

with the micro-to-mainframe connection. Chances are, you'll have to start getting acquainted with the Family of the Year quite soon. □

Micro-to-mainframe links

Vendor	Product	Description	Price	Circle
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Protocol converters

Avatar Tech. (617) 435-6872	PA 1000	SNA- or bisync-protocol converter	\$995	615
	PA 1000E	SNA- or bisync-protocol converter with expanded support for dialup communications	\$1,095	
	PA 1500	SNA- or bisync-protocol converter	\$1,495	
Innovative Electronics (305) 624-1644	MC-80 Series	Protocol converters that support 3270 SNA-to-ASCII communications	\$1,295 to \$1,495 (one or two ports)	616
	MC-800 Series	Same	\$3,600 to \$15,990 (up to 32 ports)	
Protocol Computing (213) 716-5500	Model 151	IBM S/34-, /36-, /38-to-ASCII protocol converter	\$1,800 to \$5,300	617
	Model 171	BSC-to-ASCII protocol converter	\$1,800 to \$4,300	
	Model 176	SNA-to-ASCII protocol converter	\$1,800 to \$4,300	
Simware (613) 235-6736	Sim 3278	Protocol converter; supports async communications under VM or MVS/VTAM, allows 3270 emulation and file transfers	\$8,000 (VM) \$15,000 (MVS) \$5,000 (unlimited micro packages)	618

Special micros

Data General (617) 366-8911	Desktop Generation 10SP, 20, and 30	Runs version of Data General's AOS/DS operating system; can emulate IBM and Data General terminals	\$6,000 and up	619
Digital Equipment (617) 897-5111	MicroVAX 1	Includes terminal-emulation, file-transfer, and Ethernet-communications capabilities	\$6,000 and up	620
Direct (408) 980-1414	Direct IPC	IBM PC-compatible with built-in emulation capabilities	\$3,195	621
IBM Contact local sales office	XT/370	Micro that emulates IBM terminal and S/370 workstation; includes hard disk	\$8,995	622
	3270 PC	Micro that links to IBM 370, 308X, and 43XX systems via 3274 controller	\$5,585	
Mohawk Data Sciences (201) 540-9080	Hero, Super 21, and Intelligent 3270	Micro and network that allow terminal emulation and file transfers between micros and IBM mainframes	\$2,950 and up	623

ENHANCED WORD PROCESSORS: LOOKING MORE LIKE MICROS

A few kinks still need to be worked out but, with enhancements, more and more word processors will share in the capabilities of their micro cousins. Then, these two branches of the computer family will communicate better.

by Rick Cook

By now, everyone knows you can run word-processing programs on a computer. What is less commonly known is that you can do computer jobs with a word processor.

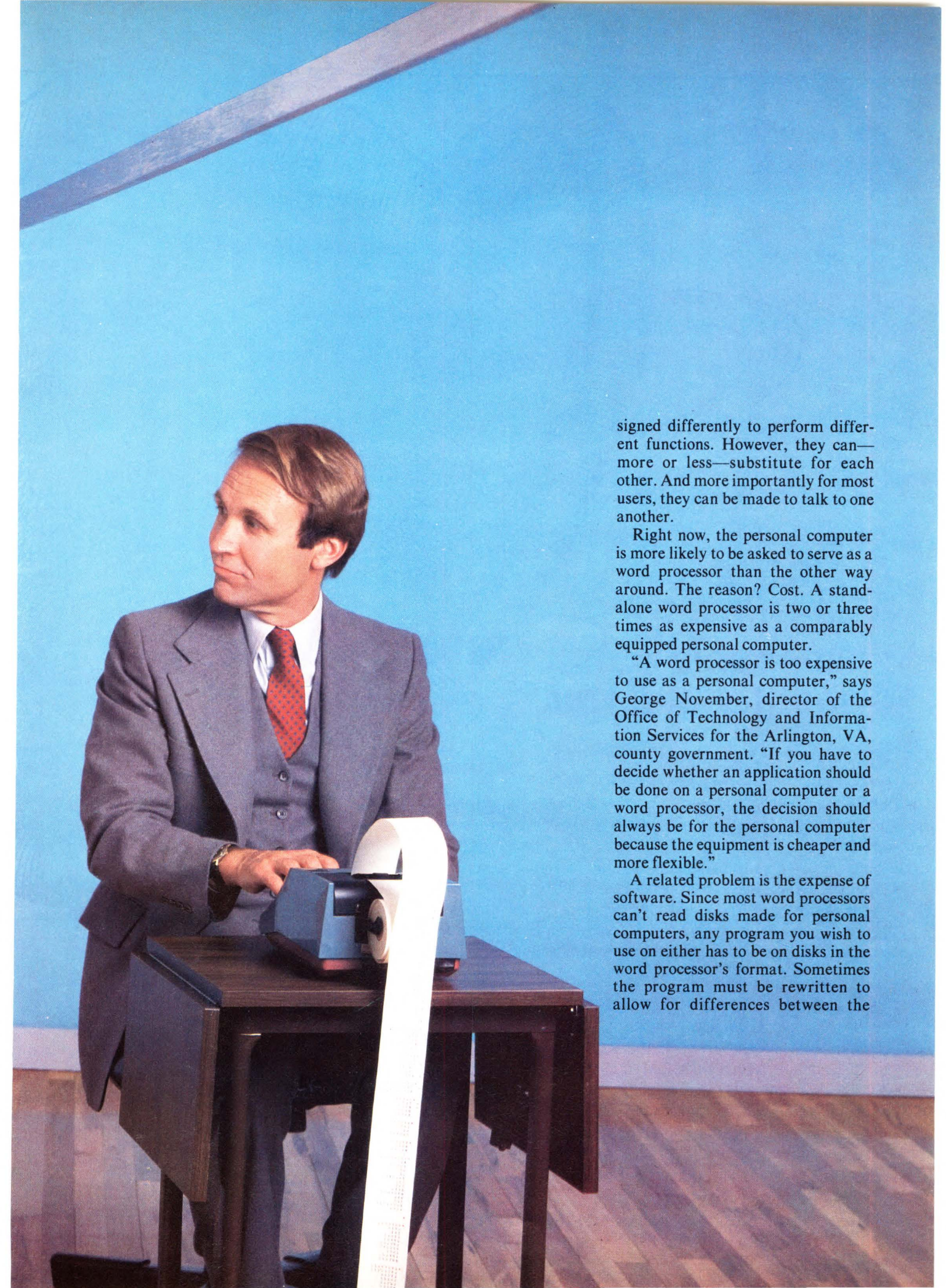
Recently, the differences between dedicated word processors and computers—particularly stand-alone word processors and microcomputers—have become less distinct. Most of the modern generation of one-user word processors are built around the same microprocessor chips that power personal computers. The software, keyboard, and display may be quite different, but the disk drives, random-access memory (RAM), and other internal components are pretty much the same.

Today, manufacturers known for their word processors—Wang Laboratories, for instance—make personal computers, too. Some companies, like Lanier, also make hybrids—machines designed to do the jobs of word processors *and* personal computers. Even some multi-user word processors include attachments that let them function as personal computers.

For all their similarities, word processors and personal computers are *not* the same machines. They are de-

Photo by George Hausman



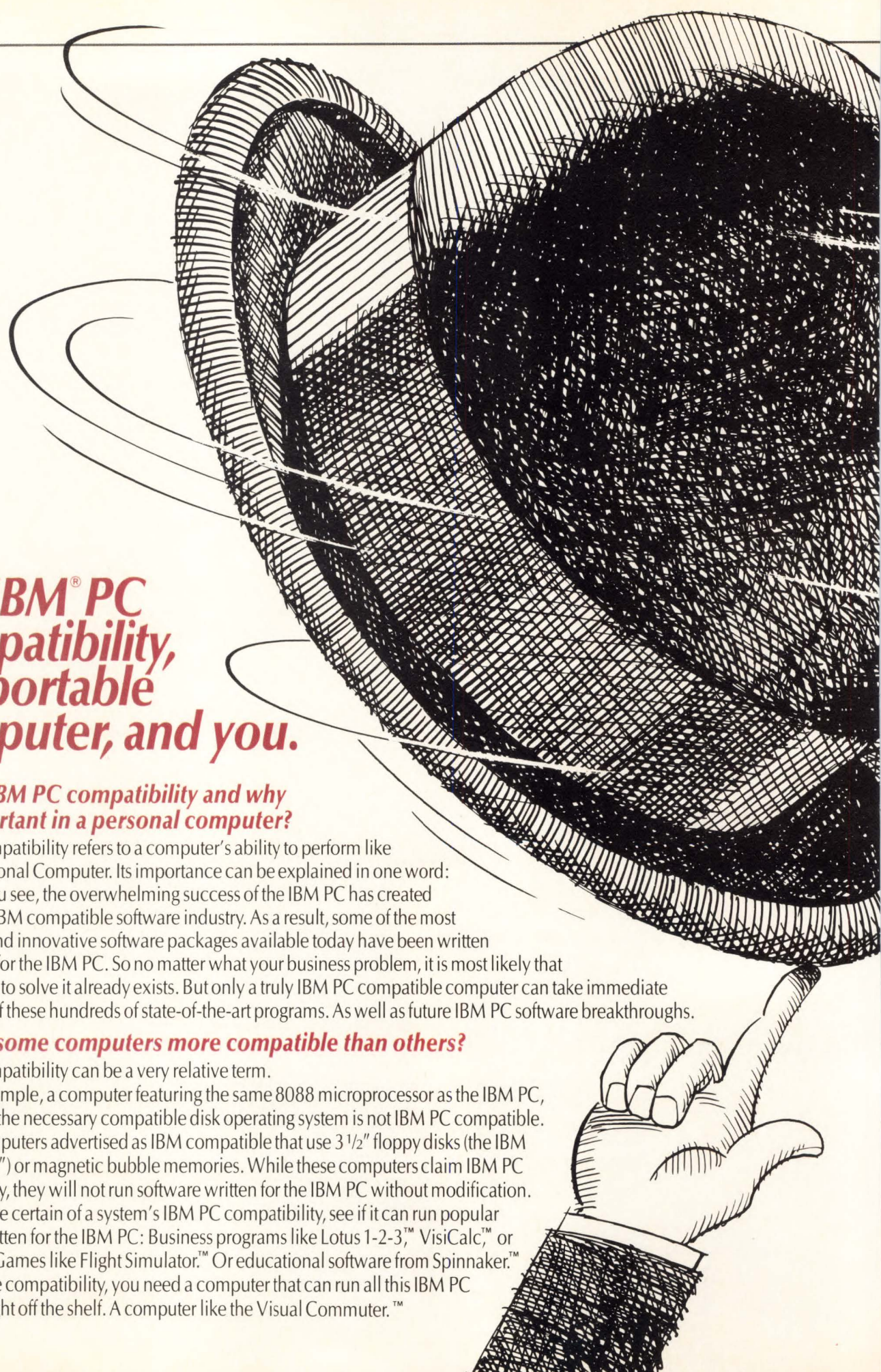
A man in a grey suit, white shirt, and red patterned tie is seated at a dark wooden desk. He is looking towards the left of the frame. On the desk is a blue dot-matrix printer with a large roll of white paper emerging from it. The background is a solid blue wall with a diagonal wooden beam running from the top left towards the center. The floor is made of light-colored wood planks.

signed differently to perform different functions. However, they can—more or less—substitute for each other. And more importantly for most users, they can be made to talk to one another.

Right now, the personal computer is more likely to be asked to serve as a word processor than the other way around. The reason? Cost. A stand-alone word processor is two or three times as expensive as a comparably equipped personal computer.

"A word processor is too expensive to use as a personal computer," says George November, director of the Office of Technology and Information Services for the Arlington, VA, county government. "If you have to decide whether an application should be done on a personal computer or a word processor, the decision should always be for the personal computer because the equipment is cheaper and more flexible."

A related problem is the expense of software. Since most word processors can't read disks made for personal computers, any program you wish to use on either has to be on disks in the word processor's format. Sometimes the program must be rewritten to allow for differences between the



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What is IBM PC compatibility and why is it important in a personal computer?

IBM PC compatibility refers to a computer's ability to perform like an IBM Personal Computer. Its importance can be explained in one word: software. You see, the overwhelming success of the IBM PC has created a booming IBM compatible software industry. As a result, some of the most advanced and innovative software packages available today have been written specifically for the IBM PC. So no matter what your business problem, it is most likely that the software to solve it already exists. But only a truly IBM PC compatible computer can take immediate advantage of these hundreds of state-of-the-art programs. As well as future IBM PC software breakthroughs.

Why are some computers more compatible than others?

IBM PC compatibility can be a very relative term.

For example, a computer featuring the same 8088 microprocessor as the IBM PC, but without the necessary compatible disk operating system is not IBM PC compatible. Nor are computers advertised as IBM compatible that use 3 1/2" floppy disks (the IBM PC's are 5 1/4") or magnetic bubble memories. While these computers claim IBM PC compatibility, they will not run software written for the IBM PC without modification.

To make certain of a system's IBM PC compatibility, see if it can run popular software written for the IBM PC: Business programs like Lotus 1-2-3,™ VisiCalc,™ or WordStar.™ Games like Flight Simulator.™ Or educational software from Spinnaker.™

For true compatibility, you need a computer that can run all this IBM PC software right off the shelf. A computer like the Visual Commuter.™

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16 pounds of power at a very compatible price: \$1995.

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Best of all, Commuter is priced at only \$1995. Now what could be more compatible than that?

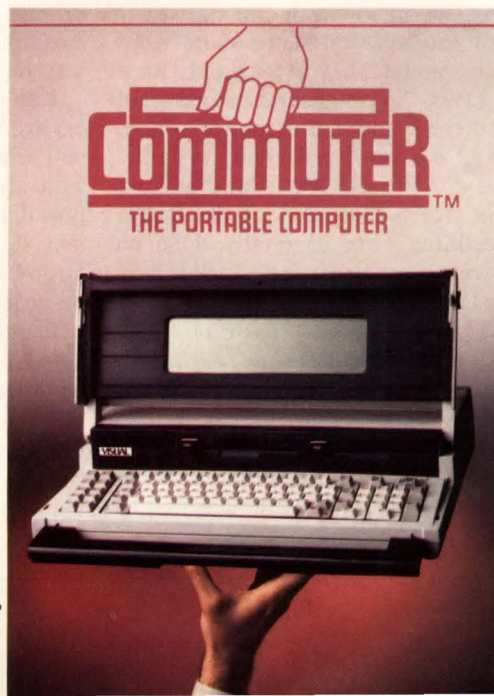
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Word-processor Enhancements

(Continued from page 185)

word processor and the personal computer. This means generating special software, which isn't cheap.

"These packages—dBase II, or Supercalc, or whatever—are effective proprietary software packages," says Ken Drews, chief of the office-automation section at the U.S. Department of Justice. "The prices are a great deal different from those you see advertised. There's no value in buying these programs unless you have the existing machinery."

Not all word processors require special software, though. Lanier's Business Processor, a combination word processor/personal computer, can run programs supported by the popular CP/M and MS-DOS microcomputer operating systems. The

Consider the problem one middle manager at a southwestern utility faces every month: Part of his job is to produce elaborate forecasts and reports full of tables detailing information on his division's performance. It used to take several days with a pencil and calculator to massage the many tables in the reports. Now, with the aid of an IBM Personal Computer and the 1-2-3 integrated-software package from Lotus Development Corp., Cambridge, MA, the manager can churn out a report—tables and all—in an afternoon.

The problem? The manager's results have to be rekeyed into a dedicated word processor to produce the finished report. The columns and rows of figures cranked out so painlessly on the personal computer have to be entered on the word processor, keystroke by keystroke. This task falls to the manager's secretary. Not only does she have to key in the original, she has to go over it two or three times to correct the inevitable mistakes and make last-minute changes. It is *not* her favorite job. It's also inefficient.

This sort of problem arises because, without some help, most word processors can't read disks produced by personal computers. This basic incompatibility can be a considerable hindrance in corporations that use both personal computers and word processors. To close the gap, several manufacturers have come out with products that will transfer files from a computer to a word processor, in one way or another.

Ken Drews says his department is experimenting with equipment that will transfer files and he is enthusiastic about it. "My biggest problem is how to transfer documents to the clerical staff after I finish my work," Drews says. "File transfer just can't be beat."

Another advocate of file transfer is Jeff Ellentuck, an attorney with the Middletown, NJ, firm of Giordano, Halleran and Ciesla, PC. Like Drews, Ellentuck uses a board that plugs into his IBM Personal Computer to transfer files to and from a Syntrex multi-station system.

"The disk format used by Syntrex is different from IBM's and the dedicated word-processing software is substantially different," says Ellentuck. "The board allows me to do two tasks. First, I can either take my secretary's disks, run them on my PC, make alterations, and the like; or I can take the output from the IBM and put it in the Syntrex format. The second task is to plug my PC into Syntrex's Gemini and Polaris databases." This lets Ellentuck pull data and documents from the word-processor's files for review or revision and feed the results back to his secretary for formal preparation on the Syntrex equipment.

The savings, Ellentuck says, come not so much in the document prepara-

"The differences between dedicated word processors and personal computers have become less distinct."

Business Processor's disk-file format is different from a microcomputer's, but the vendor supplies a conversion program that lets the machine transfer programs written for several popular personal computers to its machine.

George November says the Arlington, VA, county government has file-management software and statistics/math packages on some of its word processors but they're used only for a few tasks. "We do have a record of all our streets and maintenance schedules on our word-processing system," he says. "We can sort it and make a list of streets that need repairs. These procedures were originally done on the wp system because we lacked personal computers. But generally, I don't see us going in that direction."

Although substituting word processors for personal computers is not yet common practice, there is one use for word processors with personal computer-like abilities that is very popular: file transfers between computers and word processors.

"Without some help, most word processors cannot read disks produced by personal computers."

tion as in the revision. "It doesn't cut down that much on secretarial time. It does cut down on attorney time."

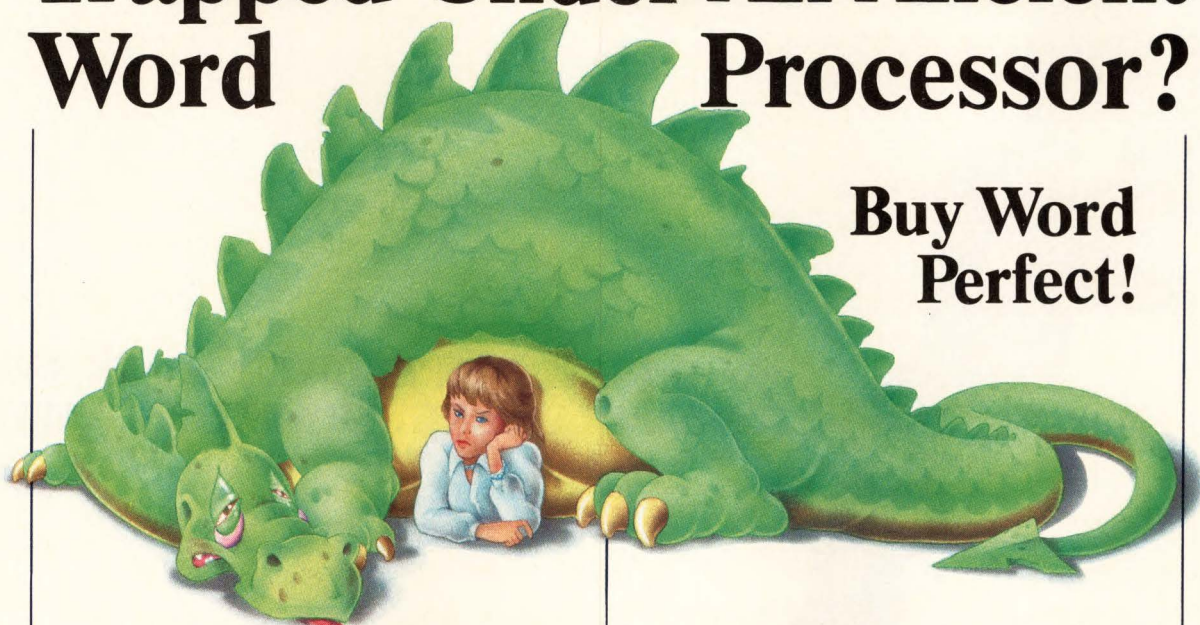
By hooking personal computers into a multi-station word-processing system, computer users can take advantage of the filing-and-document-management capabilities of the word processor. In addition, says Drews, managers at the Department of Justice can put newly created documents in a special file that serves as an electronic "in basket" for their secretaries. When a secretary finishes working on the document, she or he puts it in another file for review.

"Even if the managers don't type, they can look at the document on the screen and review it," he says. "And guess what? Inside of a month, they are typing."

Drews says managers begin by making simple corrections to the documents on their screens. As they gain confidence, the corrections become more elaborate. Soon they start writ-

(Continued on page 192)

How Can You Avoid Getting Trapped Under An Ancient Word Processor?



**Buy Word
Perfect!**

Once upon a time, word processors were monstrous things. Dot commands, page orientation, and separate editing, formatting and printing programs turned them into lumbering beasts. Only a well-educated programmer would dare don his armor and tackle such a beast — not a pleasant task for a modern secretary, executive, or writer.

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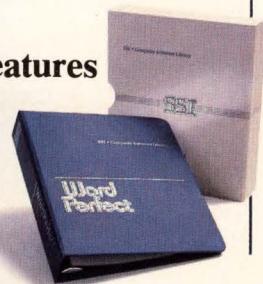
When writing, you don't want to worry about page formatting, making room for headers or footers, or

whether you are in "edit" or "create" mode. Your word processor should do it automatically and WordPerfect does. WordPerfect lets you think in terms of ideas, not pages. It is simple enough that you quickly forget about the mechanics and your writing flows easily.

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we've
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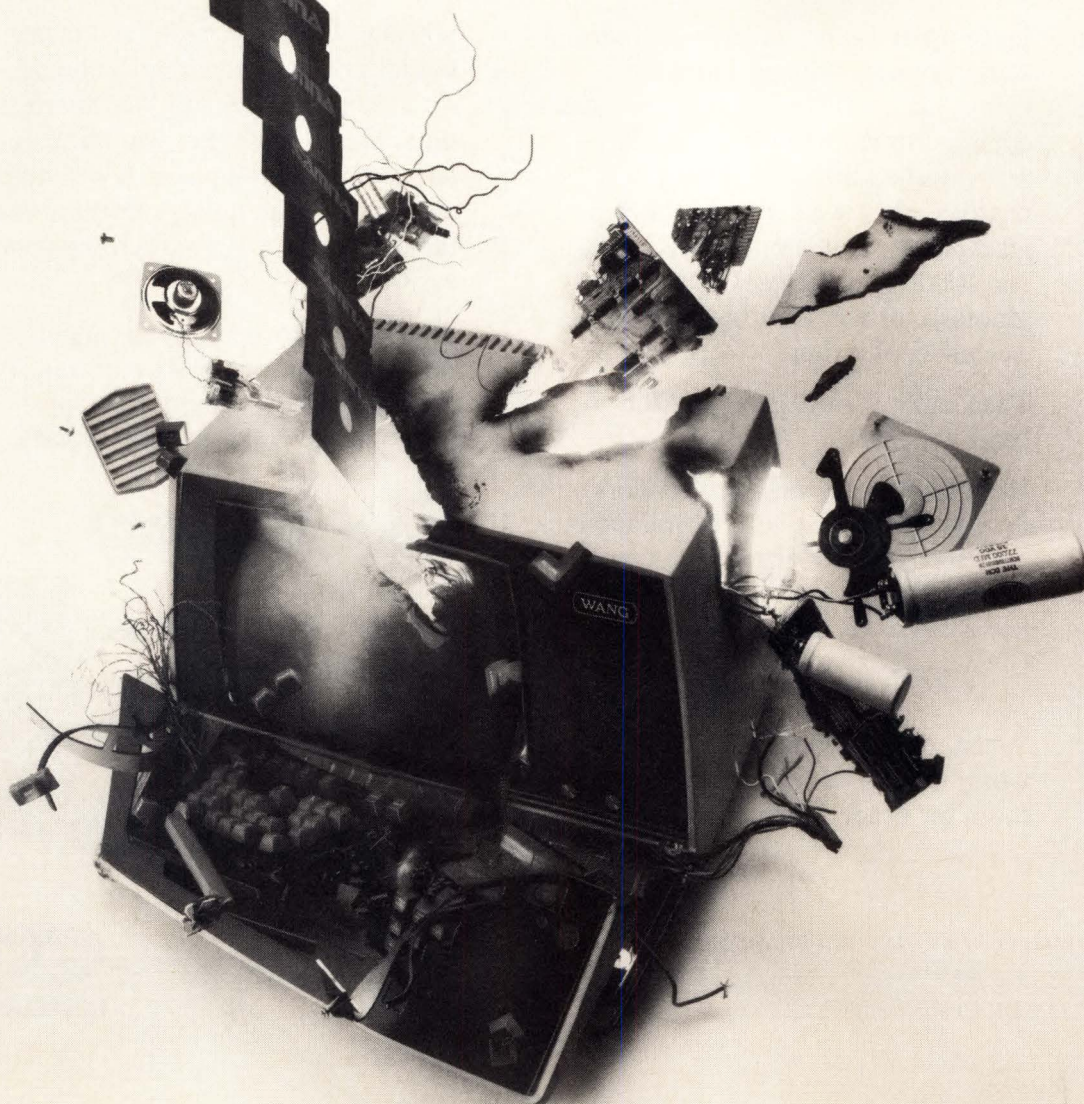
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When the comparison was over, all 10 participants said SAMNA outclassed any word processor they'd ever used. And word processing was only the beginning.

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SAMNA also accepts ASCII files directly from other software. So you can use it with Lotus 1-2-3®, dBase II®, even WordStar®.

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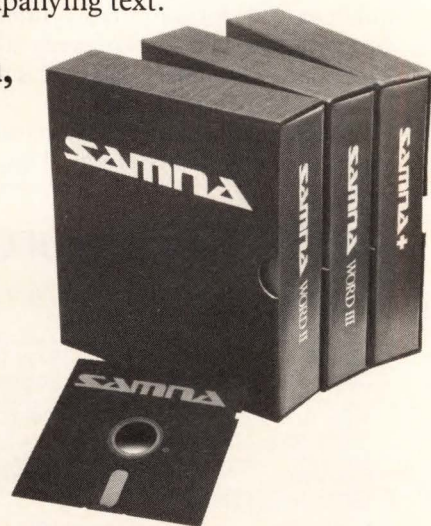
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Word-processor Enhancements

(Continued from page 188)

ing memos and other short documents. Finally, they begin creating major documents at the keyboard. "We get them over the fear," adds Drews. "You can't really make a mistake on a word-processing system because the mistakes can be cleaned up."

File compatibility between word processors and personal computers can be achieved in three ways. The personal computer can produce files that the word processor can read; the personal computer or word processor can run a conversion program to turn the computer's files into something the word processor can read; or the word-processor modification can include the ability to read the computer's files. Some systems offer a combination of these methods.

In many cases, the compatibility between word processors and personal computers is limited to transference of data files. The word processor can't run the computer's programs, but it can read words and numbers off a disk prepared by the personal computer. One reason for this limited compatibility is that there is very little standardization among personal computers and word processors or, for that matter, from computer to computer or word processor to word processor. Most machines use the American Standard Code for Information Interchange (ASCII) to represent alphanumeric characters, but that is as far as standardization goes.

Though a fair number of word processors still use IBM-format single-



sided 8-inch floppy disks, that standard was never popular for business personal computers. Generally, vendors use their own formats, mostly in conjunction with 5¼-inch floppies. The closest to a standard in 5¼-inch disks for personal computers is the format used by IBM on its Personal Computer. Many personal computers popular for business use—for example, the Compaq, Televideo, and Columbia—are IBM compatibles and use the IBM disks. On the other hand, almost no word processors use the IBM PC format.

When a word processor that takes 8-inch floppies is to be used with a personal computer that takes 5¼-inch floppies, an additional disk drive is needed for the conversion. This can be either an 8-inch unit that will attach to the personal computer or a 5¼-inch one that can be fitted to the word processor.

Over the next couple of years, more compatibility problems will probably

crop up as smaller disk drives appear on new personal computers. Already, in fact, the Apple Macintosh and the Hewlett-Packard HP 150 are using 3.5-inch disks; other manufacturers are expected to follow their lead.

There is more to compatibility between disks than matching size, however. There are many differences in the way information is put on the disk, too. Fortunately, several microcomputer programs are available that will take information from one disk format and put it into another. The Lanier Business Processor, for example, has a multiple-conversion program.

Yet even conversion programs are not without their difficulties. For example: Usually, they will not handle copy-protected disks. Sometimes, they can't even read the program. Often, they can read the program, but they cannot produce a workable copy—either the program will not load, or it will load but will not work. Since most software comes on disks that are copy-protected, it is difficult to move software onto the word processor. Disks containing data and files are not copy-protected, though. Therefore, you might not be able to load your spreadsheet program into the word processor with a conversion disk, but you can load the actual spreadsheet. It is, after all, just a collection of alphanumeric characters and standard control codes.

Systems like Syntrex, which ties an IBM Personal Computer or PC-compatible into the word-processing

(Continued on page 196)

Selected word-processing vendors

For more information on vendors mentioned in this article:

Vendor	Product	Price	Circle
Lanier (404) 329-8000	Lanier Business Processor (stand-alone word processor/personal computer)	\$2,995 & up	654
NBI (303) 938-2795	CP/M attachment for Oasys 4000s	\$495	655
Syntrex (201) 542-1500	Synpro file converter for Synpro word processors	\$500 (on Gemini) \$2,000 (on Polaris)	656
	Syntrex Connection (connects personal computer to Syntrex word-processing system)	\$600 (single-user system) \$900 (to file server)	
Wang Labs. (617) 459-5000	CP/M for the OIS line of word processors	\$300	657

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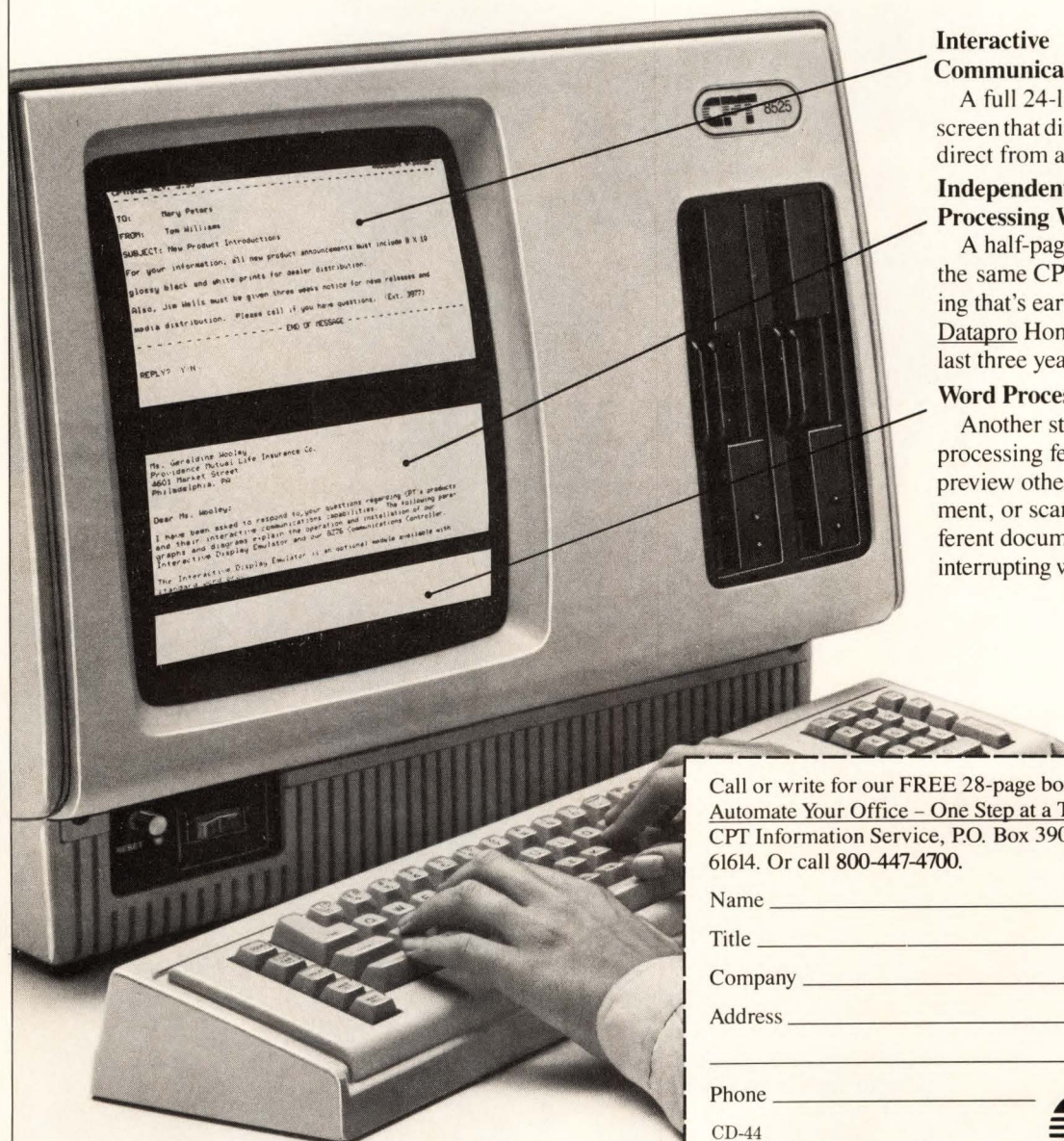
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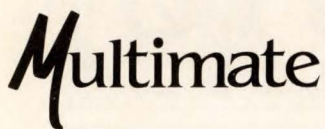
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To find out more about Multimate, the word processor, and Multimate International, the company, call Jordan Caswell at 1-800-243-3142.

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Word-processor Enhancements

(Continued from page 192)

network, avoid the problem of disk incompatibilities. In the Syntrex system, the connection is made with the aid of a plug-in board.

This brings us to the final aspect of incompatibility: the data files. Almost all personal computers and word processors use the ASCII code to represent numbers, letters, and punctuation marks. But the ASCII convention does not cover any but the simplest formatting commands. For example, there are codes for "carriage return" and "line feed," but not for "end of paragraph." For this reason, software vendors and word-processor manufacturers have developed their own control codes, and they are seldom the same. For you, this means it will be fairly easy to transfer letters and numbers, but moving something as complicated as a spreadsheet may be much more problematic.

There are several ways around this. One of the simplest solutions for text documents without a lot of tables is



the establishment of standardized formats for users of word processors and personal computers. It's true that few word-processing programs for personal computers will accept formatting commands as elaborate as those on a word processor, but they are capable of producing most of the standard business formats. With many word-processing programs, these formats can be stored on a disk and called up when needed. Or the job

of formatting can be left entirely to the word processor.

Another possibility is to run a program on the word processor or the personal computer that can convert the formatted output into something the word processor can accept. If the word processor can run a program that lets it recognize, say, Visicalc formatting commands, and translate them into its own commands, it can easily handle Visicalc spreadsheets. Of course, this requires a special conversion program.

Whatever paths to compatibility are taken, it seems that, before long, word processors will be able to routinely exchange files and data with personal computers. And we will probably see more word processors with what we think of as personal-computer capabilities. But that will be because they need those capabilities to better communicate with their cousins, not because they are filling in for them. □

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It's tough to keep track of a computer room full of disks. Even more so when cartridges or packs are sloppily marked, illegibly labeled or lose their I.D.'s altogether.

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Managing Consultants

(Continued from page 112)

nical problem, you don't want junior executives handling it.

Jacobson: This becomes a problem particularly when you're dealing with a rapidly growing consultancy that can't hire qualified people fast enough.

Prouty: It's the client's right to insist on experienced consultants, and there should be mutual agreement on this beforehand. However, what a lot of consulting firms do is structure their work force. I'm expensive, so it doesn't make sense for me to do certain tasks that someone at half my billing rate can do.

Ahern: But Jack, isn't there a tendency in many firms to use the star system? In other words, you pitch your biggest nationally known names in order to get the contract and then you send in junior people.

Prouty: Yes, but if the client establishes the conditions up front, you've removed the possibility of this problem.

Question: Chuck, this star system that Tom describes. In your opinion, how prevalent is it?

Chapman: If you're bidding against 30 competitors, you're going to throw in a bunch of star names. So, yes, the star system exists and clients had better watch out. They should find out where the stars live, and whether the stars are going to move closer for the duration of the project or keep flying in from another city. If the stars will be commuting by jet, it's safe to assume that their roles will be quite limited.

Question: When clients complain about this practice, do you feel their complaints are justified?

Chapman: Certainly. In some cases clients have merely misunderstood what we've said. In other instances, maybe we did mislead them. If this is the case, you either provide the client with what was originally stipulated or talk the client into something else.

In her scathing indictment of the funeral-home industry entitled: American Way of Death (Fawcett, 1979), author Jessica Mitford observes that, when it's time to bury a loved one, "Choice doesn't enter the

picture for the average individual, faced, generally for the first time, with the necessity of buying a product of which he is totally ignorant, at a moment when he is least in a position to quibble."

To be sure, those who seek out the

help of consultants are not as vulnerable as someone who's just suffered a death in the family. Yet, because the consultant's wares are often sought in the heat of crisis, the forces of supply and demand become erratic.

(Continued on page 198)



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Managing Consultants

(Continued from page 197)

Nontechnical executives, especially, have trouble assessing the trade-offs that exist. The executive must ask: "Am I getting a good deal, or am I being sold a bill of goods? How can I ever know for sure?"

Pennathur: We all belong to organizations where we meet with our peers. For this reason, word of mouth is probably the most important factor in choosing a consultant.

Jacobson: The best way to get the most for your money is to invest enough time up front to talk to each competitor. Make the consultant accessible to your people for interviews, and solicit their observations.

Ahern: The consultant is analogous to a doctor, and when you're looking for a good doctor, you don't shop around for the lowest fee.

Long: You probably won't learn too much by chatting with a previous client. To properly check out the consultant you should pay previous clients a visit to see how closely their projects relate to yours. If you're going to spend a lot of money on a consultant, it's worth your time to research thoroughly.

Pennathur: It may sound strange but we don't always hire the most skilled consultant. We tend to hire the one we know we can get along with. It doesn't matter how much expertise someone has if you can't get along with him or her long enough to finish a project.

Sorken: Sometimes, you really do need a Big Eight firm—like when your company is looking for that kind of comfort level. Specialists from a small firm may be just as knowledgeable, but the fact is, senior manage-

ment may not listen to them as closely as they'd listen to somebody from a major firm.

Question: Jerry, what is the advantage of going to a small firm like the one you head, as opposed to an Arthur Andersen?

Long: A small firm usually enters situations that have specific technical problems. In our case, it's usually the type of customer who, let's say, has bought an Integrated Data Management System (IDMS) and is wondering what to do next. We help them get organized and get the environment set up and maybe work on the first couple of projects.

Ahern: In an ideal situation, a firm like Jerry's can hit the deck running, whereas a consultant like Arthur Andersen may encounter a learning curve.

Chapman: We may or may not have some people with IDMS expertise. The point is they may be a small part of an overall project to implement a large system. If we couldn't provide the IDMS part, we might ask a firm like Jerry's to help us out.

At the outset of this meeting, we discussed the consultant's perceived indispensability. Like dry cleaners, hair stylists, and sanitary engineers, consultants are here to stay. But a distinction needs to be made between an occasional need and a troublesome addiction—an addiction that can result in the painful symptoms of withdrawal. Consultant Jerry Long comments on an extreme case of this:

Long: One bank brought in a facilities-management organization, and it was like taking the first fix from a dope pusher. The bank execu-

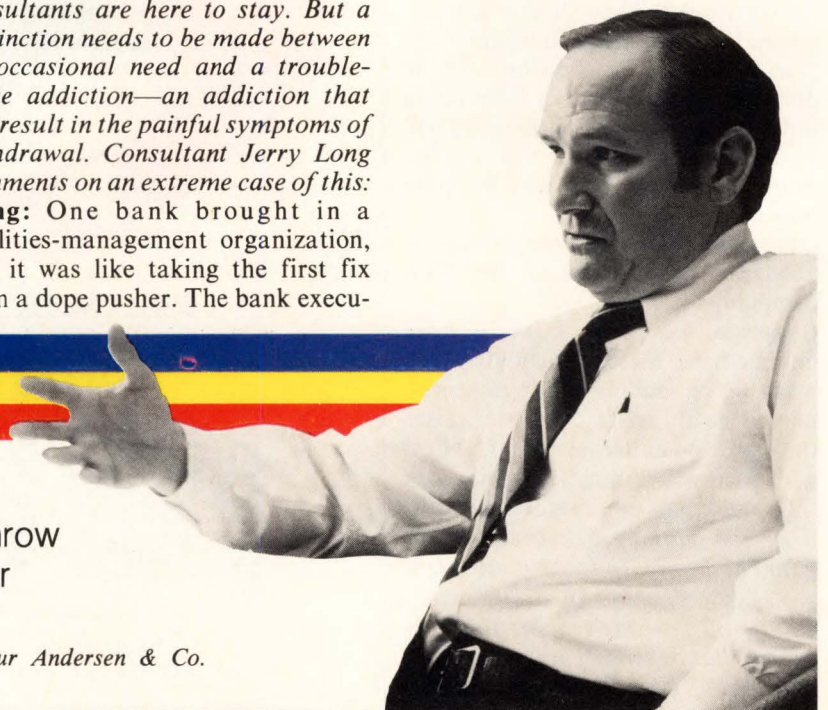
tives got hooked. Now, to be fair, this bank was in desperate shape. But five years later, when you're not in such desperate shape, it's hard to get back on your own feet.

Prouty: When you bring in a consultant, you're going after some resources that were previously unavailable or very expensive. You need a particular level of expertise for a short amount of time. And you should be managing the consultants so that you're not only driving toward the finished product, but also seeing a transfer of skills and knowledge. In this way, your employees will be able to perform independently by the time the consultant walks out your door.

Pennathur: Sometimes the situation falls apart right after the consultant leaves. This leaves you wondering if the consultant was merely working to camouflage a bad situation. Consultants are like therapists, after all, and there are some patients who never get out of therapy. □

Readers are invited to submit their experiences with consultants—both positive and negative. We will try to publish as many responses as possible in an upcoming issue.

"If you're bidding against 30 competitors, you're going to throw in star names. So, yes, the star system exists and clients had better watch out." *Chapman, Arthur Andersen & Co.*



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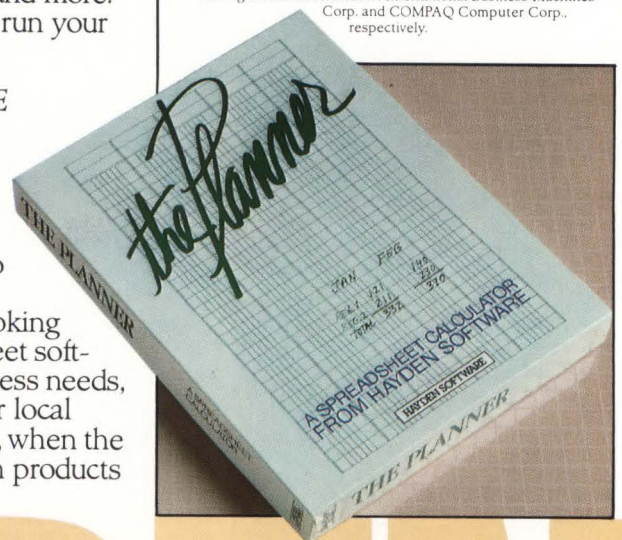
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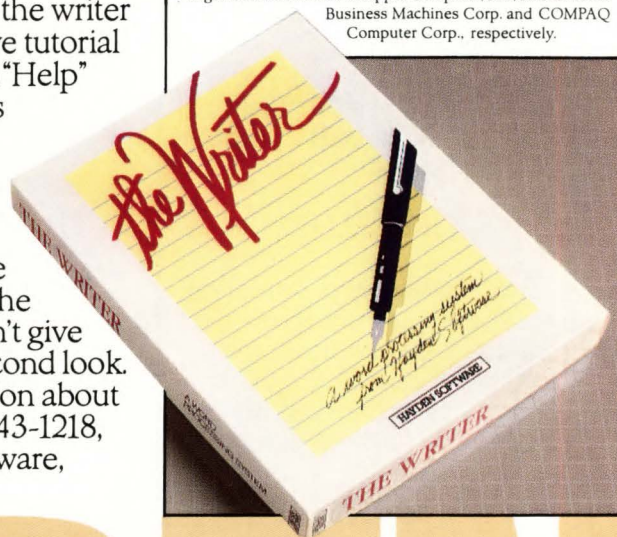
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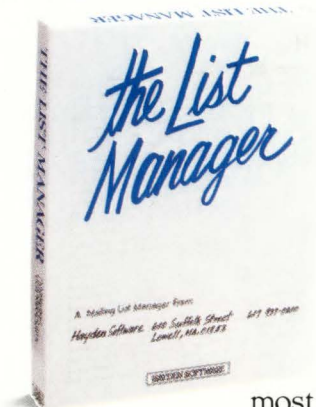
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It's an easy to use data base that allows you to collect lists, names, addresses, phone numbers, account numbers, expiration dates and other miscellaneous information. Plus, its "buy it and use it" format lets you use a data base without having to learn how to build one. And without spending a lot of money either.

The List Manager is compatible with the IBM PC, PCjr., PC XT, or COMPAQ Computer. List price \$49.95.

THE SPELLER.

The Speller helps you eliminate spelling errors forever. It contains a dictionary of over 20,000 of the most frequently used words in the English language, which means you have

OTHER BUSINESS PRODUCTS FROM AMERICA'S FIRST FAMILY OF SOFTWARE.

97% of total word usage at your fingertips. You can also create your own dictionaries to use with The Speller. And its unique compression formula allows it to thoroughly examine a 15 page document in a matter of seconds.

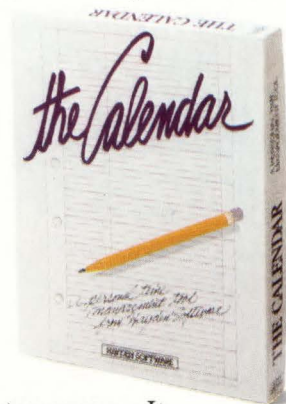
The Speller is compatible with the IBM PC, PCjr., or COMPAQ Computer. List price \$49.95.

THE CALENDAR.

With The Calendar, you'll never need your pocket secretary or desk appointment calendar again.



It gives you everything you need to keep your club meetings and appointments on schedule. Using its unique "Window" approach, The Calendar lets you see any day, week, month, or year on the



computer screen. It will even provide printouts for any time period or upcoming event. Which can make juggling schedules a lot easier for you.

The Calendar is compatible with the IBM PC, PCjr., PC XT, or COMPAQ Computer. List price \$49.95.

Hayden Software,
600 Suffolk St., Lowell, MA 01853
800-343-1218.

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HAYDEN

LETTERS

Low-cost graphics

Thank you for David Whieldon's fine article, "Computer graphics: Art serves business" (May). One impression created by this article is that hard-copy output devices tend to be a bit "pricey." We would like to advise you of the NPC Screenshooter, a low-cost product that allows the user to create a photographic image of a graphics screen on either a Polaroid 600 camera (included with the product) or a standard 35mm camera and normal lens. The Screenshooter retails for \$169 and includes—in addition to the Polaroid 600 camera mentioned—a screen hood, a diopter lens, and a 35mm-camera-mounting bracket.

As a wholesale distributor of this product, we would be pleased to advise your readers on how to obtain it.

Harvey M. Schlesinger
Vice President
Professional Network Services
315A Chestnut St.
Needham, MA 02192

More to this story

Congratulations on John Seaman's timely and pertinent May Data Communications column, "Is IBM's IMS your Achilles' heel?" The column identified some important data-security concerns for IMS installations that support remote dialup access via 3270 protocol converters. (The converters must be used, since IBM 3270s don't even support dial access.) However, while the column noted some potential trouble spots, the consultant to whom you spoke glossed over solutions that are in use today. There's more to this story.

For instance, the column mentioned two possible ways to avoid security breaches: Modify IBM's IMS, or tweak the protocol converter so it uses a unique terminal address for each individual user. Your consultant discouraged user modification of IMS. (He also overlooked a simple way to get the desired effect by properly designing users' application programs in the first place.) As for the second option, we

find it difficult to understand why your consultant says it requires "major hardware changes" when it is basically a software modification in the protocol converter.

More important, the shortcomings of some early protocol converters don't define the present market. Some newer protocol converters have such security features as automatic log-off upon user terminal-disconnect, password security, terminal-inactivity timers, etc. And protocol converters needn't cost the \$1,000-or-so per channel implied by the prices mentioned in the column: Our pricing, for example, is less than half that figure!

As representatives of this part of the industry, we'd like to help clarify any misconceptions about protocol converters and security, and we'd welcome the opportunity to discuss any such concerns with your readers.

Scott Brear
Microm Systems Inc.
20151 Nordhoff St.
Chatsworth, CA 91311

Editor's blade mightier than pen

Your March 15 Special Issue, "Corporate Executives' Guide to Personal Computing," contains an article, "The right tool for the right job," in which statements I made to reporter Joe Hillhouse were not accurately conveyed.

Both professionally and personally, I firmly believe that there is, and will continue to be, a place for timeshare mainframe computers in the scheme of corporate information systems. While it is true that more and more functions are migrating to personal computers, it is my opinion that there will continue to be applications which are best handled on mainframe computers.

Mark Burnham
Security Pacific National Bank
Micro Computer Services
Los Angeles, CA

Editors' note: Mark Burnham's statement to reporter Hillhouse—that personal computers have the potential to

put timesharing systems out of business—was inadvertently made more emphatic as the article was shortened during editing.

Unconvinced

Norman Epstein (March 15 Special Issue) certainly speaks forcefully, doesn't he?

I don't know what a DG [Data General] MV/4000 costs, but by his own statements, Epstein has one for every 25 terminals. Presumably, the DGs are networked. Presumably, Epstein has an army of systems and operations pros at his disposal. Presumably, he has hardware- and software-maintenance contracts, uninterruptible power systems, environmental-control systems, and elaborate security measures. Also, he must buy magnetic tape and disk packs by the carload.

While some of Epstein's concerns about personal computers are valid, the most opinionated speaker in the world couldn't convince me that 25 micros aren't a cheaper way to achieve the same results.

Emily G. Johnston
President
Carroll Computer Consultants Inc.
Westminster, MD

Norman Epstein responds: What Emily Johnston overlooks is that our 400 DG MV/4000s will be in our branch offices throughout the world—without an army of systems and operations people (not even a platoon), without any uninterruptible power systems, without computer rooms, without security systems, without any additions to staff at the branch level. No matter how you slice it, 6,000 networked micros, powerful enough to do the basic tasks, distributed among 400 locations around the world, are indeed more expensive than having 400 remote DG MV/4000s with 6,000 terminals integrated in the fabric of E.F. Hutton's computers and communications.

Address letters to the editor to Computer Decisions, 10 Mulholland Dr., Hasbrouck Heights, NJ 07604.

LETTERS

The Americans

"Snyders on Software" in the December issue featured a listing and critique of accounting packages. Although our company, American Management Systems Inc., was listed

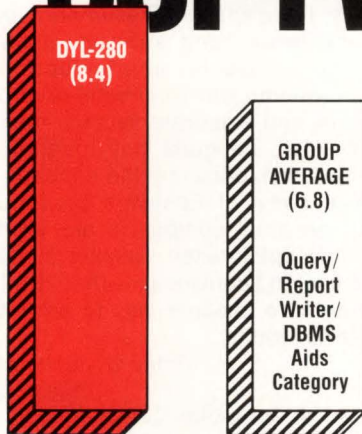
as a vendor, the telephone number and the information supplied on our Corporate Financial System (CFS) apply to American Software, a company based in Atlanta. American Management Systems is headquartered in the metropolitan

Washington area, and our telephone number is (703) 841-6000. Our CFS software runs on the IBM 370, 4300, and 30XX, and the DEC VAX. The IBM CICS/VSAM version costs from \$125,000 to \$175,000; the IMS version, from \$175,000 to \$250,000; the DEC version, from \$95,000 to \$130,000. CFS handles general ledgers, accounts payable, accounts receivable, consolidations, and operating budgets.

Patrick W. Gross
Chairman, Executive Committee
American Management Systems Inc.
Arlington, VA

Editors' response: Jan Snyders' original copy was correct; in preparing the list for print, the two entries for American Management Systems and American Software were inadvertently typed as one. Our apologies to both companies.

WHY USERS RATE DYLAKEOR SOFTWARE #1



Latest Data Decisions Systems Software Survey Shows Dylakor is Overwhelming Choice of Users...Again

Survey after survey, year after year, Dylakor products are rated number 1 for IBM mainframes. Why? Because Dylakor software has the versatility, flexibility and reliability that provide outstanding performance... and Dylakor provides the support and service that assures continuing satisfaction.

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Computer _____

Mail to: Dylakor, 17418 Chatsworth Street,
P.O. Box 3010, Granada Hills, CA 91344

Seeks help uploading

We have an IBM System/38 with IBM Personal Computers connected via 5250 emulation boards. We have solved the problem of downloading our database to PC programs like Multiplan, Lotus, etc. However, we haven't been able to do the reverse—upload the numeric information that we collect on the PCs back to the S/38.

We could write programs that would upload the numeric data by converting each numeric field into an alpha field, but then we'd have to write more programs—on a file-by-file basis—to convert the data back to numeric. This would obviously be tedious and not very functional.

Have any of your readers solved this problem (without writing programs for each file)?

Also, have any of your readers who have a System/38 installed IBM PCs and or XTs in Canada or Europe?

Thank you very much for your help.

Greg Della-Croce
Data Processing Manager
Greater Europe Mission
P.O. Box 668
Wheaton, IL 60189

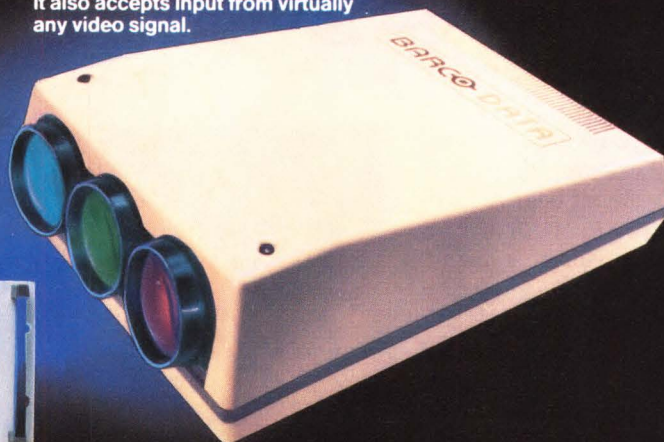
Those who have advice for reader Della-Croce may write to him at the Wheaton address shown.

CIRCLE 94

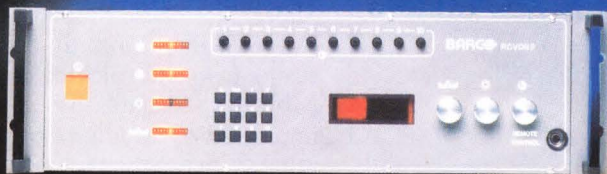
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Someday you'll wonder how you ever got along without it.

APPLICATION

Madic sparks growth

Z ycon Corp., a manufacturer of printed circuit boards, attributes its extraordinary growth to Madic, a manufacturing- and financial-information system. Madic has proved to be a superior shop-floor control system, handling all of the data-processing for Zycon's manufacturing processes. Says John Dunning, senior vice president: "The control we have now is incredible."

Madic was implemented at Zycon via timesharing in November 1981. At about, \$2,500 a month, timesharing was an inexpensive way to "test drive" the software. Within three weeks, Zycon was tracking its marketing backlog online, and sales-order status and shipment-reporting were vastly improved.

By October 1982, Zycon had achieved even more impressive results. Shipments were up 45 percent and the accuracy of the work-in-progress (WIP) inventory improved by 50 percent. By year's end, the average lead time for production had been reduced by four weeks, while the system continued to maintain WIP accuracy of more than 95 percent. After the key personnel on the shop floor were trained, WIP accuracy improved to 98 percent.

Zycon chose Madic because the package lets users know what's in the shop, what's coming, what's going, and when. Jim Herlihy, manufacturing manager, uses Madic to determine the production status of a particular product. He now has time to plan



Larry Shoemaker, corporate planning manager (right) at Zycon Corp., and Keith Reed, drill operator (left), review work-in-process statistics for a computerized drilling machine.

ahead, rather than simply reacting to outdated information.

Before installing Madic, Zycon used a batch service bureau to track its backlog of sales orders. Everything else was processed by hand. However, the service bureau had a three-day turnaround, too slow for a company growing at the rate of 40 percent a year. Larry Shoemaker, now corporate planning manager, was hired to select an automated system and guide implementation. The package had to be fully integrated, user friendly, and have material-requirements-planning (MRP) capabilities.

Shoemaker examined at least 15

MRP-based software packages, including Man Man from Ask Computer Systems, NCA's Maxim, and MDC Qantel's Q MRP. Shoemaker chose Madic for two reasons. First, it has strong job-yield-tracking capabilities. Second, he was impressed by Madic's operating system—the Pick relational-database operating system. There are over 800 programs written in Basic available for Pick.

Zycon chose Prime Computer's version of Pick, which includes Inform, a report-writing facility that lets users create custom reports in minutes. Says Shoemaker: "Once I understood Inform's capabilities, I found myself writing many custom reports to give users exactly what they asked for."

Madic was installed at Zycon in January 1983, running on a Prime 2250 minicomputer. The crossover from timesharing was completed in one afternoon. Shoemaker, Herlihy, and Dunning agree that Madic has smoothed transactions between departments.

Zycon has big plans for expansion. During the next five years, it plans to increase annual sales from the current level of about \$25 million to \$40 million to \$50 million. The company's executives believe Madic will be a vital tool.

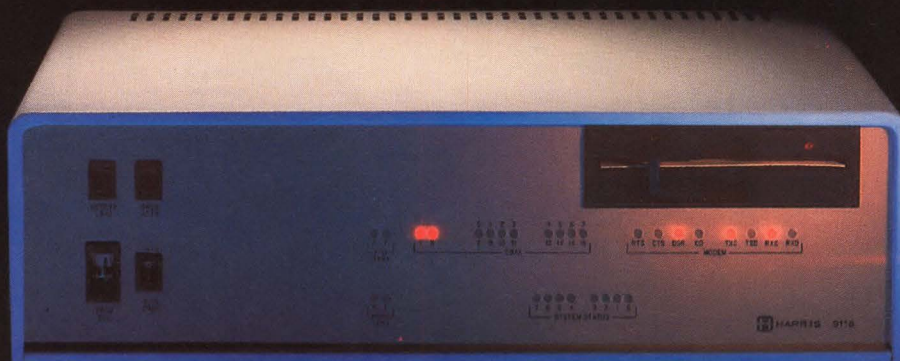
Madic runs on minicomputers powered by the Pick operating system. When purchased with a Prime 2250, it costs \$105,000. Madic Corp. is located in Santa Clara, CA; the phone is (408) 988-8311. *Circle 754*

9116

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It fits.

Space, Budget, Function — and Future.



THE SECRET of putting 3270 computer power into a small space is the 9116 System by Harris. And the secret of the system is the 9116 *Controller*. Now branch offices, customer service desks, and all remote departments with limited space can link up with an IBM mainframe without the burden of a big, bulky controller. The 9116 offers full remote SNA

communications capability at protocol converter prices. And as your remote office grows, so can your Harris System. Each 9116 can accommodate up to 16 devices — including a range of terminals: 12" and 15" displays; green, amber, and color displays; screens up to 132 columns. The 9116 is customer installable. The fit is perfect. The quality is Harris.



HARRIS

CIRCLE 132

TO: J. Barry, VP Marketing Interactive Products Division, Harris Corporation,
16001 Dallas Parkway, P.O. Box 809022, Dallas, Texas 75380-9022.

We're ready for a perfect fit! Send more information on 9116.

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CD-784

For your information,
our name is Harris.



APPLICATION

Scanner speeds international messages

Compuscan's Alphaword III+ optical-character-recognition (OCR) scanner has improved the speed and accuracy of United Brands' international communications network. OCR has ended the redundant and error-prone practice of rekeying messages into a communications processor.

Alphaword III+ reads up to 300 typewritten pages per hour and makes an error only about once every 300,000 characters.

"With the scanner, our operation processes inter- and intracompany communications 50 percent faster," says Robert Nakken, supervisor of the corporation's communications center in New York. Nakken attributes a significant boost in productivity to the scanner. "It has provided a savings of more than \$15,000 in its first year of use," he explains.

United Brands is a New York-based food importer and processor with worldwide 1983 sales of \$3.9 billion. Eighty percent of the messages received by the United Brands communications center must be routed around the globe. Many of the messages are addressed to ships on their way to ports. Because these ships may cross several time zones, transmissions to them must be precisely timed. Delays can interrupt the flow of vital information and messages.

Telex was United Brands' standard communications medium before the arrival of Alphaword III+. Telex

requires that messages be translated onto perforated paper tape, which slows transmissions. The Telex operation ran smoothly enough, but it couldn't keep up with the heavy flow of messages through the communications center. Also, paper tape tears easily and requires large amounts of storage space.

The installation of Alphaword III+ was the last step in a conversion from the paper-tape translators to

primary function of processing messages for transmission. The scanned messages are instantly converted to digital formats that can be switched onto other electronic systems.

Recently, the communications center received a three-page message for transmission to London containing urgent instructions for a transaction to be completed before the close of that city's business day. Under normal conditions, the center would have

needed 30 minutes to process the message for transmission via Telex, too long for the London message.

The Alphaword III+ scanner sent the message on its way to London within five minutes, leaving time to spare. As Nakken sees it, "This sort of efficiency alone justifies our decision to install an OCR reader."

The scanner has a built-in keyboard and 32-character display that lets operators correct text, add paragraphs, or simply verify messages before they are transmitted for processing. Operators make

changes right on the scanner. The communication center's operators use this feature to edit copy.

Alphaword III+ also gives operators the opportunity to make corrections after a message is transmitted to the Micronet 6.

The Alphaword III+ scanner has a base price of \$29,500. The Micronet 6 has a base price of \$15,900, including a single workstation.

Circle 753



United Brands' communications clearinghouse works 50 percent faster with an Alphaword III+ scanner.

two Micronet 6 telecommunications processors from Sidereal Corp., Portland, OR. The new processors helped speed processing of the heavy load of traffic, but Nakken's staff was still spending too much time inputting memos and messages. Those chores ended in November 1982, with the arrival of the OCR scanner. Alphaword III+ eliminates the need for data-entry processing by the Micronet 6 units, freeing them for the



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CIRCLE 98

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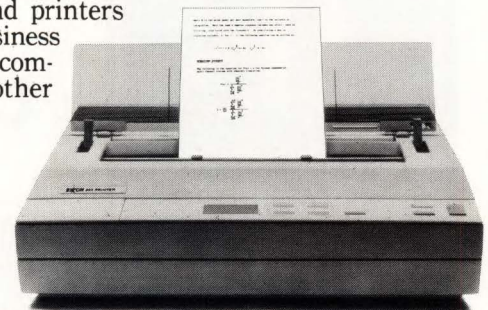
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CIRCLE 99



NCC PRODUCTS

Peripheral controllers

Three new peripheral controllers, the ZDF-1, BMX-1, and BMX-2, are compatible with Data General minicomputers. ZDF-1 controls both disk and tape drives from a single board

on Data General's Nova/Eclipse Series minicomputers. The interface features total emulation of Data General disk and tape subsystems and enhancement via E2PROM technology, which eliminates the

need for on-board switches. Price: \$4,195 each; quantity discounts are available. The BMX-1 is a fully emulating single-board disk-drive controller that supports up to four SMD disk drives on Data General's BMC. E2PROM technology allows drive configuration from the operator's console. Price: \$4,995 each; quantity discounts are available. Model BMX 2 is a magnetic-tape coupler designed for plug-and-go compatibility with Data General's MV and Eclipse Series minicomputers. Price: \$1,995; OEM quantity discounts are available. It supports new emulations 4307 and 6026 under AOS/VS and offers transfer rates of 1.2 Mbytes per second.

Zetaco Custom Systems Inc., 6850 Shady Oak Rd., Eden Prairie, MN 55344. (612) 941-9480.

Booth D-3306
Circle 752

Graphics controller

The GC-20 Graphics Controller for DEC LSI-11 Bus generates a 1,024 x 1,024 interlaced image, with four bits per pixel. Price: \$5,900 apiece. It provides for the simultaneous display of 16 colors from a palette of 4,096 colors. Text capabilities include four screens of 64 lines by 80 characters.

Dataram Corp., Princeton Rd., Cranbury, NJ 08512. (609) 799-0071.

Booth A1314
Circle 748

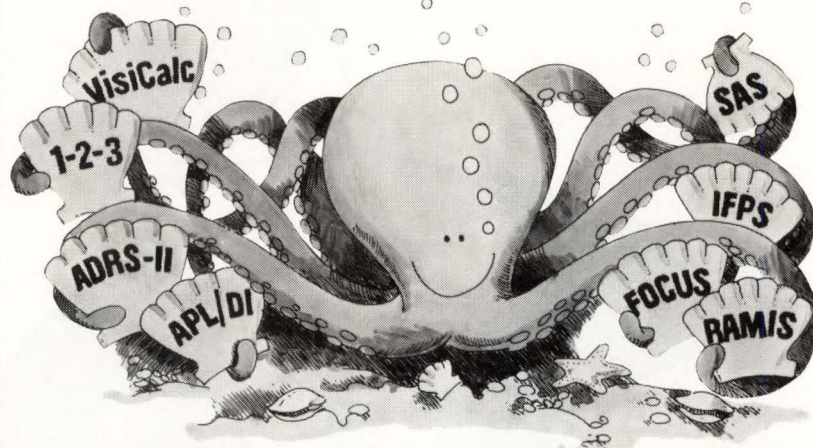
Networking system

Wangnet FastLAN is a prepackaged, user-installable cable system that offers the full communications capabilities of Wangnet, Wang Laboratories' broadband LAN. It lets small and medium-sized organizations link Wang and non-Wang equipment. FastLAN comprises three easy-to-install modules: FastLAN-A, a broadband radio-frequency amplifier unit, \$995; FastLAN-B, a network branch, \$350; and FastLAN-C, a drop cable, \$120.

Wang Laboratories Inc., One Industrial Ave., Lowell, MA 01851. (617) 459-5000.

Booth C3918
Circle 749

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THE VITAL CONNECTION IN YOUR INFORMATION CENTER.

Imagine the potential of an Information Center tool that lets even the most novice of users work with data and send it back and forth among leading micro and mainframe products.

STSC's DATAPORT product is that tool. With this versatile display and analysis product in your Information Center, there is virtually no piece of data beyond reach. DATAPORT's interfaces connect you to popular products like FOCUS®, RAMIS®, IFPS®, SAS®, ADRS-II, APL/DI, VisiCalc®, and LOTUS's 1-2-3™.

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formatting, and even works with multi-dimensional data.

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Guarantee power for your computer. Avoid downtime losses. Let EPE supply a computer power protection system to suit your needs and your budget.

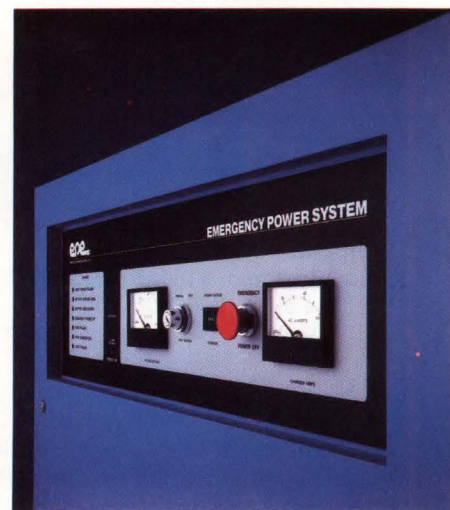


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ACCESSORIES

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Optical Coating Laboratory Inc., 2789 Northpoint Pkwy., Santa Rosa, CA 95401.

(707) 545-6440.

CIRCLE 210

Corner stations

A line of adjustable ergonomic workstations is designed to fit into 90-degree corners. Price: \$415 to \$1,100, depending on configuration. These units can function as stand-alone workstations or as multi-surface workstations with angular attached re-



turns. They come in walnut, putty, or oak finish.

Biotech Systems, 3158 Production Dr., P.O. Box 8, Fairfield, OH 45014.

(513) 874-9498.

CIRCLE 211

Hard-sectored disks

An 8-inch, single-sided, single density Shugart-compatible floppy disk with 32 section holes features a durable

hub ring and a write-protect notch. Price: \$7.20. Double-density 5 $\frac{1}{4}$ -inch floppies with 16 sector holes also feature durable hub rings. Prices are \$5.19 for the single-sided and \$7.40 for the double-sided. They come in boxes of 10 and carry a lifetime warranty.

TDK Electronics Corp., 12 Harbor Park Dr., Port Washington, NY 11050. (516) 625-0100.

CIRCLE 212

Mobile crt table

The MTT-1 Mobile Terminal Table is a single-surface unit for crts. Price: \$172. It has a five-legged base with locking casters, providing both a stable worktable and a means for moving



the terminal. The mar-resistant laminate work surface comes in putty or teak.

Bretford Mfg., 9715 Soreng Ave., Schiller Park, IL 60176.

(312) 678-2545.

CIRCLE 213

Diskette storage

The Diskette Carousel stores and protects 72 5 $\frac{1}{4}$ -inch floppies in a high-impact-plastic rotating file. The diskettes, in color-coded envelopes, are stored vertically and never touch each other. The units can be stacked and cost \$30 apiece. The Twist and Tilt monitor holder is designed for the IBM PC but holds other microcomputer

monitors as well. Price: \$30. It can rotate 360 degrees and tilt forward or backward 25 degrees, and is vented to dissipate heat.

Inlad, 32051 Howard, Madison Heights, MI 48071.

(313) 585-2330.

CIRCLE 214

Rolltop disk file

The Rolltop 100 Executive is a deluxe model of a file holding 120 diskettes. It comes with 10 dividers and color-coded labels. Price: \$40 for a standard model and \$50 for a locking model.

Microcomputer Accessories Inc., 5721 Buckingham Pkwy., Culver City, CA 90230.

(213) 641-1800.

CIRCLE 215

Printout caddy

Printouts are organized, kept handy for frequent referral, and can be transported to other locations in a 26 $\frac{1}{2}$ -inch high mobile unit with six shelves and a drawer. It comes in champagne or black and costs \$110 without a locked drawer and \$125 with it. (Each shelf accommodates 6,000 sheets.)

Wilson Jones, 6150 Touhy Ave., Chicago, IL 60648.

(312) 774-7700.

CIRCLE 216

Atmospheric check

The System II reactive computer warns mini-computer operators of potentially damaging conditions such as overheating, humidity, power fluctuations, and smoke or airborne particles. Prices start at \$13,600. The System II has LED indicators and audible alarms, and it automatically separates the mini from the power line if there is a problem.

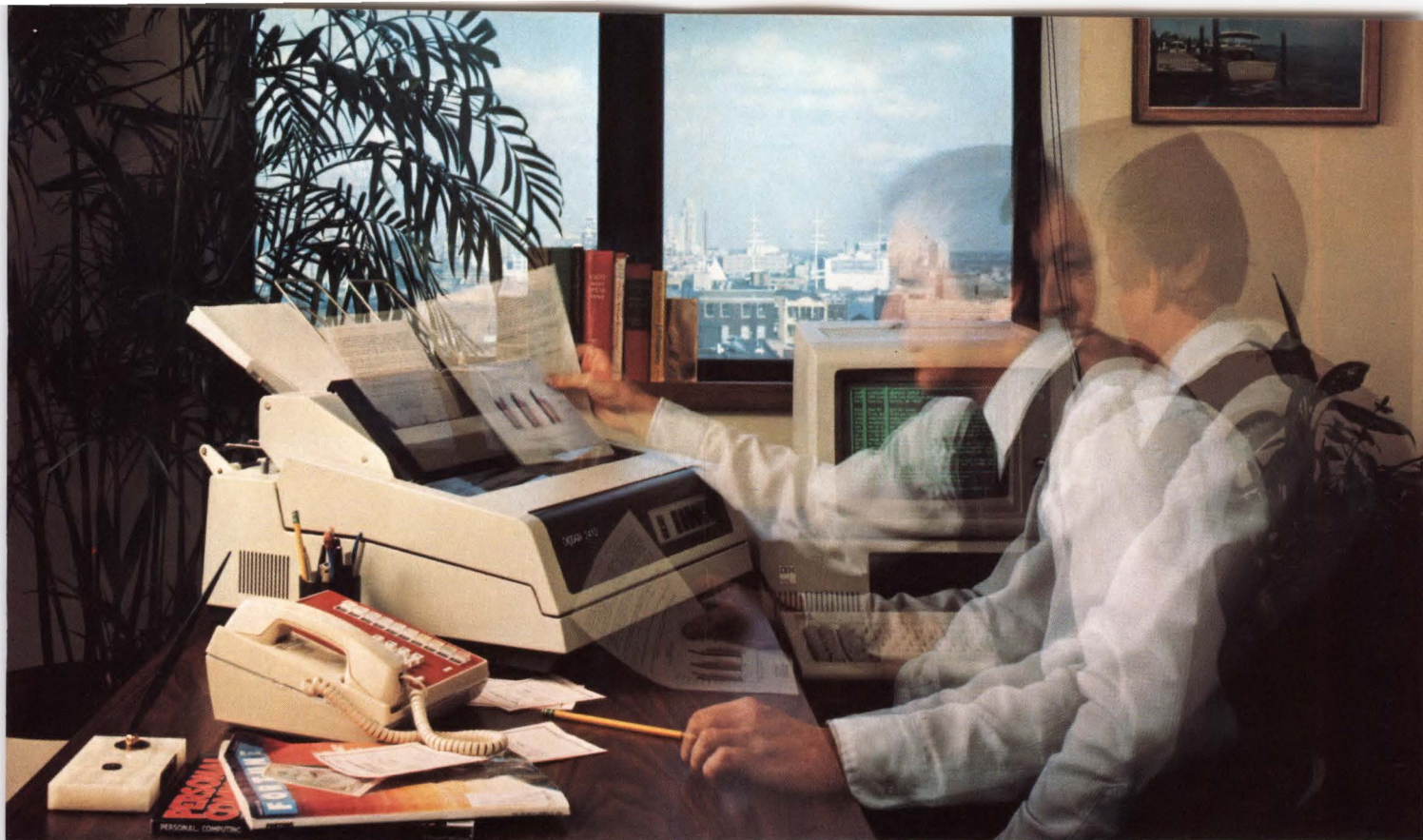
Sentec Inc., 1265 N. Dutton Ave., Santa Rosa, CA 95401.

(707) 542-8336.

CIRCLE 217

Dibol on Pro: DBL, an advanced version of the Dibol business-programming language, is available on the DEC Professional Computer under RT-11. It's from Disc of Sacramento, CA.

CIRCLE 218



THE PRINTER TO PICK WHEN THE PACE QUICKENS.

It's happening all over the PC and micro worlds.

You're getting hit with a ton of increased throughput requirements. Your applications are generating a deluge of paper. You need more printer speed. A lot more.

You're also looking for more professional-looking presentations so you need better print quality. A lot better.

Who's got the best of both worlds for you?

Okidata's Pacemark 2350 and 2410 dot matrix printers.

They'll not only help you *keep* pace with your world, they'll help you set new and exciting ones. In print speed. In print quality. And in vastly increased compatibility and capability.

Take throughput. The 2350 and 2410 can quickly get you out of the waiting game to where you're *really* cranking it out. And with flexibility, too: up to 5 pages per minute.

But wait. Cranking *what* out, you may ask? A single, restrictive printing mode? No way. The 2410 can give you DP, draft,

and a correspondence quality that truly rivals the daisywheel.

And the 2350 and 2410 can both print at up to 350 cps. While producing 120 to 420 lines a minute for you. With bidirectional printing and short line seeking logic. And both high speed horizontal and vertical slew.

PC COMPATIBILITY. SOFTWARE COMPATIBILITY.

The 2350 and 2410 use industry standard interfaces making them hardware compatible with most mini and micro-systems on the market today. In addition, they are supported on the menus of most of the important software being offered to microsystem users like Visicalc, Lotus 1, 2, 3, DBASE 2, Peachtree 500 and General Ledger, Multi-Mate WP, Wordstar, etcetera.

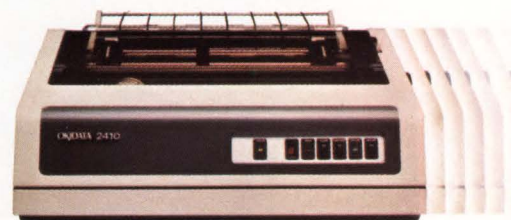
But wait, there's more. Like an outstanding all points addressable graphics capability with 144 x 144 dots per inch resolution.

Two color printing for highlighting. Down line loadable font sets for flexibility.

Subscripts and superscripts so your scientific and technical usage won't bog down. Six-part forms handling. The capability to print 132 columns on eight-inch paper using 17.1 characters per inch to save paper costs and make output easier to handle.

And—so that you can depend on getting all that good stuff, all the time—a mean time between failure of 2200 hours. A mean time to repair of only 30 minutes. An average printhead life of 200,000,000 characters. And an industry low warranty claim rate of less than 2%.

No doubt about it, the quicker the pace at your place, the more you need Pacemark from our place. For more information, call toll free 1-800-OKIDATA. In New Jersey, 609-235-2600. Or write OKIDATA, Mt. Laurel, NJ 08054.



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See us at NCC booth #1744

CIRCLE 133

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CIRCLE 104

COST CUTTERS

Sperrylink cuts

Several peripheral components of the Sperrylink Office System have been reduced, making the cost of a typically configured Desk Station \$7,869. For example, two draft printers have been reduced from \$1,875 to \$1,275 and from \$2,125 to \$1,395. A forms tractor, formerly \$495, is now \$329, and a cut-sheet feeder that was \$995 is \$745.

Sperry Corp., P.O. Box 500, Blue Bell, PA 19424.
(215) 542-4213. **CIRCLE 219**

Stratus tape and disk drives

A magnetic tape drive for the Stratus/32 Continuous Processing System reads and writes standard 1/2-inch reel-mounted tape. Price: \$10,000. The Stratus/32 operates in both streaming and start/stop modes. It can be used as a backup for disks or as a storage unit for tape dp applications. A Stratus 143-Mbyte Winchester disk drive has been reduced from \$26,000 to \$12,500.
Stratus Computer Inc., 17 Strathmore Rd., Natick, MA 01760.
(617) 653-1466. **CIRCLE 220**

Plotter and graphics

A six-pen MP1000 plotter from Softkey comes bundled with Graphtec's Keychart presentation-graphics package, which costs \$375 separately. The complete turnkey system costs \$1,190. Keychart can access a number of spreadsheet files, such as Lotus 1-2-3, Supercalc, Visicalc, and Multiplan, and can produce sophisticated charts on the plotter.

Softkey Software Products Inc., 2727 Walsh Ave., Santa Clara, CA 95051.
(408) 986-8148. **CIRCLE 221**

Electronic mail

Prices for ADP's Automail electronic-mail service are based on the number and type of transactions rather than on the amount of time elapsed. Messages sent to the first addressee are 75 cents per 1,000-character segment; for additional recipients the cost is 30 cents per address. There is no charge for connect time on the ADP Autonet public data network, except for third-party network and WATS connections. Recipients are not charged for reading incoming messages.

ADP, 175 Jackson Plaza, Ann Arbor, MI 48106.
(313) 769-6800. **CIRCLE 222**

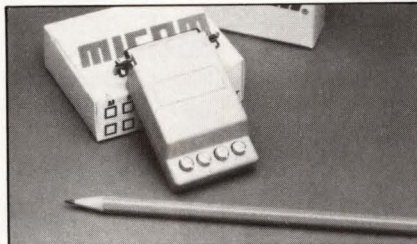
Graphics systems

The PS 300 family of graphics systems has been reduced. Model PS 330, with 1-Mbyte of memory, 19-inch color calligraphic display, keyboard, and data tablet, has been cut from \$84,995 to \$48,000.

Evans & Sutherland, P.O. Box 8700, 580 Arapen Dr., Salt Lake City, UT 84108.
(801) 582-5847. **CIRCLE 223**

Data-comm support

The Model 430 Mini Driver, operating at up to 19,200 bps at a distance of over mile, costs \$807.50 for a carton of 10. The Model 431 Mini Dataset, operating at up to 9,600 bps over the telephone company's private circuits,



costs \$902.50 per carton of 10. The Mini Driver and the Mini Dataset—each small enough to fit into the palm of your hand—plug directly into the terminal, requiring no cables, AC cord, or outlet.

Micom Systems Inc., 20151 Nordhoff St., Chatsworth, CA 91311.
(213) 998-8844. **CIRCLE 224**

Ethernet link

Etherlink, an Ethernet interface and software for personal computers, has been reduced from \$950 to \$795. Enhanced Ethershare software now supports an IBM PC as both a network server and a workstation. It costs \$595. An Etherstart chip (\$100), when inserted on the networking board, allows an IBM PC to function on the network without a local disk drive and controller.

Com Corp., 1390 Shorebird Way, P.O. Box 7390, Mountain View, CA 94039.
(415) 961-9602. **CIRCLE 225**

Kaypro 2 cut

The Kaypro 2 personal computer with bundled software can be purchased for \$300 less than the suggested retail price of \$1,295. The Kaypro 2 offers two double-density disk drives with 400-K storage, 9-inch high-resolution screen, and professional keyboard.

Kaypro Corp., 533 Stevens Ave., Solana Beach, CA 92065.
(619) 481-4300. **CIRCLE 226**

RS-232 modem

The 212-compatible command-drive Intelligent Modem has been reduced from \$649 to \$549. It operates from 110 to 300 baud and, at 1,200 baud, it has auto-dial, auto-answer, programmable auto/log-on sequence, synchronous and asynchronous communications, speed detection, and diagnostics.

Bizcomp Corp., 532 Mercury Dr., Sunnyvale, CA 94086.
(408) 745-1616. **CIRCLE 227**

Enhanced 308X

IBM 308X systems now offer improved performance at no extra cost, as well as increased memory options and control-program enhancements. The costs of upgrades and maintenance have also been reduced. Prices range from \$1.2 million for the 3083EX with 8 Mbytes of memory to \$9.16 million for the 308QX with 128 Mbytes.

IBM (contact local sales office)

CIRCLE 228

Data retrieval

Prices have been revised for the Creatabase data-retrieval system, which runs on Wicat, HP 3000, Tandem, Univac 1100, IBM under VM/CMS, Control Data Cyber, and Cray computers. A perpetual license is \$35,000 for Univac, \$25,000 for the IBM 4341, and \$45,000 for IBM 308X series. The software is also available through monthly rentals. Creatabase allows a user to find occurrences of any phrase or number instantly; it searches unstructured text or structured data fields by content, without creating key fields or indices.

NDX Corp., 8260 Greensboro Dr., McLean, VA 2102.
(703) 442-7598. **CIRCLE 229**

Give your PC some exciting new personalities.

Our EtherGuide™ seminar-on-a-diskette will show you how.

This diskette seminar demonstrates how easy it is to get into personal networking. With 3Com's EtherSeries™. The effect is dramatic. Instead of a solid, useful, but limited business assistant, your PC shows its true potential.

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sultant, secretary, messenger, meeting planner, graphic artist, author, financial analyst, executive, and friend.

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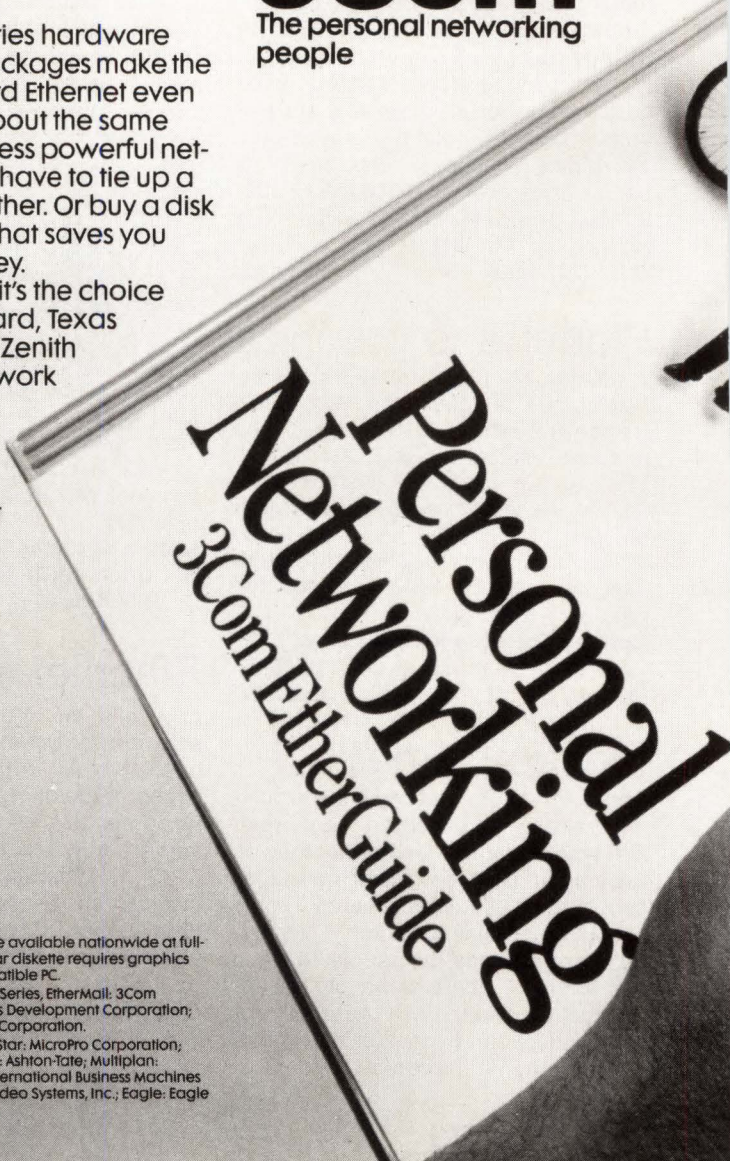
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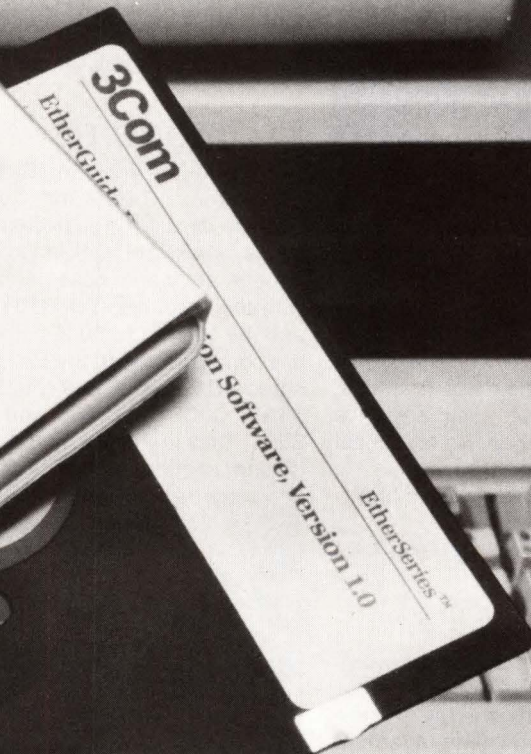
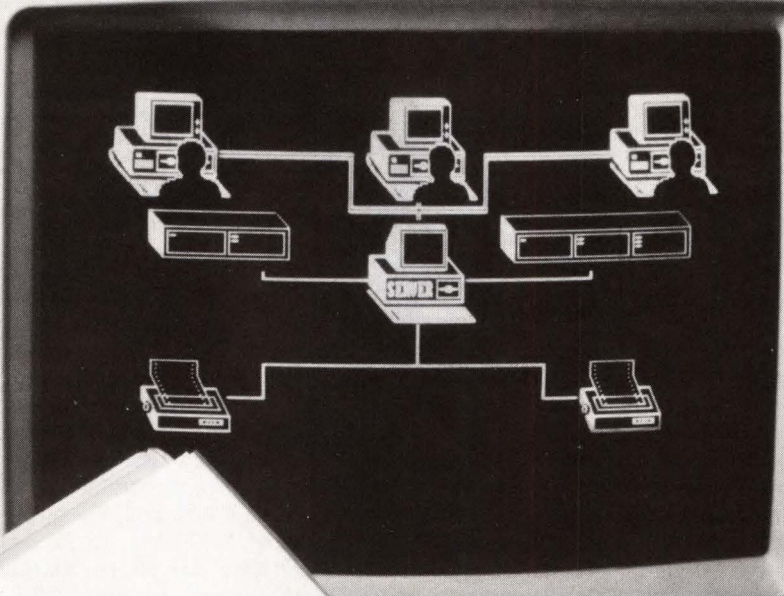


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Networking
3Com EtherGuide

3Com EtherSeries products are available nationwide at full-service PC retailers. The seminar diskette requires graphics capability on an IBM or compatible PC.

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P.O. Box 7390, Mountain View, CA 94039, Attn: Corey Randall,
(415) 961-9602.

DATA-COMM EQUIPMENT

Protocol analyzers

Four diagnostic analyzers clearly describe what is happening on your data lines. The Digilog 200, smallest of the series (\$4,995), sets up, decodes, and analyzes protocols, tests devices, and automatically identifies faults. Capabilities and features include program or data storage, remote control, full programming, menu-driven traps and triggers, help screens, printer output, typewriter-like keyboard, crt, and six bit-error-rate tests. The Digilog 400 (\$7,495) and the 600 (\$11,500) offer speeds of up to 72 Kbps, more programming power, built-in 3½-inch micro disks, soft-function keys, graphics, protocol simulation, and all the features of the 200. The top of the line Digilog 800 (\$18,500) also offers fully selective bit-image recording, automatic protocol analysis, and speeds of



up to 256 Kbps. Other capabilities of the 800 include online color graphics, internal 10-Mbyte hard disk, selective logging, and comprehensive statistical analyses and reports.

Digilog Inc., 1370 Welsh Rd., Montgomeryville, PA 18936.
(215) 628-4530. **CIRCLE 278**

Mid-range PABX

The System 75 business-communications system combines voice, high-speed data, and an array of communications and system-management features in an integrated system. It can be upgraded to the capabilities of the larger System 85, introduced last year. The System 75 private automatic branch exchange (PABX) is intended for medium-size users with 50 to 400 lines. The System 75 costs between \$600 and \$700 a line, depending on configuration. Standard features include simultaneous voice-and-data transmission on the same line, data transmission at rates to 64 Kbps, six-way voice conferencing, and advanced



call-management features. The menu-driven System Management capability permits customization of features, generation of usage reports, and diagnostics. The terminal-emulation option allows AT&T Models 500 and 515 Business Communications Terminals to act as IBM look-alikes or standard asynchronous terminals.

AT&T Information Systems, 100 Southgate Pkwy., Morristown, NJ 07960.

Contact local sales office. **CIRCLE 279**

PC modems

Four modems for the IBM Personal Computer, PC-XT, and compatibles include two stand-alones and two single-board units. Special communications software, called George, runs with the modems. The 300V (300 bps) and the 1200V (1,200 bps and 300 bps) are compatible with the Bell 103 or 212 standards. Prices: 300V, \$350; 1200V, \$595; 300PC, \$325; and 1200PC, \$595. They feature terminal-controlled dialing, eliminating the need for a tele-



phone; call-progress detection; unattended tone or pulse dialing; and answering and call disconnect based on previously established default parameters. The 300PC (300 bps) and the 1200PC (full-duplex transmission at 1,200-bps and 300-bps) are also Bell 103 and 212 compatible and feature the dialing protocols of Racal-Vadic and Hayes. These board modems also offer automatic dialing and call-progress detection. George is bundled

with the board models and costs \$95 with the stand-alones.

Racal-Vadic, 1525 McCarthy Blvd., Milpitas, CA 95035.
(408) 946-2227. **CIRCLE 280**

Network switches

Two new switching concentrators are targeted to local and long-distance distribution over leased and dialup lines. Elite One (\$4,500) is a switching concentrator for intra-city dialup connections. It can accept asynchronous and synchronous traffic at data rates of up to 9,600 bps. Output moves at rates of 2,400 bps to 72 Kbps. The Esprit One (\$35,000) is a larger switch that connects a number of Elite networks among cities on leased lines. Esprit One accepts asynchronous and synchronous data at speeds of up to 19.2 Kbps and sends it out at 9,600 bps to 56 Kbps. As many as 99 Esprit One switches can be configured to switch up to 4,000 ports from the Elite networks. Both units are usable with asynchronous, bisynchronous, SDLC, and X.25 protocols.

Doelz Networks Inc., 18581 Teller Ave., Irvine, CA 92715.
(714) 851-2223. **CIRCLE 281**

Economy mux

The Quadplexer is an economical small multiplexer that allows up to four personal-computer users to have instant access to the vendor's mass-storage units. List-priced at \$400, the Quadplexer provides a simple local-area network (LAN). Easily expandable, up to five Quadplexers can be configured in a daisy chain to accommodate as many as 16 users. The Quadplexer does not require large and cumbersome network software. The vendor's Universal Mass Storage Controller handles the networking function, enabling each of the individual personal-computer users to access the same files and programs.

Sunol Systems, P.O. Box 1777, Pleasanton, CA 94566.
(415) 484-3322. **CIRCLE 282**

Product catalog: Datatel Inc. (Cherry Hill, NJ) is offering a free 20-page catalog describing its complete product line. Products include statistical multiplexers, modem switches, auto dialers. **CIRCLE 283**

See us at NCC.
Booth #A1047. 1145. 1147.



Your most productive asset has been dodging work.

Look at it this way.

If you have had to dodge irksome screen glare while entering data. Hour after hour. Just how efficient would you be? The fact is, CRT glare takes its toll. On your terminal user. And on department productivity.

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Of course, there are less expensive anti-glare products available. But the nylon strands of mesh screens cause fuzzy images. While etched panels merely spread glare around and blur resolution.

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Glare/Guard panels cut glare 94%.

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A difference you can see.

CIRCLE 103

DATA-COMM EQUIPMENT

Multimedia LAN

Codex's first local-area network (LAN) supports hybrid networks; it can combine high-capacity broadband trunks with lower-capacity baseband feeders. The new Codex LAN is compatible with the Net/One LAN from Ungermann-Bass, as well as the Ethernet standard. The Codex baseband LAN transmits data at speeds of up to 10 Mbps within a single facility or building group. A basic LAN configuration consists of a Network Management Facility, transceivers, and entryways. The entryways serve as intelligent nodes for interconnecting terminals and CPUs, via the coaxial cable. The transceivers provide the carrier-sensing mechanism used to access the LAN. The Network Management Facility provides diagnostic capabilities and network-management information. Price: \$450 to \$750 per port.

Codex Corp., 20 Cabot Blvd., Mansfield, MA 02048.
(617) 364-2000.

CIRCLE 284

Compatible network

The Passkey program capability makes IBM System/34, /36, and /38 compatible with asynchronous Univac, DEC, Data General, Tandem, HP, or IBM hosts within a communications network. Along with the Gateway communication front end, which uses the IBM Series/1 as the point of connection, it provides personal computers and IBM 3101 terminals with access to IBM and non-IBM hosts, switching capability between up to seven mainframes and minis, and X.25 support. The Gateway and Passkey package is \$27,000; Passkey alone is \$5,000. A Passkey stand-alone module, priced at \$13,000, acts as an ASCII host-switching device between up to seven hosts and as an X.25 packet network interface.

Systar Corp., 1762 Technology Dr., San Jose, CA 95110.
(408) 280-7066.

CIRCLE 285

PABX add-on

Northern Telecom offers V.35 ADM, a new version of the Add-on Data Module (ADM) for use with its SL-1 digital business-communications system (PABX). Costing approximately \$1,100, the device provides CCITT standard V.35 interface capabilities,

while supporting all synchronous data features and capabilities of the standard SL-1 ADM. The CCITT V.35 interface protocol is designed to enhance data-communications capabilities for devices that communicate at rates exceeding 20 Kbps. It can be used with any synchronous protocol.

Northern Telecom Inc., 1001 E. Arapaho Rd., Richardson, TX 75081.
(214) 238-4790.

CIRCLE 286

Data switching

Robin Desktop Data Switch can link terminals, micros, mainframes, printers, and other peripherals in a local-area network with sophisticated data switching. Each Robin has 64K



memory, configuration control, cable connector for other Robins, four RS-232 ports, and a Centronics-compatible parallel port. One cable can support 225 Robins with 900 serial and 225 parallel ports. It is easily installed and modified; configuration is performed through menu selection. Several Robin networks can be connected via modems or other data-communications circuits. A Robin serving four serial devices and one parallel device is \$1,950.

Metapath, 737 Lincoln Centre Dr., Foster City, CA 94404.
(415) 345-7700.

CIRCLE 287

PC graphics

Forte-Graph claims to be the first product to give online mainframe-graphics capability to the IBM PC. Price: \$2,590 for both boards and software. A combination software and board package, Forte-Graph allows a PC or XT to act as a full-function IBM color-graphics terminal linked to an IBM mainframe computer. Forte-Graph provides enhanced emulation of an IBM 3279 Model S3G color-graphics terminal with programmed symbols, and displays seven colors. A single keyboard command moves the user from a stand-alone session to a session with the mainframe, opening access to a very large library of main-

frame graphics software. The Forte-Graph hardware consists of a program-symbols option board that "piggybacks" onto Forte's emulator/adaptor board, the Forte-PJ. Forte-PJ provides the essential 3278/79 emulation capabilities, and the requisite coaxial-cable interface for connection to an IBM 3270 network. Together, Forte-Graph and Forte-PJ use only a single expansion slot in a PC or XT.

Forte Data Systems Inc., 1500 Norman Ave., Santa Clara, CA 95050.
(408) 980-1750.

CIRCLE 288

Protocol conversion

The Crystalink 25X Series of communications processors can now carry out protocol conversion of IBM 2780/3780 batch transactions to 3270 interactive bisynchronous protocol. Prices for the Crystalink series start at \$5,200. The 25X can also interface multiple standard 2780/3780 remote-job-entry (RJE) devices to an IBM or plug-compatible host as a 3271 cluster controller communicating in 3270 bisynchronous protocol. Up to 27 RJE devices can be accommodated in the Model 257 communications processor.

Icot Corp., 830 Maude Ave., Mountain View, CA 94039.
(415) 964-4635.

CIRCLE 290

Drafting for VAX: A Design Graphix Computer Aided Design and Drafting system for DEC VAX running under VMS is available from Engineering Systems Corp. of Baton Rouge, LA. You can buy the software alone if you have compatible equipment.

CIRCLE 289

IBM host interface: The Model 8911A programmable channel interface from Auscom (Austin, TX) makes it possible to link an Apollo Domain local-area network directly to an IBM or plug-compatible mainframe. Prices start at \$16,000, plus a \$1,000 software-license fee.

CIRCLE 330

Electronic-mail brochure: Wizard Mail, a computer-based message system, is described in a four-page color brochure entitled, "The Affordable Electronic Mail Software." The brochure is available free from Steel Heddle Computer Products, Greenville, SC.

CIRCLE 331

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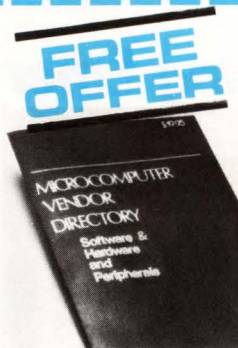
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DATA-COMM EQUIPMENT

Dual-speed modem

The NCC 12/24, a full-duplex modem for direct-dial line use, can handle synchronous or asynchronous data at 2,400 bps or at its 1,200-bps fallback speed. Price for the stand-alone modem is \$1,195. The modem automatically adapts to Bell 212-compatible units at 1,200 bps. The NCC 12/24 is CCITT V.24 and V.22 compatible and has originate, manual, and auto-answer modes. Both stand-alone and rack-mount versions are available.

National Computer, 260 West Ave., Stamford, CT 06904.
(203) 357-0004. **CIRCLE 332**

Mux line

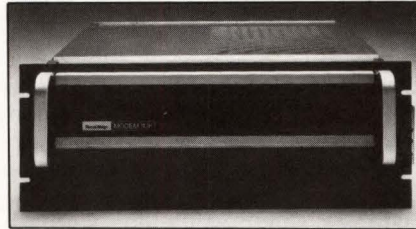
The Phalo/OSD multiplexers cut the cost and complexity of linking IBM Series 3270 communications controllers to remote devices. The pre-packaged systems, priced at \$7,200, include a unit that multidrops 32 devices in groups of eight and a \$1,750 economy system that includes a controller and device muxes for eight devices on a shared co-ax. A similar 32-device system costs \$5,695, including diagnostics. Although they are designed primarily for new installations and expanding systems, the Phalo/OSD muxes also replace up to 32 separate cables with a single shared co-ax. Key features include multidrop capability, support of extended-distance options for IBM 3270 controllers, and proprietary architecture.

Phalo/OSD, 65 Moreland Rd., Simi Valley, CA 93065.
(805) 522-3333. **CIRCLE 333**

High-speed modem

Modem 112K, a 112,000-bps device, is designed for wideband carrier systems such as microwave and/or satellite networks. It incorporates advanced diagnostics and line-equalization methods to maximize network performance. Modem 112K, which costs \$16,500, operates full-duplex, features manual downspeed switching for compatibility with the vendor's Modem 56K, and for transmission over degraded lines. Modem 112K offers a CCITT V.35 compatible interface, and is available with three

options. An integral multiplexing option permits two-port operation—each port having a 56-Kbps data rate.

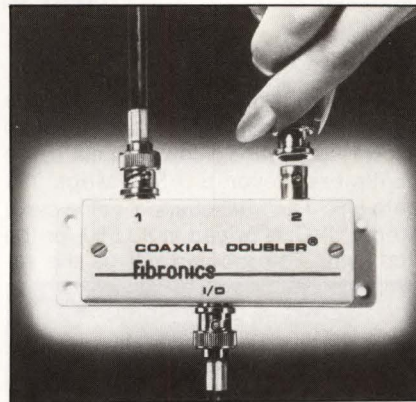


The elastic buffer option stores and reframes data to compensate for clock variations and delays found in satellite circuits. An alarm-relay option permits employment of a user-provided external alarm for notifications of trouble conditions.

Racal-Milgo, 18600 N.W. 41st St., Miami, FL 33166.
(305) 592-8600. **CIRCLE 334**

Coaxial doubler

The Coaxial Doubler module enables users of the IBM 3270 controller to add or move terminals within minutes—without any special tools or adjustments. Price: \$490 a pair. This compact, low-cost connecting module can transmit signals from any two ports of



an IBM 3274 controller over a single coaxial cable. The cable can then be shared by two IBM 3270 peripherals.

Fibronics International Inc., 218 W. Main St., Hyannis, MA 02601
(617) 778-0700. **CIRCLE 335**

Multipoint modem

The 9600/FP (Fast-Poll) is intended for multipoint applications on unconditioned leased lines and employs a 30 msec. training sequence to provide reliable operations. Prices start at \$3,350. The 9600/FP retrains each

time the system is polled so variations in the line on one drop will have no effect on other drops.

Kinex Corp., 6950 Bryan Dairy Rd., Largo, FL 33543.
(813) 541-6404. **CIRCLE 336**

Auto-speed LDM

The DCP3055 limited-distance modem features auto-speed capability, which permits operating speed changes at unattended, remote sites in response to changes made on the local unit. This capability is useful in statistical-multiplexer and TDM-tail-circuit applications. The modem operates synchronously at 1,200 to 19,200 bps and asynchronously at up to 64,000 bps. Typical range is 10



miles at 1,200 bps. Other features include RS-232C interface, diagnostics, front-panel indicators, and a choice of RTS/CTS delays. Price is \$440 to \$550, depending on quantity.

Datatel Inc., Cherry Hill Industrial Center, Cherry Hill, NJ 08003.
(609) 424-4451. **CIRCLE 337**

Switch control

A software package enables T-bar switch users to control switching operations through an IBM PC. Software prices start at \$5,000. The IBM PC control offering gives users a hardware/software control and communications package which provides an enlarged database, with automatic time-of-day scheduled reconfigurations and a real-time color-graphics display.

T-bar, 141 Danbury, Wilton, CT 06897.
(203) 834-8227. **CIRCLE 338**

Triple-duty modem: A two-page bulletin, available free from Infotron Systems Corp., Cherry Hill, NJ, describes a rack-mounted modem that automatically responds to Bell 212A, Bell 103, and Racal-Vadic VA3400 originating modems. Price: \$855. The DSM/Triple Modem answer-only unit handles both synchronous and asynchronous communication at speeds of up to 1,200 bps. **CIRCLE 339**

DATA COMMUNICATIONS

Communications interface

The COM-80 communications interface allows a Hewlett-Packard Series 80 personal computer to communicate with a host mainframe, and can turn the same Series 80 into an applications-oriented, intelligent terminal. The easily-installed interface allows asynchronous and bisynchronous data communications on multiple ports and costs \$845, including software. A standard feature allows up to three hardware devices per board. The COM-80 applications are function-key driven and include 2780/3780 RJE terminal emulation and asynchronous terminal emulation with file-transfer capabilities. In either the bisynchronous or asynchronous mode, the COM-80 offers standard data rates up to 9,600 bps. Price: \$845, including software.

Hewlett-Packard Co., 1320 Kifer Rd., Sunnyvale, CA 94086.
(408) 738-4133.

CIRCLE 341

Display adapter

The Bob single-board, color-display adapter for the IBM Personal Computer and PC XT not only supports all the color-graphics features offered by the IBM color-display adapter, but also delivers text resolution claimed to be superior to that provided by the IBM monochrome-display adapter. Base price: \$425. The product is designed to interface with advanced high-resolution monitors such as the NEC 14-inch Models JC-1410P2(A) and JB-1410P2(A).

Persyst, 15801 Rockfield Blvd., Irvine, CA 92714.

(714) 859-8871.

CIRCLE 342

Mux and chassis

The Datamizer RM-4 is a central-site version of the stand-alone SDC-4 data compressor/multiplexer from Symplex Communications. Prices: SCD-4 stand-alone, \$4,950; RM-4 card, \$4,700; RM-6 chassis, \$1,695. The RM-4 addresses the needs of large Datamizer users that require efficient use of space. The RM-6 chassis, with redundant power supplies and control unit, holds up to six RM-4s, the card version of the SDC-4. The RM-6 features an easy-to-read panel, including

a full RS-232 breakout display that can be switched among any of the Datamizer cards installed in the chassis. The command port, which allows constant monitoring of network statistics, is built into the RM-6 unit so that one terminal can access any of the Datamizer cards in the chassis. In addition, several RM-6 chassis may be interconnected to allow a single terminal to address up to 48 RM-4 cards.

Symplex Communications Corp., 5 Research Dr., Ann Arbor, MI 48103.
(313) 995-1555.

CIRCLE 343

X.25 interface

A software option for Communications Inc.'s Server/1 (CS/1) Ethernet unit increases data-transfer rates between computer systems while reducing computer-room cabling mazes. The CS/1-X.25 is priced at \$13,500. It is equipped with new software and serves as a front-end processor to connect X.25-protocol-equipped host systems to the Ethernet local-area network multiplexing up to 48 simultaneous sessions to and from the host over a single X.25 line.

Communications Inc., 10440 Bubb Rd., Cupertino, CA 95014.
(408) 446-2981.

CIRCLE 344

Voice/data module

A voice-digitizing option for Timplex's Link/1 facilities-management system allows up to 48 voice channels to be multiplexed over a 1.544-Mbps T-1 data link. The four-channel voice card, Model QVC, is priced at \$3,550 for the first unit. The module halves the re-



quired bandwidth under the world-standard coding technique for voice digitizing of 64 Kbps. This effectively doubles the voice-channel capacity of the Link/1-based T-1 network.

Timeplex Inc., 400 Chestnut Ridge Rd., Woodcliff Lake, NJ 07675.

(201) 930-4600.

CIRCLE 345

Protocol analyzer

Simon 5, a multi-function protocol analyzer, claims to offer the means to conduct a wide range of diagnostic tests on data communications networks. Price: \$17,950. Simon 5's four modes of operation allow users to choose tests based on their needs and knowledge. Diagnostics range from standard bit and block tests to custom programs like response-time measurements on SNA cluster controllers. Softkeys simplify setup and operation and provide a logical control technique for users. Simon 5's hard disk stores 2.5 Mbytes of line data along with real-time interface status at speeds of up to 64 Kbps; the disk can also store up to 24 programs. Plug-in modules change Simon 5's interface from RS-232 to V.35, X.21, or RS-449; they are used for both interactive testing and passive monitoring. An on-disk tutorial provides the user with training.

Dynatech Data Systems, 7644 Dynatech Ct., Springfield, VA 22153.
(703) 569-9000.

CIRCLE 346

PC call manager

Asher, an integrated voice/data add-on product for the IBM Personal Computer, lets users exchange data between computers and carry on a phone conversation at the same time. Price: under \$800. Asher incorporates an electronic telephone and a 300-bps internal modem that slide into the PC's expansion slots, and software that permits the PC's memory to be partitioned to store several programs at the same time. Standard Asher telephone features include conference calling, call forwarding, and automatic redialing. Also included are phone-management functions. Asher can be used with standard telephones and with PABXs from Rolm, NEC, Northern Telecom, and others.

Wilcom, 1009 Mansell Rd., Roswell, GA 30075.

(404) 993-4590.

CIRCLE 347

Electronic-mail software: Flash-Com electronic-mail software is available for Sanyo MBC550 and Radio Shack 2000 personal computers. Priced at \$299, Flash-Com is operational on over 80 percent of the installed personal computers. It is available from Omni Computer Systems Inc., Chestnut Hill, MA.

CIRCLE 348

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SECURITY

Micro protection

Security is a package providing password and user-code protection for programs on micros running under PC-DOS or MS-DOS. A demonstration disk costs \$25, which can be applied toward the \$50 purchase price. No modifications to the operating system are required.

The Answer in Computers, 6035 University Ave., San Diego, CA 92115. (619) 287-0795. **CIRCLE 201**

Asynch protection

Commlock is an asynchronous data-encryption device linking a crt or printer and a modem, multiplexer port, or computer port. Price: \$600. Up to 1,024 unique encryption codes can be programmed, including separate codes for transmit and receive paths. Thus, persons making illegal entries never know if they are violating the system. Commlock is programmable for data rates, word length, parity, and number of stops bits.

ADM Concepts Inc., 1445 Los Angeles Ave., Simi Valley, CA 93065. (805) 581-1201. **CIRCLE 202**

Safe microdata

Watchdog is a set of programs for the IBM PC under PC-DOS version 2.0 or 2.1. Price: \$295 for two diskettes and guides. Users can be selectively admitted or excluded from different programs and files while information in a protected section may be enciphered. An audit trail monitors the time a user spends in a system area and also tracks usage by project.

Fischer Innis, 4175 Merchantile Ave., Naples, FL 33942. (813) 793-1500. **CIRCLE 203**

Password device

Gateway is a stand-alone security device for asynchronous modems on dial-up or leased lines connecting to micros, minis, or mainframes. Price: \$395. Correct codes must be entered within three attempts and within a user-definable time limit, or the modem is disconnected. Passwords can be any length and can include letters, numbers, spaces, commas, and control characters, for added security. A record of all log-on attempts is kept in nonvolatile memory. The device is

transparent to the host.

Adalogic, 1522 Wistaria Ln., Los Altos, CA 94022. (408) 996-8559. **CIRCLE 204**

Waste depository

Data Dis-Guard looks like a four-drawer filing cabinet but it's actually a temporary depository for crumpled paper, printouts, microfilm, and other confidential waste. Price: \$450. The tamper-proof, padlocked cabinet has a zippered, lockable bag inside. Anyone can deposit material but only au-

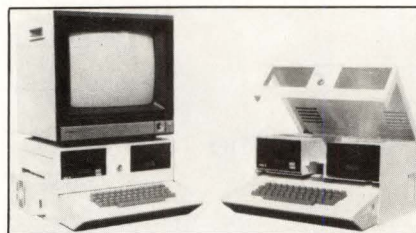


thorized individuals can remove it.

Security Engineered Machinery, 5 Walkup Dr., Westboro, MA 01581. (617) 366-1488. **CIRCLE 205**

Apple cabinet

The Apple Armor steel cabinet enclosing the Apple II securely fastens the computer, along with disk drives and fan, to any wood or metal surface. The monitor sits on top of the cabinet. During off hours, Apple Armor grips the monitor cord and locks the main power



cord, rendering the computer useless. For repair or changing boards, the key is turned, the cover lifted, and the computer and disk drives slide out. Price: about \$100.

Omni Tech Corp., 1455 N. Barker Rd., Brookfield, WI 53005. (414) 784-4178. **CIRCLE 206**

Database protection

The DL series of database-security devices are stand-alone or rack-mountable units connected via RS-232 interface and programmable by any ASCII terminal. Price: \$275. The DL125 dial-up version hangs up on unauthorized attempts at entry. The DL225 dedicated communication-line model ignores attempts at entry for 15 minutes after three invalid attempts.

Optimum Electronics Inc., 425 Washington Ave., North Haven, CT 06473. (203) 239-6089. **CIRCLE 207**

Media storage

Records Management Services provides offsite storage, retrieval, and maintenance of all types of media for customers in the Boston, Chicago, and Los Angeles areas. It offers 24-hour, 7-day pickup and delivery and environmentally controlled vaults protected by sound-and-heat-detection devices and camera surveillance. There are various fee schedules. Annual storage fee for magnetic media is \$2 per tape to \$10 per large disk pack for significant quantity levels.

Digital Equipment Corp., Maynard, MA 01754. (617) 897-5111. **CIRCLE 208**

Displaywriter printer: With Santec's (Amherst, NH) S700B Variflex Printer, IBM Displaywriter users can print without stopping for keyboard changes. It prints in over 200 languages, with scientific symbols and graphics. **CIRCLE 209**

S/36 documentation: Remdoc, an IBM S/36 documentation pack, is from REM Associates of Village Station, NY. It generates over 20 reports integrating source and procedures from up to 30 libraries, and it merges nested procedures in execution sequence. **CIRCLE 249**



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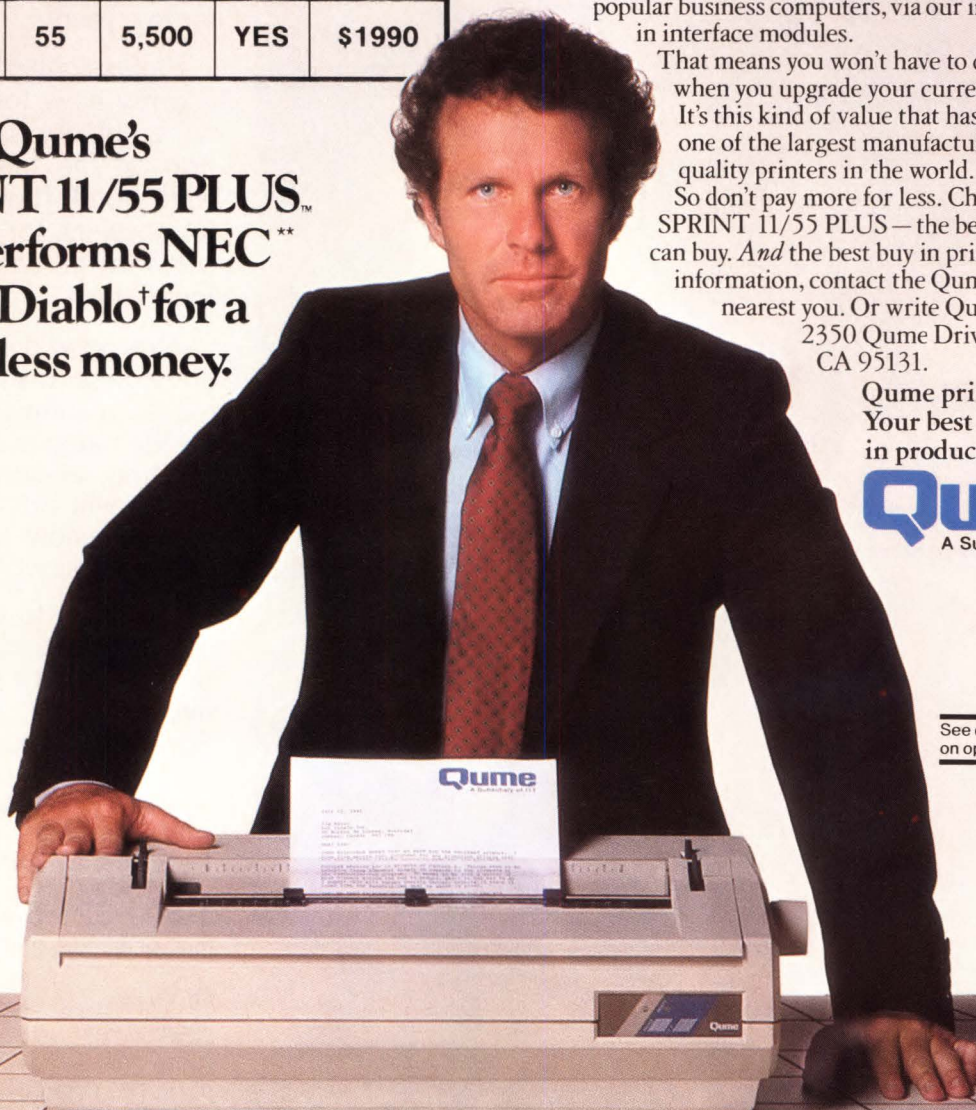
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CIRCLE 106

TRAINING AIDS

Micro CBT system

The Educator computer-based training (CBT) system runs under PC-DOS, MS-DOS, CP/M-80, CP/M-86, and Unix/Xenix operating systems. Price: \$3,500 per year for a single copy. Its range of features allows for the creation and use of graphs, charts, and color graphics with instructional presentation frames. The developed training software can be linked to any applications package being taught. Videotapes and video disks can also be integrated into the presentations. A performance-tracking feature is included.

Spectrum Training Corp., 18 Brown St., Salem, MA 01970.
(617) 741-1150. CIRCLE 271

LAN cassettes

This course on local-area networks consists of six videotapes, each less than an hour long, concentrating on a particular aspect of LANs. The complete set of cassettes can be purchased for \$1,800, or rented for six weeks for \$750. A 40-minute cassette that previews the LAN course sells for \$95, and the course's study guide sells for \$36.50. The cassettes are available in VHS, Beta, and 3/4-inch formats.

AMCEE Inc., 225 North Ave. N.W., Atlanta, GA 30332.
(404) 894-3362. CIRCLE 272

Software tapes

Twenty half-hour videotapes make up the Software Engineering course. The tapes cover ways to reduce testing costs while improving software design, testing effectiveness, and vendor-user communication. They cost \$7,090 for the entire 20-tape set, or \$390 apiece, and are also available through rentals. The tapes come in VHS, Beta, and 3/4-inch formats.

Colorado State Univ., Engineering Research Center, Fort Collins, CO 80523.
(303) 491-8417. CIRCLE 273

Video magazine

Deltak's half-hour "video magazine" on managing a communications network brings together telecommunications experts to discuss various subjects. The topics include compatibility problems for voice communication

and data transmission, the problems of dealing with multiple vendors, and who should control the flow of information. The program can be purchased for \$450. The disks are \$70 apiece. Deltak's Microsystems Library has added courses on Multiplan, Lotus' 1-2-3, TK!Solver, VisiText/Plot, and PFS software to its "Teach Yourself" series for the IBM PC.

Deltak Inc., 1751 W. Diehl Rd., Naperville, IL 60566.
(312) 369-3000. CIRCLE 274

Peachtree courses

Peachtree Software offerings for the IBM Personal Computer are the subjects of disk-based training programs. Price: \$75 each. The eight programs are: accounts payable, accounts receivable, inventory control, sales invoicing, list manager, general ledger, Peachtext, and Peachcalc.

American Training Int'l., 3770 Highland Ave., Manhattan Beach, CA 90266.
(213) 546-4725. CIRCLE 275

Focus instruction

"Focus Reporting for the End User" includes six to 10 hours of training on Focus, the fourth-generation language from Information Builders. Examples and topics are explained for the non-technical end user. Price: \$4,500, or \$175 a month on a one-year lease. The computer-based training course utilizes IBM's IIS and is compatible with Goal System International's Phoenix. It is intended to support information-center training efforts.

MVC Associates Inc., 849 N. Summit Ave., Lake Forest, IL 60045.
(312) 295-3344. CIRCLE 276

Micro video guides

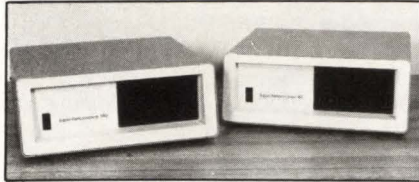
Six self-study videotape courses on popular personal-computer hardware and software are available in VHS, Beta, and 3/4-inch formats. Price: \$195 each. The tapes—two for Lotus' 1-2-3, and one each for the IBM Personal Computer, dBase II, Multimate, and Visicalc—accompany Videoguide workbooks highlighting the tapes' key points.

Anderson Soft-Teach, 2161 Blossom Valley Dr., San Jose, CA 95124.
(408) 356-3552. CIRCLE 277

MICROSYSTEMS PLUS

High-capacity disk

A Hard Disk System for the IBM PC, XT, and compatibles features a 30-msec average access time and 8 msec track-to-track with 60 msec maximum including settling. Two models, a 65-Mbyte and 140-Mbyte, cost \$4,995 and \$6,995, respectively.



Options include dual drive, tape streamer, RAM cache, and intelligent formatter. The package includes hard disk, controller, host adaptor, power supply, cables, and chassis.

Dragon Industries, 35 Main St., Hopkinton, MA 01748.
(617) 435-41831. **CIRCLE 246**

PC-mainframe link

The Personal Computer File Transfer Manager facilitates the transfer of data files between IBM mainframes and the IBM PC or compatibles. Tape for the host and one PC diskette costs \$1,250. Additional PC attachments are five for \$250. The software provides a transfer capacity of 10,000 records and provides security for data.

Relay Software Inc., P.O. Box 50551, Columbia, SC 29250.
(803) 733-0925. **CIRCLE 247**

Path to supermicro

A nine-user, 16-bit, 40-Mbyte system, Model S986-40, has 1 Mbyte of RAM and costs \$12,990. This model is the top of a line of five micros that offer an upgrade path that begins with a three-user, 8-bit model, which has been



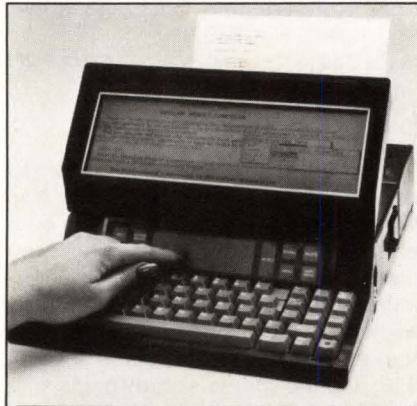
reduced to \$4,990. All the models in the line feature bundled terminals, software, and cabling, so users need only plug in a printer. A 17-Mbyte

magnetic-tape backup option is priced at \$2,995 for any of the systems.

Altos Computer Systems, 2641 Orchard Park Way, San Jose, CA 95134.
(408) 946-6700. **CIRCLE 248**

Mobile computers

A 16-line liquid-crystal-display portable computer, the Gavilan, has integrated a touch panel for cursor control, a built-in modem, a 3 $\frac{1}{2}$ -inch micro floppy-disk drive, and the MS-DOS operating system. It replaces an 8-line model at the same price: \$3,995. A large base of MS-DOS applications software will be available for the 16-bit



model, including Wordstar, Supercalc 2, PFS:File, and PFS:Report. The MS-DOS Gavilan SC, an 8-line model with RS-232C serial port but no modem, is \$2,995. A 5 $\frac{1}{4}$ -inch disk drive and interface allow downloading from the IBM Personal Computer to the Gavilan 3 $\frac{1}{2}$ -inch diskettes. Programs can also be copied from the Gavilan to the 5 $\frac{1}{4}$ -inch drive.

Gavilan Computer Corp., 240 Hacienda Ave., Campbell, CA 95008.
(408) 379-8000. **CIRCLE 249**

Personal computing for office systems

A personal-computing option for Northern Telecom's Model 585, 565, and 445 office-information systems eliminates the need for stand-alone personal computers. It allows Model 500 and 400 series terminals to function as workstations and personal computers, and it allows sharing of data files and peripherals between CP/M and Omnitask applications. This option, with hard-disk-storage capability of 22 to 342 Mbytes, can access

a wide range of peripherals and can be accessed by other Northern Telecom systems. Model 445 is \$14,440; Model 565, \$20,700 to \$34,300; and Model 585, \$26,000 to \$154,000.

Northern Telecom Inc., 259 Cumberland Bend, Nashville, TN 37228.
(615) 251-4903. **CIRCLE 250**

PC/Unix link

Intext II Emulator software enables the IBM PC to communicate with Interactive's Unix-based Ined editor and Advanced Productivity Systems, as well as with DEC VMS software and most public networks. The \$475 package requires 64 Kbytes of memory, a diskette drive, monitor, and asynchronous communication card. With Interactive's screen editor, it relieves the host of several functions. The emulator also permits the IBM PC to function as a VT100 or VT52 or as a dumb terminal.

Interactive Systems Corp., 1212 Seventh St., Santa Monica, CA 90401.
(213) 450-8363. **CIRCLE 251**

Mainframe link for PC

Microseek provides users of the IBM Personal Computer and PC XT with asynchronous communications capability to mainframe hosts. It includes two-way file transfer; terminal emulation for accessing a host mainframe, public data service, or Comshare's timesharing service; prepackaged log-on sequences for automatic connection to hosts; and the ability to automate repetitive PC/host tasks. Price is \$200 per copy. Another version, Microseek Plus, includes a file-transfer program for error checking. Price: \$3,500.

Comshare Inc., 3001 S. State St., Ann Arbor, MI 48106.
(313) 994-4800. **CIRCLE 252**

Techniques for S/34: "Altered Bytes" provides programming techniques that increase user-response speed, decrease the need for main-storage processing, and increase system availability to multiple users of the System/34. It details procedures for record releasing, throughput efficiency, indicator usage, and editing methodology. The manual is from Intech Publishing.

CIRCLE 253

Disk-cache system

A disk-cache system called Quick Disk is an add-on memory device that increases the speed and performance of Santa Clara Systems' PCnet network and speeds up hard-disk drives. Five models range from \$2,795 for 128 Kbytes to \$8,595 for 1 Mbyte. A family of internal disk drives for the IBM PC or XT ranges in price from \$2,095 for 6 Mbytes removable to \$2,995 for 6 Mbytes removable and 6 Mbytes fixed. Upgrade kits that convert internal single-drive to dual-drive systems cost \$905 for a half-height floppy and \$1,295 for 6-Mbyte fixed upgrade.

Santa Clara Systems, 1860 Hartog Dr., San Jose, CA 95131.

(408) 287-4640.

CIRCLE 254

Electronic disk

A hardware-implemented, RAM-based electronic disk plugs into the I/O slot of an IBM Personal Computer or XT and replaces a floppy drive. The \$1,595 unit allows instant data access, instantaneous look-up of records, high-speed data sorting, and other processes without stopping and starting. It is not subject to data losses from electromechanical failure, head wear, or media wear, and an external uninterruptible power supply keeps it going even when the machine is shut off or the power fails.

Dilog PC Products, 12800 Garden Grove Blvd., Garden Grove, CA 92643.

(714) 534-8950.

CIRCLE 255

TRS-80 utility

Powertool provides direct access to diskettes used on TRS-80 Models I, III, 4, or 4P. Price: \$50. Powertool allows users to directly examine and modify diskettes in versions of TRS-DOS and L-DOS, or restore many unreadable diskettes, to format or backup all or part of a diskette.

Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102.

(817) 390-3300.

CIRCLE 256

Smart PC packs

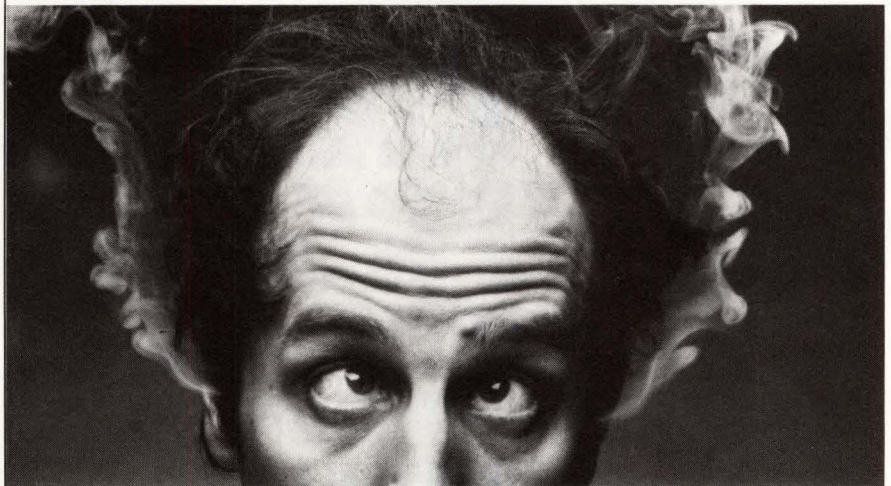
Three packages for the IBM PC and compatibles offer full-color support and allow sequential tasks to be done in series without user intervention. The Smart Data Manager costs \$595 and

allows multiple files on the screen at once, either linked or unlinked. The Smart Spread Sheet with Graphics handles large amounts of data in many formats, has a slideshow feature, and also costs \$595. The Smart Word Processor has many features of a ded-

icated word processor and costs \$475. A \$100 refund is given after the second program is purchased and another \$100 after the third program.

Innovative Software Inc., 9300 W. 110th St., Overland Park, KS 66210.
(913) 383-1089.

CIRCLE 257



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CIRCLE 110

MICROSYSTEMS PLUS

Pro 300 manager

Protact transaction processing system provides complete terminal, file, and network management for the Digital Professional 300 Series. One or two users can access applications on a lo-

cal or remote PDP-11 or VAX. Items can be chosen from a menu and implicitly routed to another system for processing. The Protact Developers Kit, for writing and implementing applications, is \$2,500; run-time license is \$395. The Protact Terminal Server,

for use in Ethernet local-area networks, is \$595. Protact also supports a second terminal user on the Pro.

Advanced Systems Concepts Inc., 22 Hudson Place, Hoboken, NJ 07030. (201) 798-6400. **CIRCLE 258**

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CIRCLE 111

Keyboard system

The layout on the Dvorak keyboard is based on letter frequency so it's easier to learn and use, according to its developers, than the traditional QWERTY keyboard. Surestroke software, running on the IBM PC, PC XT, or Compaq, translates keystrokes to Dvorak and teaches the keyboard the new locations of characters. The \$50 price also covers transfer letters for key tops, audio cassette, and a manual.

Seasoned Systems Inc., P.O. Box 3036, Chapel Hill, NC 27515. (919) 967-5818. **CIRCLE 259**

Disk editor

Disk Fix disk editor and recovery utility is compatible with 8080-, 8085-, or Z-80-based computers running on CP/M. Price: \$150. In addition to general disk editing, it reconstructs files with bad sectors, recovers files from disks with damaged directories, and restores erased files. It is available in most 8- and 5 $\frac{1}{4}$ -inch formats and automatically configures to floppy and hard disks.

The Software Store, Chippewa Square, Marquette, MI 49855. (906) 228-7622. **CIRCLE 260**

Apple III software

Two integrated packages for the Apple III require 256K RAM and a hard disk. Keystroke Data Base, at \$249, is a powerful data-management system that is menu-driven and operates by one-key commands. Capabilities include merging with Visicalc and other application packages, free-form input, and cross-referencing. The Keystroke Report Generator costs \$149 and works with the Keystroke Data Base. It offers fast sorts, statistics, capability to alter predefined reports, report splitting, and summary-only reports.

Brock Software Products Inc., P.O. Box 799, Crystal Lake, IL 60014. (815) 459-4210. **CIRCLE 261**

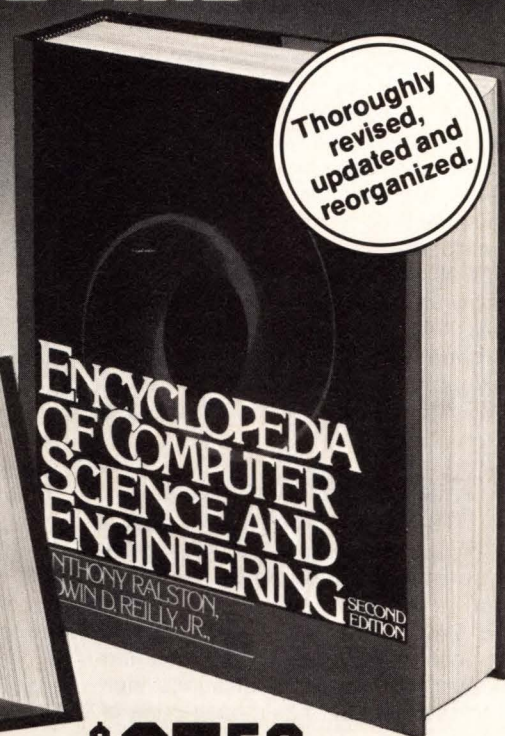
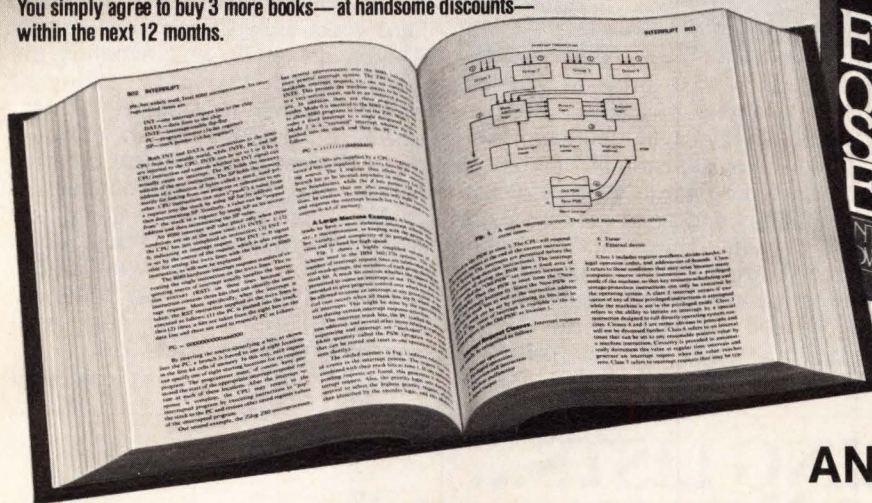
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references to sub-categories, doubles as a computer science dictionary, and is an invaluable tool for locating specific information.

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SYSTEMS

Multi-tasking series

The MAI 8000 Series consists of three models of 32-bit, interactive, multi-tasking computers. Operating software allocates the workload equally among the central processors, so many programs can be executed at the same time. Prices for models with one to three processors are from \$50,000 to \$500,000. Cost for a system with more than 100 terminals is about \$4,000 per workstation.

Management Assistance Inc., 560 Lexington Ave., New York, NY 10022. (212) 909-1400. **CIRCLE 262**

Honeywell minis

Two 16-bit minicomputers and a 32-bit supermini from Honeywell offer price-performance improvements over the company's existing systems. The DPS 6/45, with 512 Kbytes of memory expandable to 2 Mbytes and support for four communications lines expandable to 32, has a base price of

\$20,000. The DPS 6/75 has 1 Mbyte of memory expandable to 2 Mbytes and support for four lines expandable to 96. Base price is \$35,000. The DPS



6/95, with a base price of \$80,000, offers 2 Mbytes of memory expandable to 16 Mbytes and four communications lines expandable to 128. A Totalcare program is a range of service options and price reductions for DPS 6 users. These include customized programs, remote diagnostics, and software-update facility. Two high-speed printers for the DPS 6 family operate at 900 and 1,200 lpm. Prices are \$26,000 and \$33,000 re-

spectively. The lower model can be upgraded onsite.

Honeywell Inc., 200 Smith St., Waltham, MA 02154. (617) 895-6000. **CIRCLE 263**

CS 9000 enhanced

The latest version of the IBM Instruments Computer System 9000 with integrated color printer/plotter has an enhanced operating system. Release 1.1 of CSOS supports four 10-Mbyte hard disks as well as double-density 5¼-inch diskettes, and expands the 9000's multi-tasking capability to where it can now support 13 user tasks. Price: \$5,695. An optional mathematical and statistical program library, SSL, has 66 subroutines, including quadrature/curve fitting and eigensystems analysis. Price: \$325. CSOS Extensions provide a full-screen editor and other features. Price: \$155. A 3101 terminal-emulation program costs \$160.

IBM (Contact sales office.) **CIRCLE 264**

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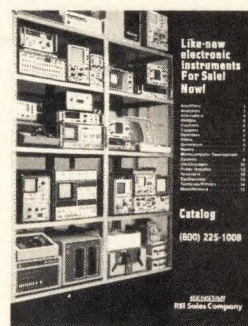
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SYSTEMS

DEC-compatible operating system

The SMS Micro/TSX-Plus is a super-micro version of the DEC-compatible TSX-Plus multi-tasking, timesharing operating system and supports PDP-11 software. It accommodates three to 16 users and provides 15.9 Mbytes of hard-disk storage. It has memory management, transparent spooling, and data and directory caching. A basic configuration, priced at \$11,000, will support three VT100 terminals and a serial printer.

S&H Computer Systems Inc., 1027 17th Ave. S., Nashville, TN 37212. (615) 327-3670. **CIRCLE 265**



RAM for the cpu's microprogram, local storage, a second processor that manages a byte multiplexer channel, serial-communication adaptors, and a 75-Mbyte Winchester disk drive, with a second drive optional. It interconnects with the Spartacus KNet data-communications network. Other features include Program-Status Word, six classes of interrupts, floating-point facility for floating-point arithmetic, dynamic address translation, virtual machine assist, error checking and correction, and command retry for a

failed channel, which does not interrupt the cpu. Price: about \$65,000 to \$95,000, depending on configuration. **Spartacus Computers Inc.**, 5 Oak Park Dr., Bedford, MA 01730. (617) 275-4220. **CIRCLE 266**

Supermicro line

Model 932-20 in Datamedia's 932 Supermicro line offers up to 2 Mbytes of RAM, 124 Mbytes of disk storage on four Winchester drives, and asynchronous and bisynchronous I/O ports that support 16 users. Price: from \$12,500. Model 932-30 has up to 2.5 Mbytes of RAM and supports up to 26 users. Price: from \$15,000. Software available includes a word-processing package for \$625 and spreadsheet for \$800, as well as link to Pick-based systems and a color business-graphics package. Three letter-quality, dot-matrix printers are also available for the 932 systems.

Datamedia Corp., 7401 Central Hwy., Pennsauken, NJ 08109. (609) 665-5400. **CIRCLE 267**

Flexible ddp

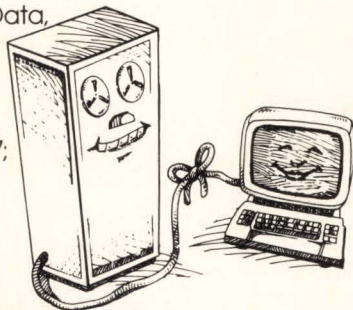
The K102 is the first in a family of IBM/370-compatible products providing distributed data processing and networking capabilities. It has 1 Mbyte dynamic RAM with an optional 1-Mbyte addition, 64 Kbytes static

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Software developer

Maestro is an integrated hardware-software office-automation system that supports all phases of software development and provides word processing/text editing, electronic mail, information retrieval, and project



management. Features include syntax menus for several languages, testing supported by JCL generators, file comparison, and dumping analysis. The systems support up to 24 workstations and support batch and interactive communications with IBM-

compatible and other mainframes. Standard configuration with 480-Kbyte memory, 24 workstations, two disk drives, line printer, and two communication controllers is about \$197,000.

Four-Phase Systems Inc., 10700 N. De Anza Blvd., Cupertino, CA 95014. (408) 255-0900.

CIRCLE 268

Perkin-Elmer 3200s add communications

Several products have been introduced by Perkin-Elmer for its Series 3200 super-minicomputers. Pengates provide transparent interfaces to SNA-based networks and other IBM-compatible systems. These emulating facilities are SNA/3270, priced at \$1,600 to \$4,500; SNA/RJE for remote job entry, from \$1,000 to \$3,000; BSC/3270, an SNA/3270 emulator over bisynchronous lines, costing \$1,400 to \$4,300; HASP, priced at \$2,120; and 2780/3780 for remote job

entry, costing \$1,500. The Pennet Plus open-systems network includes the Ethernet protocol and costs \$2,300 to \$7,000, depending on the processor group. The Resilient System combines redundant Series 3200 hardware and software to provide high-availability online transaction processing. Software costs \$15,000. Also available are a series of operating system bridging facilities consisting of Fortran VII and C compilers. A Fortran VII compiler for Edition VII Workbench is \$3,400. A C compiler for OS/32 is from \$3,400 to \$7,000, depending on the 3200 model. **Perkin-Elmer**, 2 Crescent Pl., Oceanport, NJ 07757.

(201) 870-4768.

CIRCLE 269

Info companions: The Info database management package from Harris (Fort Lauderdale, FL) has two companion products: Info Call, which provides access to the Info system from high-level language programs, and an Info interface to Muse wp software.

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CIRCLE 122

PERIPHERALS

Emulation terminals

The ABM 85H VT-52/100 emulates the DEC VT-52/100, Televideo 920, 925, and 950, and Data General D100/200 terminals. Price: \$895. Features include 9-by-13 character cell matrix,

24-by-80 column format, 16 programmable function keys, programmable cursor, RS-232 port, full video attributes, line and block graphics characters, and math symbols. The KT-7 ergonomic video display terminal also emulates the DEC, TVI, and DG

terminals. Price: \$595. It has adjustable height and features a 12-inch screen, menu setups, user-selectable attributes, 20 programmable function keys, line and block graphic symbols, and math symbols.

Kimtron Corp., 2225-1 Martin Ave., Santa Clara, CA 95050.
(408) 727-1510.

CIRCLE 314

HP-compatible

The Digital Associates Remote Line Printer System enables users of Hewlett-Packard's 2611A, 2619A, and 2617A printers to print remotely at up to 1,000 lines per minute. A pair of units consisting of a receiver and a transmitter costs \$6,750. A required controller for HP-1B applications is \$2,500. It can be attached directly with up to 3,000 feet of twisted-pair wires and can be configured in conjunction with short-haul or long-haul modems digital-data-system circuits, switched-network modems, microwave circuits, or satellite circuits.

Digital Associates Corp., 1039 E. Main St., Stamford, CT 06902.
(203) 327-9210.

CIRCLE 315

Color graphics

The UTS 60 programmable terminal offers graphics capabilities that can be used online to a Sperry 1100 main-frame or as a stand-alone with the Business Graphics Utility package. Price: \$5,618. Eight colors are standard and eight more are optional. Other features are ergonomic design, 128-Kbyte memory expandable to 2 Mbytes, 14 $\frac{1}{2}$ -inch screen, and 25th status line. Available peripherals include diskette and mass-storage subsystems, three printers, and several programs.

Sperry Corp., P.O. Box 500, Blue Bell, PA 19424.
(215) 542-4213.

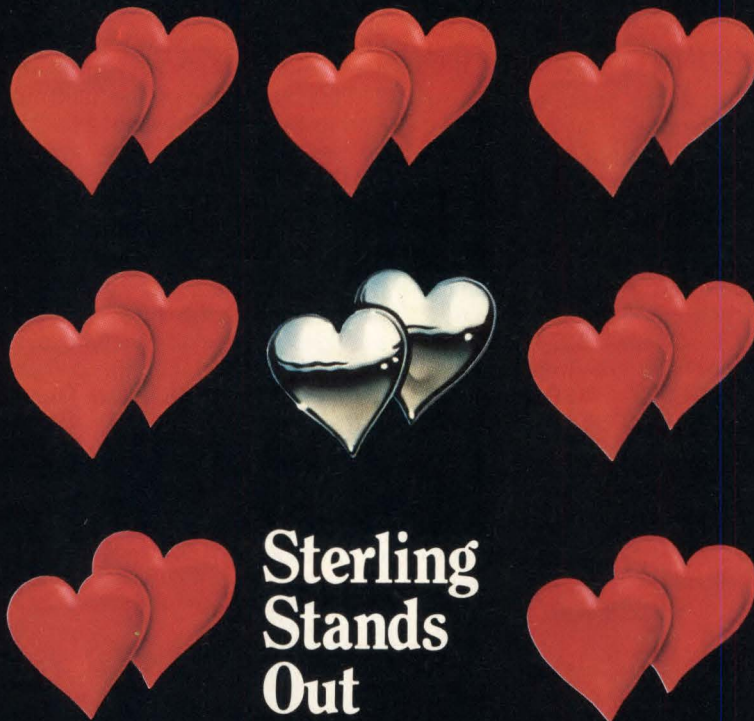
CIRCLE 316

Four-pen plotter

The WX 4731 Plotwriter is a high-speed drum plotter with built-in printer function. It's suitable for both technical and business applications and can be used with both computer and digital-control equipment. Price: \$2,500.

Western Graphtec Inc., 12 Chrysler St., Irvine, CA 92714.
(714) 770-6010.

CIRCLE 317



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CIRCLE 115

Multicolor printer

The IBM-compatible DP-9725B Color Scribe printer produces multicolored text and graphics. Price: \$1,625. Software gives high-resolution screen dumps of text and graphics displayed on the IBM monitor. It also prints in enhanced-correspondence and data-processing quality. Color mixing is software-controlled. Other features include justification, title centering, inline font changes and color changes, and RAM expandable to 12.5 Kbytes. **Anadex Inc.**, 1001 Flynn Rd., Camarillo, CA 93010. (805) 987-9660. **CIRCLE 318**

Video printer

The Axiom TX-1000 fixed-head thermal video printer provides high-resolution hard copy of whatever is displayed on the crt of most computers or other terminals. Price: \$3,395. No hardware or software is needed, the TX-1000 connects via a standard coaxial cable. The printer turns on instantly, works almost silently, and produces print on 8½-inch wide paper in 20 seconds. Users can zoom, move the image on the paper, magnify, and adjust for distortion.

Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340. (213) 365-9521. **CIRCLE 319**

Speedy printers

The DP Series of matrix band printers for superminis has speeds ranging from 600 to 1,200 lpm. Prices begin at \$8,170. The printers feature quiet operation and print bands that can be changed in seconds to alter character sets.

Printronic, 17500 Cartwright Rd., P.O. Box 19559, Irvine, CA 92713. (714) 863-1900. **CIRCLE 320**

IBM printer and laser programs

The IBM 4248 impact line printer attaches to 370, 4300, and 30XX systems. It operates quietly at 3,600, 3,000, and 2,200 lpm and can print optical-recognition characters. Operational and diagnostic messages can be displayed. A basic model is \$99,000. Three all-points-addressable programs for the 3800 Model 3 laser printer merge graphics, text, and dig-

itized images such as photos. They run under MVS/370 and MVS/XA. The print-services facility to manage new formats is \$4,260 for the initial license fee and \$710 monthly. A facility to create and manage fonts is \$825 for the license fee and \$275 monthly. An

overlay generation language can create electronic forms such as bank statements with a logo while also printing data. License and monthly costs are \$750 and \$250 respectively.

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PERIPHERALS

IBM emulation

The MC-80/600-2 stand-alone communications processor, when attached to a Televideo 920, 925, or 950 terminal, emulates the IBM 3277/3278 Information Display System. It can also replace or multidrop with IBM Models 1 and 2, 3276 Models 1 and 2, or 3274 Model 51C control units. One BSC port and crt or printer port is \$1,495. A two-port system costs \$1,695. All keyboard functions can be emulated, as can screen-formatting capabilities and light-pen functionality.

Innovative Electronics Inc., 4714 N.W. 165th St., Miami, FL 33014.
(305) 624-1644. **CIRCLE 322**

Protocol converter

The Avatar PA1500 protocol converter allows an ASCII printer to function as an IBM 3287. It lets low-cost high-speed dot-matrix, letter-quality, or line printers function in any 3270 system including BSC and



SNA/SDLC. The self-contained, user-installable unit costs \$1,495. It supports all IBM data streams in formatted or unformatted mode. Host applications can take advantage of such printer features as dot-addressable graphics, alternate character sets, and barcode generation.

Avatar Technologies Inc., 99 South St., Hopkinton, MA 01748.
(617) 435-6872. **CIRCLE 323**

IBM memory

The LCM-400 Add-In Memory System allows IBM 4300 models to be upgraded with a universal module that is transparent to all system software.

Prices range from \$6,000 per Mbyte for 2-Mbyte units to \$4,000 per Mbyte for larger increments. Memory can be extended beyond IBM's maximum capacity for most models.

Locom Corp., 2350 Bering Dr., San Jose, CA 95131.
(408) 942-1414. **CIRCLE 324**

CAD plotter

The Complot CPS-19 graphics plotter is compatible with over 100 graphics packages for micros. Price: \$13,950. It handles demanding tasks without operator intervention between drawings. The plotter can produce 33 E-size or 600 A-size drawings in one uninterrupted span.

Houston Instrument, 8500 Cameron Rd., Austin, TX 78753.
(512) 835-0900. **CIRCLE 325**

Supplies catalog: Moore Business Center (Wheeling, IL) is offering a free catalog of forms, accessories, cables, and furniture for small-business users.

CIRCLE 340

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Near-quality printers

The LW400 and LW800 line printers produce near-letter-quality printing at 400 and 800 lpm respectively. Prices for the two models with parallel interface are \$5,950 and \$7,950. An optional RS-232 serial interface is \$495. They feature quiet operation, long-life cassette ribbon, an intelligent control panel, and easy change of print bands. **Synergy Printer Systems Inc.**, 4020 Fabian Way, Palo Alto, CA 94303. (415) 493-8181. **CIRCLE 326**

Quiet printers

Three serial-impact printers feature double-daisy printing wheel, bidirectional printing, and low noise level. Model RP1600Q operates at 50 cps and accommodates wide-width paper. Price: \$2,700. Model 1500Q, operating at 40 cps, is \$1,800. Model 1200N operates at 20 cps and is useful for personal-computer applications. Price: \$900.

Ricoh of America Inc., 20 Gloria Lane, Fairfield, NJ 07006. (201) 575-9550. **CIRCLE 327**

Multi-copy plotter

The HP 7550A B-size pen plotter can prepare large numbers of multicolor charts quickly with little operator involvement. Price: \$3,900. An automatic cut-sheet paper feed loads up to 150 sheets in response to front panel or program commands. The plotter generates up to 99 paper copies of an original graph almost unattended. It has a pen speed of more than 32 ips and an acceleration of 6 g. A liquid-crystal display reports plotter status and can be used for program messages. Other features include 20 international character sets in two fonts, arc and circle generator, and 12-Kbyte I/O buffer.

Hewlett-Packard (call local sales office). **CIRCLE 328**

Three plotters

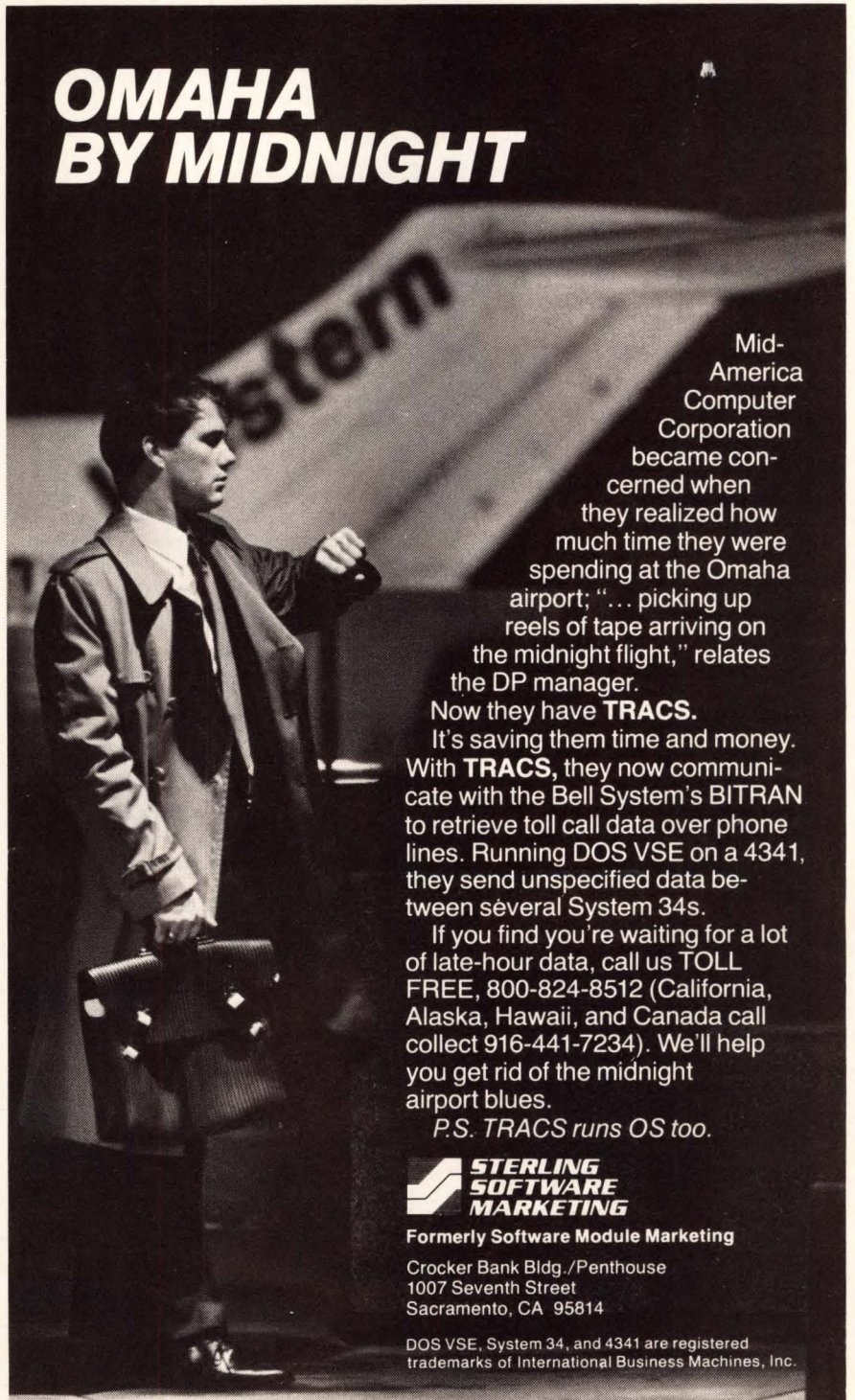
The MP 1000 multi-pen flatbed plotter comes with interface cable and Key Chart software, which reads data from most popular spreadsheet files. Also standard is firmware making it HP-GL compatible. Price: \$1,190. The WX 4731 four-pen drum plotter has a maximum speed of 8 ips and a built-in

printer function. It selects up to four different pens automatically and creates plots up to 39.3 inches long. Price is under \$2,500. Another plotter is the DA 8400, a six-pen intelligent X-Y plotter which functions as both a flatbed or rack mount. The A4 model

is \$1,850 and an A3 roll-feed model is \$2,350. It has a maximum plotting speed of 16 ips and automatic pen selection.

Western Graphtec Inc., 12 Chrysler St., Irvine, CA 94712. (714) 770-6010. **CIRCLE 329**

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OFFICE EQUIPMENT

VAX data transfer

The Vax Office Exchange allows a DEC VAX user to exchange information among five application programs: database management, word processing, spreadsheet, electronic mail,

and graphics. Entire files and documents can be transferred from one user to another. Also included are a calculator, calendar/time manager, and phone directory. The package can be purchased as single links and programs, as needs dictate. Price is

\$2,000 to \$13,000, depending on the selection.

Aquidneck Data Corp., P.O. Box 639, Newport, RI 02840.
(401) 847-7260.

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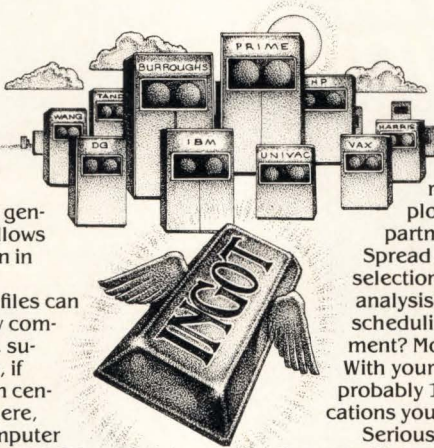
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CIRCLE 112

Publishing on a wp

With an OPS-2000 computer-aided publishing system, users can create, edit, compose, and produce copies of illustrated documents with both text and graphics. It can be used as a stand-alone or in conjunction with any of several popular microcomputers or word processors, including the IBM Personal Computer or Wang word processor. The system features high-speed laser printing, multiple fonts, advanced user interface, a mouse, and many help facilities. Price: \$60,000.

Interleaf Inc., 955 Massachusetts Ave., Cambridge, MA 02139.
(617) 497-5570.

CIRCLE 292

Protocol converter

The Altertext Communicator permits direct exchange of text, codes, and commands between previously incompatible computers, word processors, and typesetting equipment. Price: from \$7,500. The Communicator reads and writes personal-computer floppy disks and allows virtually any combination of computer-based devices to communicate simultaneously. It also functions as a stand-alone desk-top system with CP/M operating system. It has 64 Kbytes of memory, 9-inch crt, detachable keyboard, 420-Kbyte floppy-disk drive, and parallel and serial ports.

Altertext, 210 Lincoln St., Boston, MA 02111.

(617) 426-0009.

CIRCLE 293

Automation pack

Level E Omega office automation software runs on the 600 and 700 Series Compucorp processors. Standard Level E Omega is \$650 per stand-alone processor, plus a license fee of \$595 for new customers. Local-area network license fee is \$1,250. It offers word processing, math, forms creation and data entry, index access, and database management.

Compucorp, 2211 Michigan Ave., Santa Monica, CA 90404.

(213) 829-7453.

CIRCLE 294

CEO interface

An interface that connects users of DG's Comprehensive Electronic Office with Penta International editing and production software is now available. The CEO Publishing Interface I allows users to typeset, edit, and publish journals, books, and other documents. Price: \$5,000. Document Exchange II enables CEO users to create and send Telex messages anywhere in the world from their workstations. Price: \$2,500 for AOS, \$5,000 for AOS/VS, and \$500 for AOS/WS. Exchange III, a multi-vendor word-processing interface, allows CEO users to send and receive wp documents from other vendors' equipment. Price: \$2,500, AOS; \$5,000, AOS/VS, and \$500 for AOS/WS. **Data General**, Information Systems Div., 4400 Computer Dr., Westboro, MA 01581.

(617) 366-8911.

CIRCLE 295

Exxon workstation

The Exxon 750 Professional Workstation allows users to display and edit text, spreadsheets, and graphics in multiple windows and then prints them in an integrated document. It can be integrated into the Unix-based Exxon Business Support System. It also has communications capabilities. Prices start at \$7,750 for a workstation with 10 Mbytes of fixed disk, 600K diskette, and 512K RAM storage.

Exxon Office Systems Co., 777 Long Ridge Rd., Stamford, CT 06902.

(203) 329-5000.

CIRCLE 296

Printer enclosure

An acoustical sound enclosure for the IBM Displaywriter 5218-5219 and 5224 printers is available. It comes in putty, walnut, or oak finish and costs about \$600.

OPC Inc., 21018 Osborne St., Canoga Park, CA 91304.

(213) 998-6454.

CIRCLE 297

Datapoint RMS automation software

The Pro-Vista office automation software package runs under Version II of the Datapoint RMS operating system. It consists of the Vista-Guide hierarchical interface, Vista-Mail elec-

tronic-mail system, and Vista-Word enhanced word-processing software. Cost is \$1,500 per component, free to RMS users who are under a maintenance contract. The interface leads the non-technical user step by step through various functional paths and

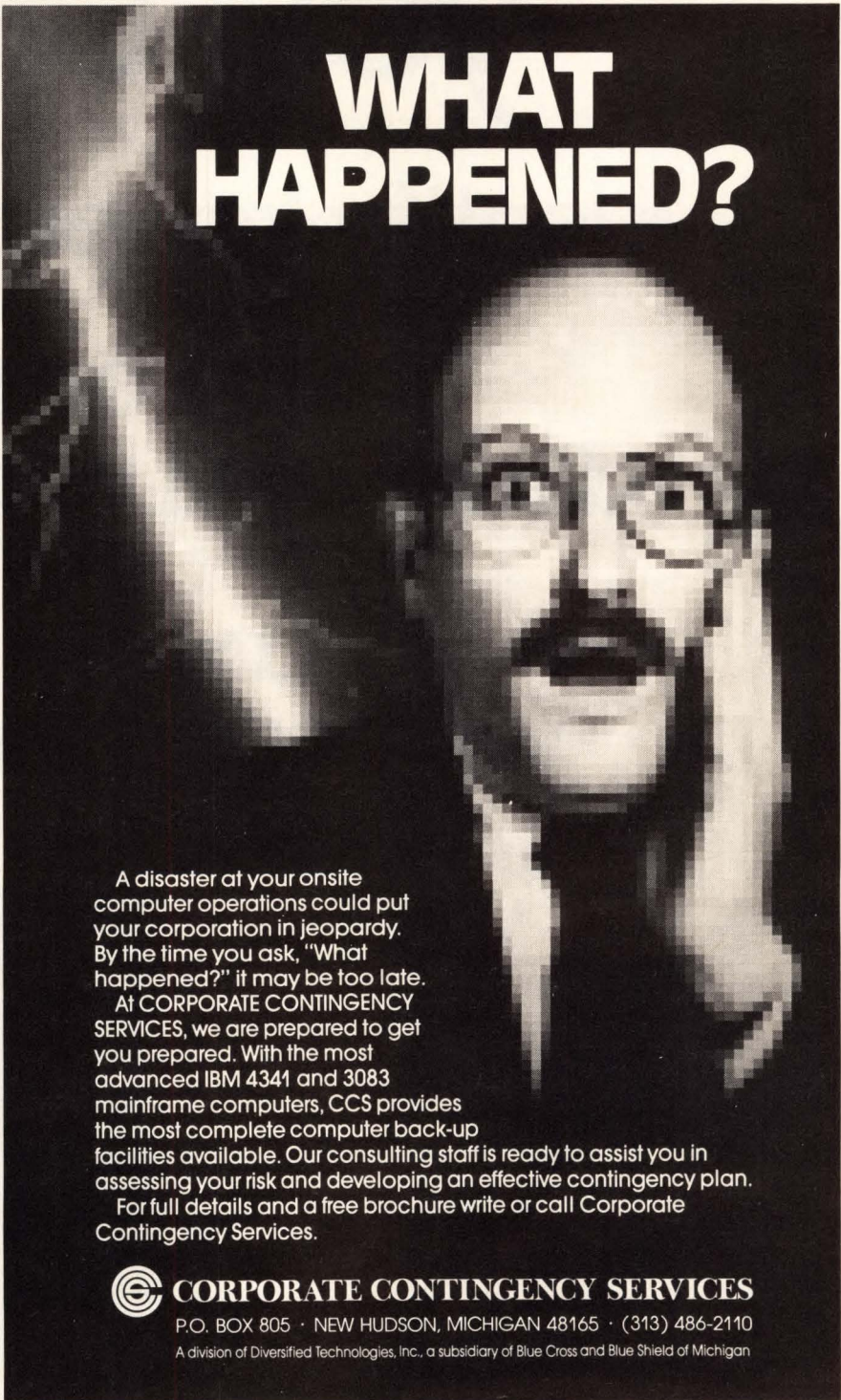
simplifies various operating procedures. The Pro-Vista package also provides access to financial modeling and communications.

Datapoint Corp., 9725 Datapoint Drive, San Antonio, TX 78284.

(512) 699-7000.

CIRCLE 298

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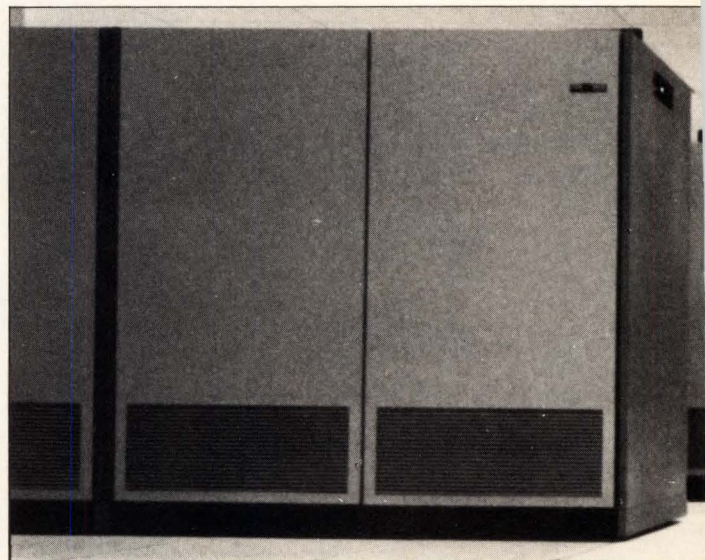
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SOFTWARE

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DYL-280 II for IBM mainframes handles virtually all information-management tasks for data, files, and systems. It simplifies hundreds of routine programming tasks; simple command statements replace large amounts of conventional code. Price: \$12,200. The DYL-280 II provides special functions such as label, personalized-letter, and test-data generation, linear-regression capabilities, table and array handling, and in-stream Cobol data-definition support. **Dylakor**, 17418 Chatsworth St., P.O. Box 3010, Granada Hills, CA 91344. (88) 366-1781. **CIRCLE 299**

Simplan graphics for IBM PC/XT

A Graphic Decision Support System (GDSS) enables Simplan users to graph their information in color on the IBM PC and XT. Price: \$1,000. Information can be entered manually or from other software packages. GDSS provides 20 formats for graphs—or users can customize graphs to their own specifications.

Simplan Systems Inc., 300 Eastowne Dr., Chapel Hill, NC 27514. (919) 493-2495. **CIRCLE 300**

Mainframe filing

Megafile is a user-friendly filing system that runs on IBM mainframes under MVS/TSO using 3270-type terminals. Megafile costs \$5,000, including 10 copies of the PC as well as mainframe modifications. Additional copies are \$150. Spreadsheets and databases created in Megafile can be downloaded to a variety of personal computers, including the IBM models. This package can be integrated with the Megacalc electronic spreadsheet.

The Mega Group Inc., 2091 Business Center Dr., Irvine, CA 92715. (714) 752-9533. **CIRCLE 301**

VAX accounting

Ezlog is a project-based resource-accounting system for VAX computers. Price: \$1,000 to \$2,200, depending on VAX model number. Ezlog provides three reporting levels for account name, user name, and project name. Each project-name/user-name

combination can have its own default directory and UIC number. Users can switch between projects without logout/login. It has password security and can be extended with reporting capabilities.

Signal Technology Inc., 5951 Encina Rd., Goleta, CA 93117. (805) 683-3771. **CIRCLE 302**

Interactive graphics

The Graphiti and Interactive Management Graphics packages work with the Project/2 project-management software system on VAX minis and under VM/CMS and MVS/TSO, and are supported on Tektronix graphic terminals. Graphiti produces high-quality presentation graphics and functions as a free-form graphics editor. Interactive Management Graphics interactively creates drawings that analyze project-component elements. It uses either resident or user-supplied data. Together, the packages cost \$1,000.

Project Software & Development Inc., 14 Story St., Cambridge, MA 02138. (617) 661-1444. **CIRCLE 303**

Estimation tool

Software Resources is an interactive tool that gives software managers an estimate of optimum staff levels, key milestones, schedule length, and costs. The program and user manual are \$175; manual alone is \$30. Managers can investigate the effects of up to 10 key project factors and can vary factors.

Associated Technology, Route 2, Box 448, Estill Springs, TN 37330. (615) 967-9159. **CIRCLE 304**

Data management

Version 4.0 of Easytrieve Plus (formerly Pro/grammar) is an information-retrieval and data-management system. It offers flexible reporting, multi-file input facility for an unlimited number of files, debugging and object code creation capabilities, and increased logic facilities. Price: \$25,000 for DOS and \$35,000 for OS. EZ/Key is a prompter and language-sensitive editor that adds several capabilities to Easytrieve Plus. Price: \$9,000 for DOS and \$15,000 for OS. It's also available as part of the Easytrieve Plus package.

The system can be tailored to individual requirements and level of expertise. **Pansophic Systems**, 709 Enterprise Dr., Oak Brook, IL 60521. (312) 986-6000. **CIRCLE 305**

CICS in TSO

CICS/TSO provides a terminal-control interface between CICS and TSO for IBM under MVS and ICS Version 1.5. First-year license costs \$3,000. A TSO command creates a single-terminal CICS system within the TSO region where CICS transactions can be processed.

D.A. Brask Systems Inc., 4805 Pershing Rd., Downers Grove, IL 60515. (312) 971-3081. **CIRCLE 306**

Reusable modules

With Wang-compatible Computer Aided Programming software, modifiable and reusable modules of Cobol source code can be cut and spliced to build a program according to programmer specifications. Development license is \$16,000 for first user, \$8,000 per additional user. These independent modules or frames can be kept in your library to be used as needed, and additional frames can be developed and stored.

Netron Inc., 99 St. Regis Ctr., N, Downsview, Toronto, Canada M3J 1Y9. (416) 636-8333. **CIRCLE 307**

Transportable DBMS for mini/mainframe

Clio is a transportable database management system for IBM/360, 370, and PCM systems under various operating systems, DEC VAX under VMS, and Honeywell DPS 6/Level 6 and DPS 7/Level 64 under GCOS. Price: \$40,000 to \$80,000. It offers interfaces for Cobol, PL/1, Fortran, and assembler programs, capabilities for data structuring, database modification and growth, and data compression; security down to the field level; and a set of support tools—including data dictionary, report writer, query language, data-manipulation language, and text editor.

Advanced Computer Techniques Corp., 16 E. 32nd Street, New York, NY 10016. (212) 696-3600. **CIRCLE 308**

IMS packages

IMS' version of Cyborg's Payroll and Human Resource Management packages is now available. Price: \$50,000, plus base price of the application. The components allow users to create new online screens within the Cyborg program, bypassing the MFS facility of IMS. A new screen can be generated and used immediately without recompiling programs.

Cyborg Systems Inc., 2 N. Riverside Plaza, Chicago, IL 60606.

(312) 454-1865.

CIRCLE 309

Productivity tool

Programaster remedies the redundancies of application-program functions. It makes these elements reusable, producing them in structured, documented ANSI '8 or '74 Cobol source code for IBM under OS or DOS. They can then be used by the developer to produce new applications software. Price: \$80,000 to \$120,000. Using Programaster menus, the programmer organizes the new application program into six functions to create a program profile and then supplies the unique data. A consulting service is available to help companies implement the product.

Master Software, 195 Worcester Rd., Wellesley, MA 02181. (617) 431-7700.

CIRCLE 310

Screen generator

Release 4.5 of BMS/GT is a screen generator for IBM 3270-type terminals under CICS. Users design a map by keying in data as they wish it to appear. Permanent license for CICS Version 1.4 and higher is \$5,500 for VSE and \$6,900 for VS/1 and MVS. The program supports line replication, full naming conventions, page building, and retrieval of any BMS-compatible map. It also offers a help processor, tutorial facility, complex array processing, and other enhancements.

GT Software, 1965 N. Park Pl., Atlanta, GA 30339. (404) 955-8866.

CIRCLE 311

RPG for VAX

The VAX RPG language is primarily for commercial applications requiring frequent report generation and ongoing file maintenance. It enhances programmer productivity. License fee is \$3,000 for compiler, editor, and runtime components.

Digital Equipment Corp., Maynard, MA 01754. (617) 897-5111.

CIRCLE 312

XT analysis

Excelerator, for the IBM PC-XT, automates most of the manual tasks of software-systems analysts, integrating graphics, data dictionary, and word processing. Prices start at \$8,000. Excelerator develops and revises data-flow diagrams, structure charts, and system documentation, and has a Microsoft Mouse for screen design and menu selections.

Intech, 5 Cambridge Ctr., Cambridge, MA 02142. (617) 492-1500.

CIRCLE 313

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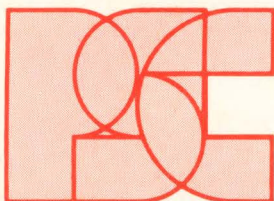


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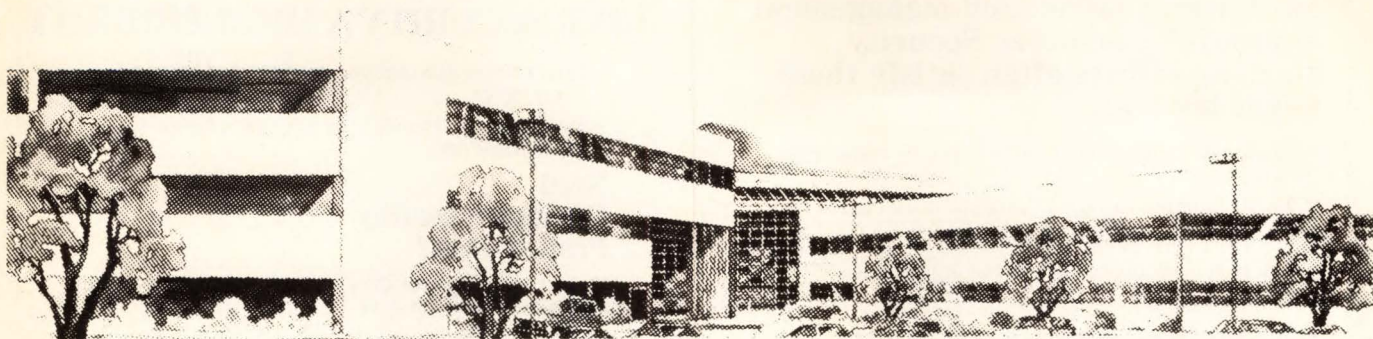


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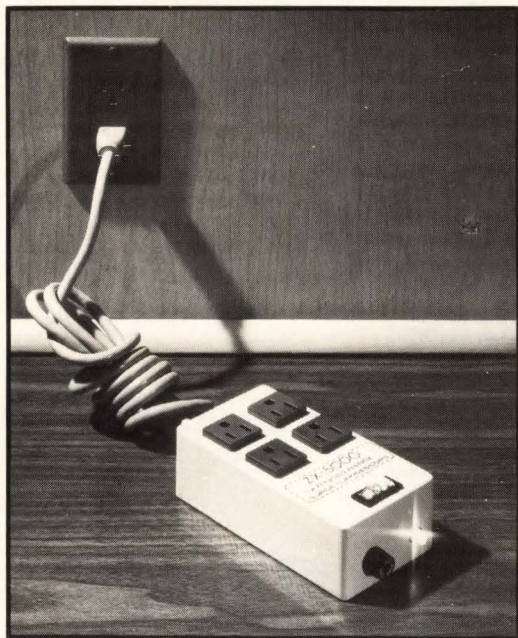
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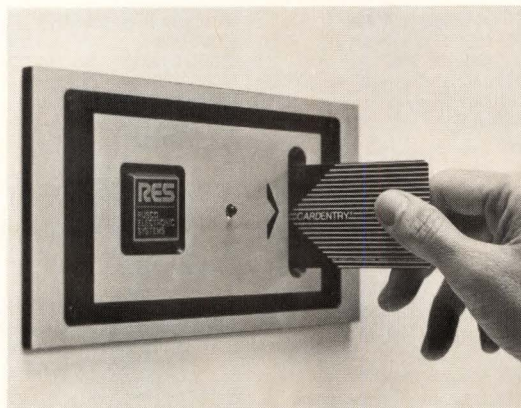
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by Mary Miles, New England Editor

YOUR CAREER

Coping with dual-career couples

You may have recently lost a valued employee because you failed to consider his or her spouse's career. The employee suddenly resigns because his or her spouse has accepted a terrific new job in a distant city. Most of the time, these resignations are shockers—you may not have known the employee had a spouse in a fast-track position. If you haven't encountered the spouse factor yet, chances are good that you will very soon.

If you haven't noticed, times are changing and fewer couples can afford the luxury of having one spouse stay at home. Even among married couples with the average 2.3 children, traditional breadwinner-homemaker couples comprise only 13.8 percent of the total. Last year, two-paycheck families made up almost 65 percent of the total. The movement of women into the workforce is helping to drive these trends: Since 1966, the number of employed women has more than doubled, and more women are moving into male-dominated fields like engineering and corporate management.

"Put all these factors together, and it's clear that a large portion of the talent pool in the future will be dual-career couples," says Arlene Johnson of Catalyst, a New York think tank. "Young, talented men are marrying young, talented women. In the near future, corporations that hope to retain talent will need policies that address the special needs of these employees."

Many managers tend to think of two-career couples as *two-income* couples. But there's a big difference. In a two-career couple, both spouses have a permanent commitment to their careers. "They're looking for more than just income from their

jobs," says Johnson. She believes that up to 30 percent of couples with two incomes are in the two-career category.

If money isn't the only goal of such employees, what are they looking for? According to Resource:Careers, a Cleveland, OH-based career-development service, career goals include personal growth and increasing levels of responsibility. Such goals aren't easily translated into monetary terms.

The trailing spouse

The spouse factor affects your organization's top talent in more than one way. The most common manifestation is "the trailing spouse." In a study of 167 organizations and 800 dual-career employees, Resource:Careers identified this phenomenon. The trailing spouse follows the old pledge, "Whither thou goest, I will go."

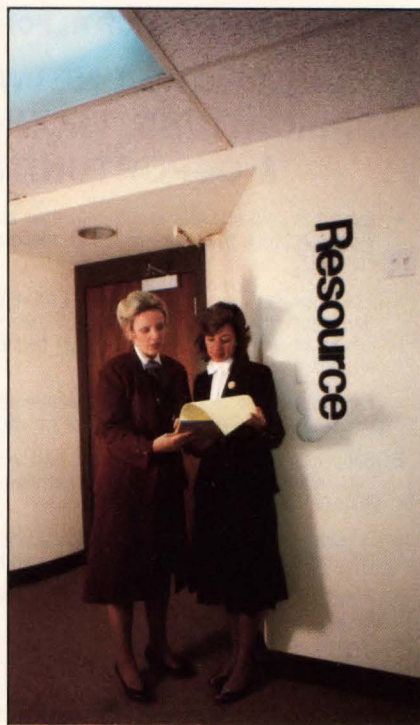
Most trailing spouses are women, but an increasing number are men. "More and more women are getting transfer promotions, and the decision of whether or not to accept is most often a joint one," says Claire Scott Miller, manager of the service's Dual Career Project. "When both careers are important, either individual might become the trailing spouse." In those cases, either spouse may be prompted to relocate by the other's moves.

The other side of the coin is the promising employee who refuses a promotion because it involves a move to a different region. In many cases, this employee's spouse has even better opportunities in his or her current job; in a joint decision, they decide to stay put. The result for the corporation is failure to place the best candidate in an important position.

These scenarios should cause corporations to reevaluate their policies,

asserts Johnson. Yet, "most companies don't know how many of their employees are involved in two-career marriages, and haven't given much thought to the implications of child-care needs, flextime, and other benefit policies, not to mention the more obvious issues of recruitment, relocation, and retention of first-class employees," she says. "This is a mistake."

What can managers do about the spouse factor? Start by acknowledging that it exists, advises Bernardo Tafur, personnel-administration manager for Celanese Corp., New York. After that, make it a consideration in personnel moves. "A major concern for both the couples



When both careers are important, either spouse in a two-career couple might follow when the other is transferred, says Claire Scott Miller (right) of Resource: Careers, pictured here with Linda Darus Clark, an associate.

YOUR CAREER

and their employers is the fact that advancement opportunities won't necessarily come equally to both individuals," says Tafur. "Different levels of skill, capability, knowledge, and experience affect advancement."

Celanese's response has been to pay careful attention to the career progress of its employees. "We look at what will happen down the road, at whether the need for relocation and/or advancement may cause career paths to diverge," says Tafur. It's vital for the couple to consider how they'd handle such an eventuality, but the corporation can also let its intentions be known, usually in performance appraisals. "During reviews, we encourage employees to define their career paths," says Tafur. "Where are they going? What do they want to do?" An employee, for example, might be asked about preferences for relocation. "If an employee tells us he or she doesn't want to

move to the Dallas office, we can use that information to assess potential changes for him or her," explains Tafur.

An economic unit

Other organizations are taking more tangible steps to mitigate the negative effects of the spouse factor. Some, for instance, have enlisted the help of outside spouse-referral and related relocation services. These services specialize in placing a transferred employee's spouse in a new job, or at least providing lists of contacts in the new city. Other corporations have formed regional consortiums to help spouses find appropriate positions as a way of encouraging employees to accept promotions that call for big moves.

Benno Curtis, a principal of Home Buyers Assistance Corp., Westport, CT, says such corporations have recognized that two-career couples con-

sider themselves a single economic unit. A transfer that threatens to deprive them of one income is a hardship. "Most couples can't even think of moving to a new location, no matter how lucrative the new job, until both are assured of employment," she says. "They can't even apply for a mortgage until they're sure about their combined income."

What kind of help do these programs provide? Spousesearch, a service provided by Gilbert Tweed, a New York-based executive recruiter, provides a variety of services. First, the agency helps the spouses of relocating employees prepare their resumes. It also provides referrals, develops lists of potential employers in the new city, and offers advice on improving interviewing and negotiation skills.

Programs that ease the trauma of relocation can be valuable recruiting tools, says Arlene Johnson. The issue

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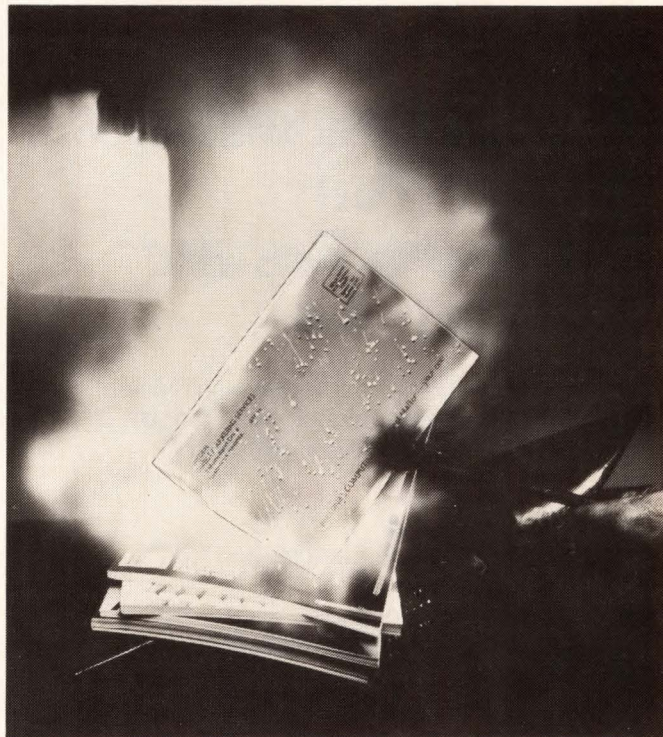
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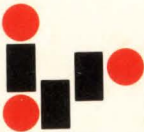
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YOUR CAREER

of a spouse's career is usually never mentioned during employment interviews, she asserts, but it should be.

The spouse factor makes the road a little bumpier for managers, but two-career couples have an even rougher time. Joint decisions and the push and pull of two careers require patience and endurance, and they exact quite a bit of pain. Experts recommend communication as the best way to negotiate the rough spots. First, let your superiors know about the special needs of two-career couples. Ignorance is not bliss in this case. Raising the corporate consciousness will help both you and the company. Needless to say, some people are better able to express these concerns to management than others, but if you expect corporate action, you've got to come forward.

The second kind of communication is with your spouse. Marilyn Machlowitz, a psychologist and consultant, has suggestions about how dual-career spouses can help each other achieve their separate goals, and stay together. First, suggestions to husbands on how to help their wives.

- Expand your wife's contacts by introducing her to your business acquaintances.
- Be a sounding board, a lightning rod, a devil's advocate, a coach, or a consoler, as needed.
- Be willing to play second fiddle.
- If you don't hire housekeeping help, do an equal share of the household chores.
- Pitch in to help manage the household.

Machlowitz also has suggestions for wives:

- Don't play Superwoman: Encourage your husband to take on an equal share of household responsibilities.
- Don't automatically defer to the demands of your husband's career.
- Don't succumb to guilt about not being a full-time housewife when the kids get sick or things go wrong.
- Beware the deadly sin of envy. Competition between husband and wife is healthy, but don't let it get out of hand.

Others have advice for both husband and wife:

- Think of your careers as distinct but equal.
- Recognize that sacrifice is part of a career and a marriage.
- Make the best use of your private time together.
- Take advantage of seminars, workshops, and other opportunities to help you manage your lifestyle better.
- Speak *to*, not *at*, each other. Don't leave your communication skills in the office.
- Share your career aspirations and goals.
- A little empathy during a relocation goes a long way.
- Recognize that you and your spouse will have different rates of career advancement.
- Be aware of how your partner gauges success, it will help you understand his or her disappointments.

The two-career couple is on the rise. For many of these couples, the need for financial security is seconded by the enhanced feelings of self-worth, the challenge, and the satisfaction of a fulfilling career. The message is clear for organizations: To attract and keep top achievers will require attention to the concerns of these couples. □

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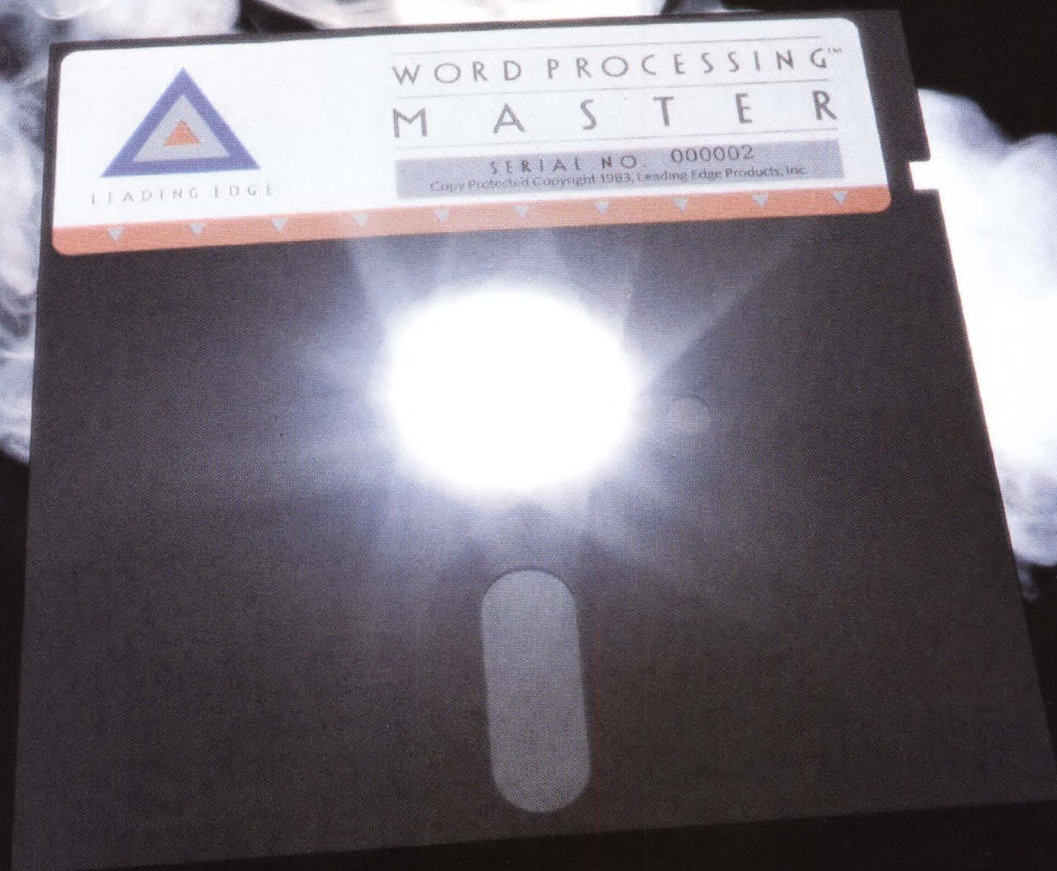
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CIRCLE 124



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MICOM's new Micro7400 is very, very different. It not only provides a Gateway for dumb asynchronous terminals to access IBM mainframe applications, but goes far beyond the basic capabilities of IBM 3270s and other protocol converters. *It's even easy to use.*

Since MICOM is the world's largest volume manufacturer of data concentrators—thanks to its Micro800/2 "Orange Box" family—it's only natural that MICOM's protocol converter should include the same features and capabilities that made the data concentrators so popular. And fortunately for asynchronous terminal users wishing they could connect to IBM mainframes, and for mainframe DP managers looking for less expensive terminals, adding concentrator features to a converter makes for a surprisingly effective hybrid.

All Standard IBM 3270 Features

Functioning as an IBM 3274 Model 51C Cluster Controller using either Bisync or SNA/SDLC protocol, the Micro7400 allows ASCII terminals (or personal computers emulating terminals) to perform as 3270s. Display terminals emulate IBM 3278s; printers emulate IBM 3287s. And special software allows printer terminals to interact with full-screen programs originally developed for crt's.

Plus Extra Functions

The Micro7400 also offers features not available in the IBM 3270 line, including dial-up access to the protocol con-

verter, terminal-controlled diagnostics, and do-it-yourself channel configuration for setting terminal-related parameters like parity.

Support for IBM Personal Computers

IBM PCs connected to the Micro7400 can emulate IBM 3270 terminals, too, for communicating with mainframes. Diskette-based MICOM software makes it easy.

Switching Between Multiple Hosts

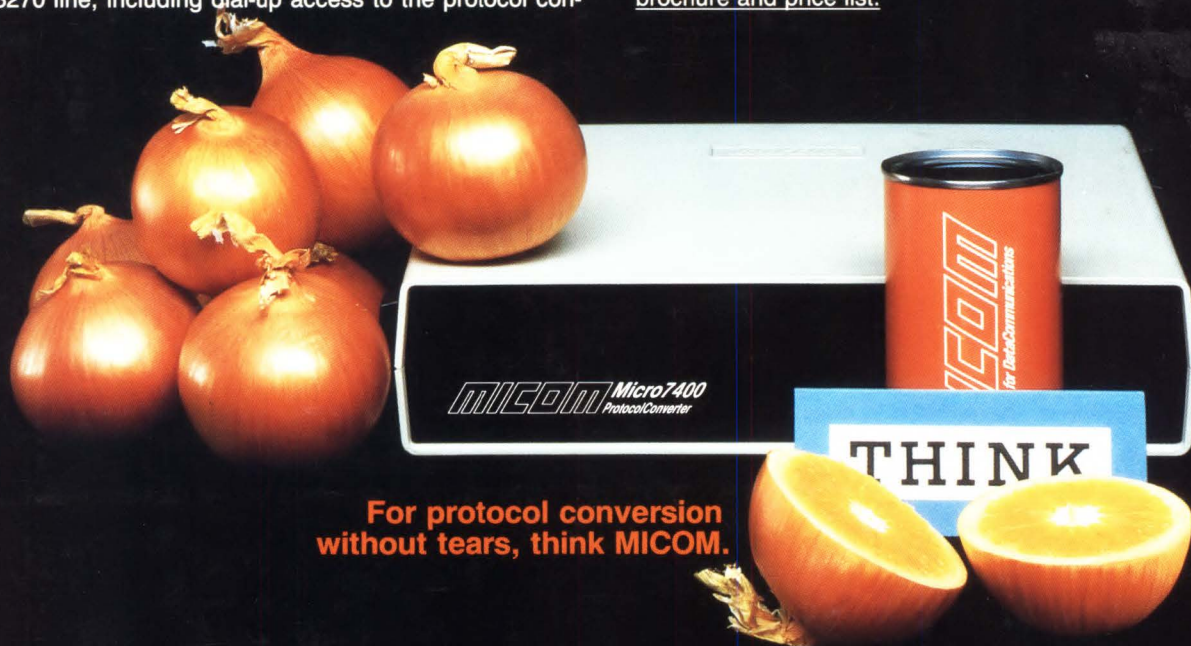
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Unique among protocol converters, the Micro7400's Command Port allows a network manager to dynamically alter operating parameters like priority assignment, as well as providing monitoring, diagnostic, and control facilities.

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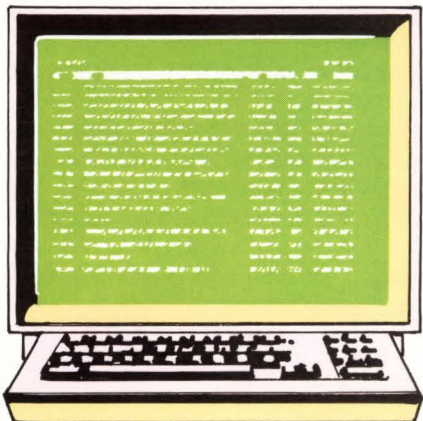
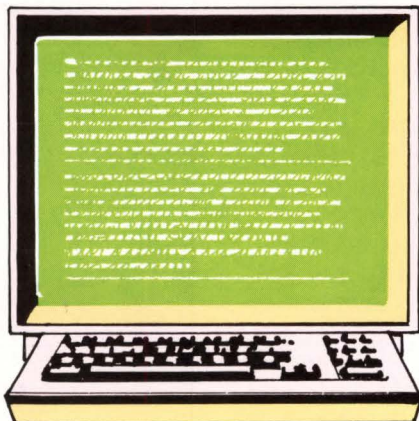
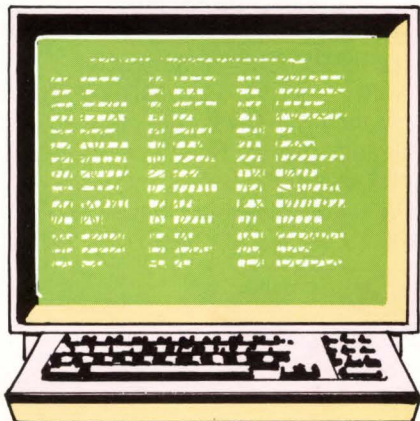
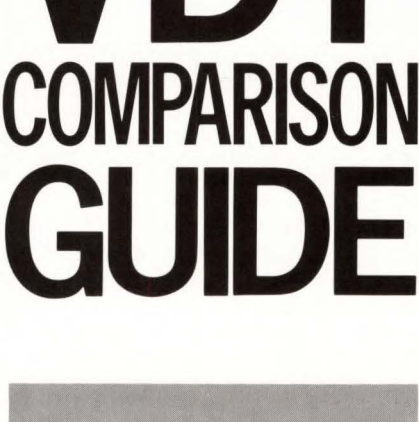
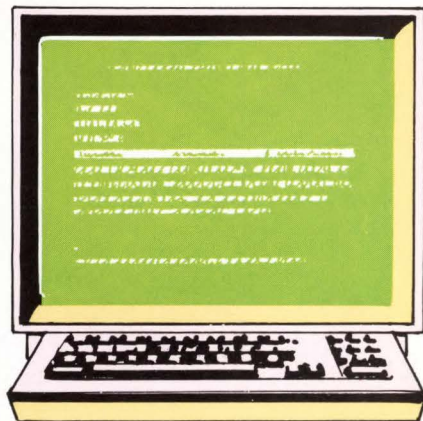
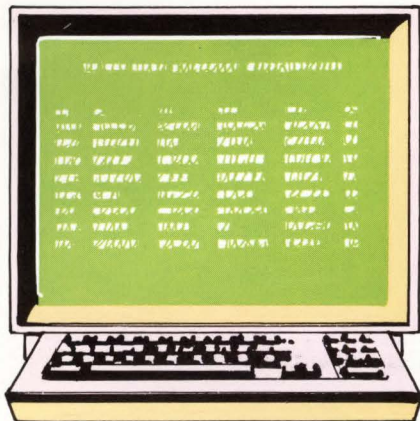
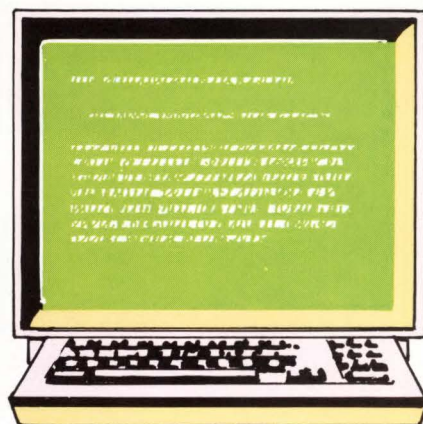
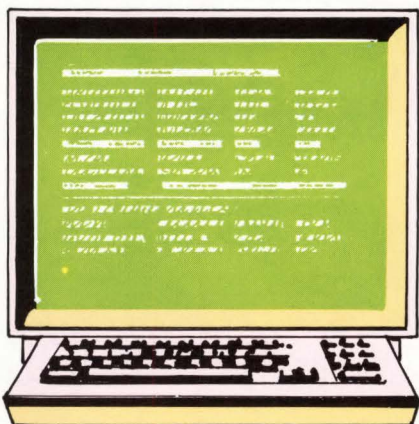
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1984 VDT COMPARISON GUIDE

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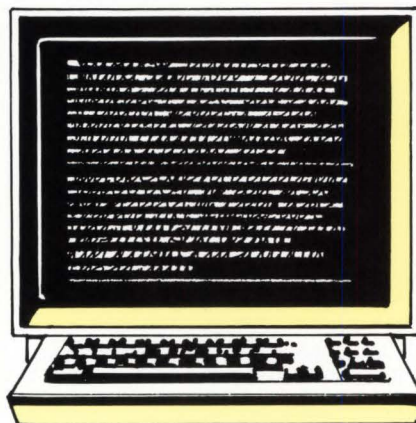
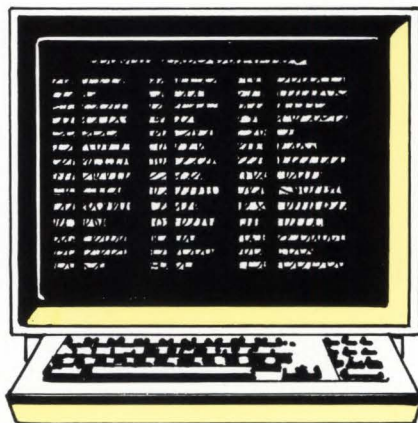
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KEY

General abbreviations

* = IBM Plug-compatible; **A** = Amps; **Add'l.** = Additional; **Buff.** = Buffered; **Charac.** = Character(s); **Cont.** = Contrast; **Equiv.** = Equivalent; **Ext.** = Extension; **Flds.** = Fields; **Gen.** = Generates; **Horiz.** = Horizontal; **LD** = Line Drawing; **Lp.** = Loop; **MP** = Modem Port; **N/A** = Not Applicable; **Not Avail.** = Not Available; **No.** = Number; **Opt.** = Optional; **PP** = Printer Port; **Prog.** = Program; **Rev.** = Reverse; **Sm.** = Smooth; **Stand.** = Standard; **Trans.** = Transmission; **TTY** = Teletype; **Unltd.** = Unlimited; **Unprotect.** = Unprotected; **Vert.** = Vertical; **W** = Watts.

Individual specifications

2. Displayable Character Set: **U** = Upper Case Only; **UL** = Upper and Lower Case; **LWD** = Lower Case with Descenders.
3. Display Format: Column x Line.
4. Character Format: Indicates Dot Matrix Across X Down; **DW/H** = double wide, high characters.

11. Cursor Style: **B** = Block; **UL** = Underlining; **BL** = Blinking.

18. Paging: Number of Pages.

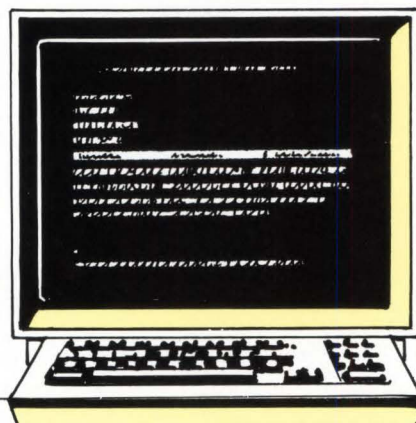
21. Display Color: **GR** = Green; **WH** = White; **AM** = Amber; **O** = Other.

22. Size of Screen: Diagonal measurement in inches.

28. Layout: **TYP** = Typewriter; **TTY** = Teletype; **IBM** = 3278; **O** = Other.

30. Numeric Cluster Pad: Number of Keys.

33. General Function Keys: Number and Type: **A** = Alternate-Use Keys; **K** = Specific Precoded Keys; **P** = Programmable.



35. Character Repeat: **K** = Separate Key; **A** = Automatic, Typmatic.

39. Clear: **S** = Screen; **EL** = To End of Line; **ES** = To End of Screen; **UP** = Unprotected Only.

42. Tab to Unprotected Fields: **F** = Forward; **B** = Backward; **A** = Automatic.

43. Tabbing: Number of Column Tab Positions.

44. Key Rollover: Number.

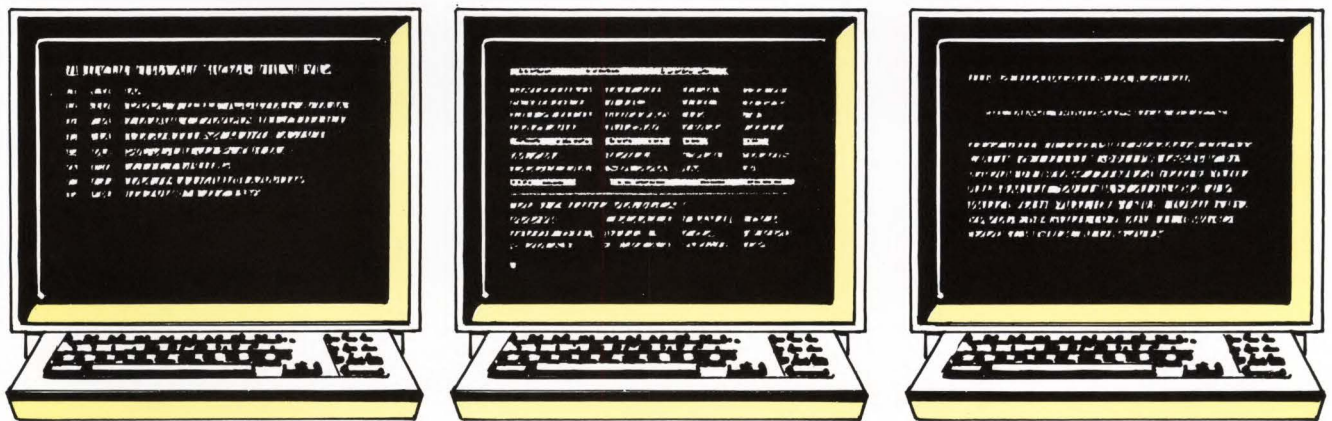
48. Transmission Rate, Baud: Minimum/Maximum.

50. Block Transfer: **L** = Line; **P** = Page; **MSG** = Message; **UN** = Unprotected Only.

53. Polling, Addressing: Protocol: **B** = Burroughs; **I** = IBM; **U** = Univac; **O** = Others.

59. Status Indicators: How Many.

64. Maximum Power: In Watts or Amps.



VDT COMPARISON GUIDE

We are using the term VDT (visual-display terminal) in the title of our guide because we can see the day when the word "visual" won't mean just cathode-ray tube (crt). Many of today's portable terminals and portable computers that can also function as terminals are already free of the heavy, cumbersome crt. Most of these devices use liquid-crystal displays (LCDs). Others have gas-discharge displays.

This does not mean that it's time to bid farewell to the crt. Various experts and market researchers have been predicting its demise for years and years. (Pretty good for a technology that is more than a half century old.) But the crt still offers powerful advantages over its rivals, such as the ability to display color and store information. In addition, the crt has a much broader viewing angle than the LCD. (The narrow viewing angle of the LCD can be an advantage when a user wants to maintain confidentiality.)

Most of the VDTs detailed in this pullout guide are crts. Beyond that criterion, there are a number of category listings that will help you decide which VDTs to consider for a specific alphanumeric application. (This guide is limited to alphanumeric terminals. However, you should be aware that some of the more popular machines, such as those made by DEC, can be upgraded for graphic applications by the addition of printed-circuit boards available from several vendors.)

Due to the great and enduring

popularity of IBM's 3270 line of VDTs, there are many "plug-compatible" replacements for the more costly machines from Big Blue. However, cost should not be the only criterion in choosing a substitute for IBM's products. For example, some of the replacements offer smaller "footprints," thereby saving desk space.

The 3270 terminals are not the only line that may be emulated. There are some VDTs that can emulate both the 3270 line and DEC's popular terminals, by the turn of a switch or depression of a button.

Ergonomic features are worth considering, especially if the terminals will be used by the same employees for many hours each day. Such features include the ability to tilt or swivel the display portion of the terminal when the user becomes uncomfortable with the original position. Blinking lights that warn of a misstep before data are destroyed are also helpful.

Ease of use should be a major consideration in selecting a VDT. Such a terminal would include the ability to insert or delete characters or lines without a convoluted procedure.

If you are planning to use the terminal in a dialup mode, you will need a modem. Some terminals come with built-in modems, which means savings in total costs and in valuable desk acreage. In the future, modems will probably be added to most VDTs in the form of a single integrated circuit.

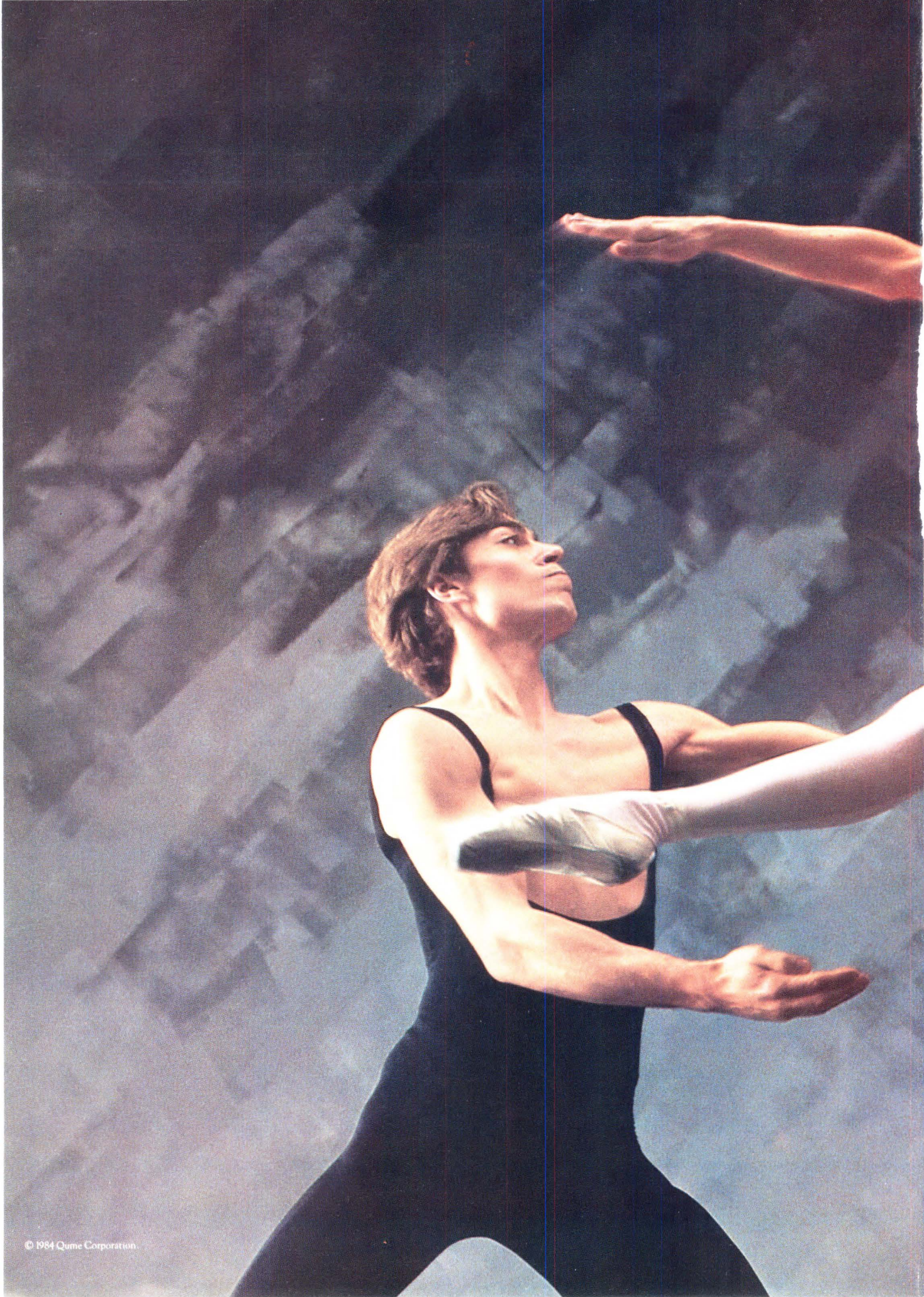
Another consideration is the

amount of power consumed by the machine. If you need to place a large number of machines in a single room, too much power may be generated. In this case, a strong air conditioning system will be necessary to ease the discomfort of the operators. And if the machines consume more power than the wiring can deliver, you will have to spend a lot of money on new power lines.

Cost, perhaps the most important selection factor, has not been included in this guide. This is due to the fact that prices change so frequently that any prices we did list might be out of date by publication. The sale of VDTs is a highly competitive business, especially now that many vendors import products manufactured overseas.

In past years, the VDT guide was presented in the form of a wall chart. We found that, as more vendors offered VDTs, we had to squeeze an ever-increasing amount of information onto an area of unchanging size. Before long, the print would have become so small that we would have had to offer a magnifying glass with each chart.

Since this is the first year the guide is in pullout-booklet form, we may have overlooked some of your needs. Please let us know how the guide might be improved. You can use the reader-service card at the back of this issue to present your comments—good or bad. If there is not enough room on the face of the card, drop us a note at 10 Mulholland Drive, Hasbrouck Heights, NJ 07604.





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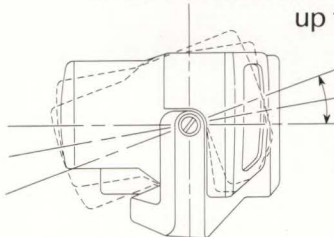
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CIRCLE 152

Manufacturer Model number	A.B. Dick VC-0010	A.B. Dick VM-0010	Ampex Ampex 4100*	Ampex Ampex 4000*	Anderson-Jacobson AJ 520	Ann Arbor Terminals Ambassador
1. No. of Display Charac.	256	256	128-Stand., 256-Opt.	128-Stand., 256-Opt.	128	128
2. Displayable Charac. Set	UL, LWD	UL, LWD	LWD	LWD	U, UL, LWD	UL, LWD
3. Display Format	80x28	80x28	80x25	80x25	80x24 or 24x80	80x18/60
4. Charac. Format	9x12	9x12	7x9	7x9	7x10, 10x12	7x9
5. Rev. Video-Screen Format	Yes	Yes	No	No	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes-Plus 2 Add'l.	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	No	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	UL, BL	UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	Yes	No/Yes	Yes
14. Full Vector Graphics	Yes	No	No	No	No	Opt.
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	No	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	N/A	N/A	8	8	6	2
19. Split-screen Format	Yes	Yes	No	No	No	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, WH, AM, O	GR, WH, AM, O	GR	GR	GR, AM	GR
22. Size of Screen	15	15	12	12	15	15
23. Sm. Vert. Scroll / Horiz. Scroll	No	No	No	No	Yes	No
24. Bright Controls / Cont.	Yes	Yes	No/Yes	No/Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No/Yes	No/Yes	No	No	Yes	No/Opt.
27. ANSI x 3.64 Standard	N/A	N/A	N/A	N/A	Yes	Yes
28. Layout	TYP	TYP	TYP	TYP	Detached TYP	TYP
29. No. of Keys	90	90	101	101	N/A	94
30. Numeric Cluster Pad	14	14	14	14	18	12
31. Cursor-Control Keys	Yes	Yes	5	5	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	A=90, K=12, P=78	A=90, K=12, P=78	A=18, K=11, P=100	A=18, K=11, P=100	P=24	P=38
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	No	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	No	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	No	F, B, A
43. Tabbing	80	80	80	80	Programmable	80
44. Key Rollover	128	128	N	N	N	N
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	Yes	Yes	Yes
47. 20 mA Current Lp. / RS 422	No	No	No	No	No	Yes
48. Trans. Rate / Baud	50/19.2k	50/19.2k	300/19,200	300/19,200	50/19.2	110/19.2K
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	Yes	No	Yes
50. Block Transfer	L, P, UN	L, P, UN	L, P, UN	L, P, UN	UN	L, P, MSG, UN
51. Cpu Control of Block / Charac.	Yes	Yes	Yes	Yes	N/A	Yes
52. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes
53. Polling / Addressing	I	I	B, I, U, O	B, I, U, O	O	No
54. Emulations	Yes	Yes	Yes	Yes	VT100	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes	Yes	Yes
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	Yes	Yes	No	No	No	Yes
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	80	80	N/A	N/A	Depends Upon Operating Mode	No
60. Local Mode	Yes	Yes	Yes	Yes	No	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	No	No	No	Yes	No
63. Screen Tilt / Swivel	Yes	Yes	No	No	No	Opt.
64. Maximum Power	550	550	90	90	115/230	35

Manufacturer Model number	Ann Arbor Terminals Guru	Applied Digital Data Syst. Viewpoint	Applied Digital Data Syst. Viewpoint/Color	AT & T Teletype 5 410	AT & T Teletype 5 420	Beehive Int'l. ATL-008
1. No. of Display Charac.	128	1,920	1,920	224	224	1,920, 3,169
2. Displayable Charac. Set	UL, LWD	U, UL, LWD	U, UL, LWD	U, LWD	U, LWD	UL, LWD
3. Display Format	60/160x18/66	24x80	24x80	80/137x24	80/132x24	80x24, 137x27
4. Charac. Format	7x9 DW/H	5x7	5x8	7x9, 5x7	7x9, 5x7	7x9, 9x13
5. Rev. Video-Screen Format	Yes	Yes	Yes	No	No	Yes
6. Dual Intensity	Yes	N/A	N/A	Yes	Yes	Yes
7. Protected Format	Yes	No	No	No	Yes	Yes
8. Rev. Video Fields	Yes	No	No	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes/No	Yes	Yes
13. LD Set, Charac. Graphics	Yes	No	Yes	Yes	Yes	Yes
14. Full Vector Graphics	No	No	No	No	No	No
15. Status Line	Yes	No	No	Yes	Yes	Yes
16. Security Blank Field	No	No	No	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	Yes	No	Yes	Yes	Yes	N/A
18. Paging	10	No	2	3	3	12
19. Split-screen Format	Yes	No	No	Yes	Yes	No
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR	GR, WH	GR, WH, AM, O	GR, AM, WH	GR, AM, WH	GR
22. Size of Screen	15	12	13	12	12	14
23. Sm. Vert. Scroll / Horiz. Scroll	Yes	Yes	Yes	No	No	Yes
24. Bright Controls / Cont.	Yes	No	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No/Opt.	Yes	Yes	No	No	No/Yes
27. ANSI x 3.64 Standard	Yes	No	N/A	Yes	Yes	Yes
28. Layout	TYP	TYP, TTY	TYP, TTY	TYP	TYP	TYP
29. No. of Keys	94	N/A	N/A	89	89	94
30. Numeric Cluster Pad	12	N/A	N/A	12	12	14
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	P=38	P=3	P=16	P=8	P=16	P=8
34. Shift Rev. / Alpha Lock	Yes	No	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UN	S, EL, ES, UN	S, EL, ES, OP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	No	F, B	F, B, A
43. Tabbing	170	No	N/A	16	132	80 or 132
44. Key Rollover	N	N/A	N Key	4	4	N Key
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes/No	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	No	Yes	Yes
47. 20 mA Current Lp. / RS 422	Yes	No	Yes	No	Yes	Yes
48. Trans. Rate / Baud	110/19.2K	Up to 19,200	Up to 19.2	300/19,200	300/19,200	50/19.2
49. Charac. Transfer, TTY Mode	Yes	N/A	Yes	Yes	Yes	Yes
50. Block Transfer	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN	No	L, P, MSG, UN	L, P, MSG, UN
51. Cpu Control of Block / Charac.	Yes	N/A	N/A	No	Yes	Yes
52. Selectable Parity	Yes	N/A	N/A	Yes	Yes	Yes
53. Polling / Addressing	No	0	0	No	No	N/A
54. Emulations	Yes	Regent 2025	Regent 4060	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes/No	Yes	Yes
56. Built-in Modem	No	No	No	Yes/Opt.	Yes/Opt.	No
57. Data Compression	Yes	No	N/A	No	No	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	No	N/A	N/A	2	9	9
60. Local Mode	Yes	Yes	N/A	Yes	Yes	Yes
61. Audible Alarm	Yes	No	No	Yes	Yes	Yes
62. Composite Video Output	No	N/A	Yes	No	No	No
63. Screen Tilt / Swivel	Opt.	Yes	Yes	Yes	No	Yes
64. Maximum Power	70	N/A	N/A	65	80	40

Manufacturer Model number	Beehive Int'l. ATL-004	Braegen 8522	Braegen 8524	Chromatics CX 1100	Chromatics CT 4100	CIE Terminals CIT-101
1. No. of Display Charac.	1,920/3,169	1,920, 3,564	1,920, 3,560, 3,440	1,920/3,840	1,920/3,840	128
2. Displayable Charac. Set	UL, LWD	UL, LWD	UL, LWD	U, UL, LWD	U, UL, LWD	UL, LWD
3. Display Format	80x24, 132x27	80x24, 132x27	80x24, 32, 43	80x48/24	80x48/24	132/80x24/12
4. Charac. Format	7x9, 9x13	N/A	N/A	8x16	8x16	8x10
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	N/A	N/A	Yes	Yes	Yes
14. Full Vector Graphics	No	No	No	No	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	No
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	No
17. Display of Control Charac. / Prog. Mode	N/A	N/A	N/A	Yes	Yes	Yes
18. Paging	1	N/A	N/A	4	4	1
19. Split-screen Format	No	Opt.	Opt.	Yes	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR	GR	GR	GR, WH, 0 (8 total)	GR, WH, 0 (8 total)	GR, WH, AM
22. Size of Screen	14	15	15	19	13	12
23. Sm. Vert. Scroll / Horiz. Scroll	Yes	Yes/No	Yes/No	No	No	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	N/A	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No/Yes	Yes	Yes	Yes	Yes	Yes
27. ANSI x 3.64 Standard	No	Not Avail.	Not Avail.	Yes	Yes	Yes
28. Layout	TYP	TYP, IBM	TYP, IBM	0	0	TYP
29. No. of Keys	94	87	87	83	83	85
30. Numeric Cluster Pad	14	12	12	20	20	18
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	P=8	P=24	P=24	A=20, K=24, P=18	A=20, K=24, P=18	K=48, A=19, P=19
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A, K
36. Escape Key or Equiv.	Yes	No	No	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	No	No	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	N/A	N/A	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A
43. Tabbing	80 or 132	Not Avail.	Not Avail.	Unltd.	Unltd.	132
44. Key Rollover	N Key	Not Avail.	Not Avail.	Not Avail.	Not Avail.	2
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	No	No	Yes
47. 20 mA Current Lp. / RS 422	Yes	No	No	Yes	Yes	Yes/No
48. Trans. Rate / Baud	50/19.2	1.5 mg.	1.5 mg.	100/38.4	100/38.4	19,200
49. Charac. Transfer, TTY Mode	Yes	No	No	Yes	Yes	Yes
50. Block Transfer	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN	No	No	No
51. Cpu Control of Block / Charac.	Yes	Yes/No	Yes/No	No	No	No
52. Selectable Parity	Yes	No	No	Yes	Yes	Yes
53. Polling / Addressing	N/A	I	I	0	0	0
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes	Yes	Yes
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	No	N/A	N/A	No	No	No
58. Self Test	Yes	N/A	N/A	Yes	Yes	Yes
59. Status Indicators	9	Yes	Yes	6	6	7
60. Local Mode	Yes	Not Avail.	Not Avail.	Yes	Yes	Yes
61. Audible Alarm	Yes	N/A	N/A	Yes	Yes	Yes
62. Composite Video Output	No	Yes	Yes	Yes	Yes	No
63. Screen Tilt / Swivel	Yes	No	No	Yes	No	No
64. Maximum Power	60	Yes	Yes	150	150	90

Manufacturer Model number	CIE Terminals CIT-101e	C. Itoh Electronics CIE 7800	Computer Communications 8178	Datamedia Elite I, Model 60	Datamedia Elite I, Model 90	Datapoint Model 8220 Workstation
1. No. of Display Charac.	128	128	1,920	1,920 or 3,168	1,920 or 3,168	1,920
2. Displayable Charac. Set	UL, LWD	UL, LWD	U, UL, LWD	U, UL, LWD	U, UL, LWD	UL, LWD
3. Display Format	80/132x24	80x43, 32, 24, 12, or 132x27	24x80	24x80/132	24x80/132	80x24
4. Charac. Format	7x9	7x9	11x15	7x9	7x9	5x7
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	No	Yes	Yes	Yes	No	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	No	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, BL	B, UL, BL	UL, BL	B, BL	B, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	N/A	Yes	Yes	No
14. Full Vector Graphics	No	No	N/A	No	No	No
15. Status Line	No	Yes	Yes	Yes	No	Yes
16. Security Blank Field	No	Yes	Yes	No	No	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	3	No	1	No	No	Yes
19. Split-screen Format	Yes	No	No	Yes	Yes	No
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, WH, AM	GR, AM	GR	WH, GR & AM Opt.	WH, Opt. GR & AM	AM
22. Size of Screen	14	14	12	12	14	12
23. Sm. Vert. Scroll / Horiz. Scroll	Yes	Yes/No	N/A	Yes	Yes	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No/Yes	Yes	N/A	No	No	Yes
27. ANSI x 3.64 Standard	Yes	No	No	No	No	Yes
28. Layout	TYP	TYP	IBM	TYP	TYP	TYP
29. No. of Keys	85	87	87	N/A	N/A	65
30. Numeric Cluster Pad	18	13	12	19	19	11
31. Cursor-Control Keys	Yes	4	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	A = 18, K = 4, P = 1	A = 32	A = 24	K = 4, P = 15	K = 16	K = 5, P = 5
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	K, A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	N/A	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	N/A	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	N/A	Yes	Yes	Yes
39. Clear	S, EL, ES	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A
43. Tabbing	132	Programmable	N/A	Programmable	Programmable	Variable
44. Key Rollover	2	N-Key	8	2 1/2	2 1/2	N-Key
45. Ext. RS 232 / On-Off Control	Yes	Yes	N/A	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	Yes	Yes	Yes
47. 20 mA Current Lp. / RS 422	Yes/No	No	No/Yes	Opt.	Opt.	No
48. Trans. Rate / Baud	50/19,200	110/19.2	9,600/38,400	50/19.2	50/19.2	50/9600
49. Charac. Transfer, TTY Mode	Yes	No	No	N/A	N/A	Yes
50. Block Transfer	N/A	L, P, MSG, UN	P, UP	L, P, MSG, UN	L, P, MSG, UN	L
51. Cpu Control of Block / Charac.	N/A	Yes	Yes	No	No	Yes
52. Selectable Parity	Yes	Yes	No	Yes	Yes	Yes
53. Polling / Addressing	0	IBM	0	0	0	B, I, U
54. Emulations	Yes	Yes	Yes	Yes	N/A	Yes
55. X-on / X-off on MP / PP	Yes	No	No	N/A	No	Yes
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	No	No	No	N/A	N/A	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	7	N/A	N/A	7	7	1
60. Local Mode	Yes	Yes	No	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	No	No	Yes	Yes	No
63. Screen Tilt / Swivel	Yes	Yes	Yes	Yes	Yes	Opt.
64. Maximum Power	90	N/A	40	100	100	N/A

Manufacturer Model number	Davox Communications 811	Davox Communications 911	Delta Data D 2830-III	Dictaphone 6190 CRT	Direct 8310	Direct 8250
1. No. of Display Charac.	1,920	1,920, 2,000	19,200	1,980	1,920 or 3,168	1,920 or 3,168
2. Displayable Charac. Set	UL	UL	UL, LWD	U	LWD	LWD
3. Display Format	24x80	24x80	80x24	90x22	24x80/132	24x80, 132
4. Charac. Format	7x9	7x9	7x9	5x7	DH 10x12, 7x11x132 DW 6x12, 5x9x132	DH 10x12, 7x11x132 DW 6x12, 5x9x132
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	No	No	No	No	Yes	Yes
14. Full Vector Graphics	No	No	No	No	Opt.	Opt.
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	No	Yes	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	No	Yes	Yes
18. Paging	2	2	10	No	12	12
19. Split-screen Format	No	No	No	No	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, AM	GR, AM	GR	GR	GR	GR
22. Size of Screen	12	12	14	9	14	14
23. Sm. Vert. Scroll / Horiz. Scroll	Yes	Yes	No	No	Yes	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	N/A	Yes	Yes
26. APL / Foreign Charac. Sets	No	No	No/Yes	No	Yes	Yes
27. ANSI x 3.64 Standard	3.41	Not Avail.	No	Yes	Yes	Yes
28. Layout	TYP, TTY, IBM, O	TYP, TTY, IBM, O	TYP	O	TYP	TYP
29. No. of Keys	99	99	96	91	96	96
30. Numeric Cluster Pad	12	12	13	13	14	14
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	A=43, P=38	A=43, P=38	P=20	K=24	P=8 or 16	P=8 or 16
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	No	N/A	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S	S	S, EL, ES, UP	UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	No	Yes	Yes
42. Tab to Unprotect. Flds.	F, B	F, B	F, B	F, A	F, B	F, B
43. Tabbing	Yes	Yes	80	N/A	132	132
44. Key Rollover	N	N	N Key	No	N/A	N/A
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	Yes	Yes	Yes
47. 20 mA Current Lp. / RS 422	No	No	No	Yes/No	Yes	Yes
48. Trans. Rate / Baud	75/19.2 async to 56Kb	75/19.2 async. to 56Kb	110/19.2	N/A	300/19.2	300/19.2
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	N/A	Yes	Yes
50. Block Transfer	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN	N/A	L, P, UN	L, P, UN
51. Cpu Control of Block / Charac.	Yes	Yes	N/A	N/A	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	N/A	Yes	Yes
53. Polling / Addressing	I, O	I, O	B	N/A	No	No
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	No	N/A	Yes	Yes
56. Built-in Modem	No	No	No	N/A	No	No
57. Data Compression	Yes	Yes	No	Yes	No	No
58. Self Test	Yes	Yes	Yes	Opt.	Yes	Yes
59. Status Indicators	Yes	Yes	2	No	4	No
60. Local Mode	Yes	Yes	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	No	Yes	Yes	No	No
63. Screen Tilt / Swivel	Yes	Yes	Yes	Yes	Yes	Yes
64. Maximum Power	60	60	N/A	70	N/A	N/A



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CIRCLE 153

Manufacturer Model number	Diversified Data Resources Hydra 78	Esprit Syst. Esprit III	Esprit Syst. ESP 6310	Falco Data Products FAME II	Falco Data Products TS 2624B	General Terminals SW 10
1. No. of Display Charac.	1,920	1,920	1,920	1,920	3,168	1,920
2. Displayable Charac. Set	UL	UL, LWD	UL, LWD	UL, LWD	UL, LWD	UL
3. Display Format	Not Avail.	80x24	80x24	80/132x24	80/132x24	80x24
4. Charac. Format	Not Avail.	7x11	7x11	8x12	8x12	5x9
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	No
10. Charac. Underlining	Not Avail.	Yes	Yes	Yes	Yes	No
11. Cursor Style	B, UL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	No	Yes	Yes	Yes	Yes	Yes
14. Full Vector Graphics	No	No	No	Opt.	No	N/A
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	No
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	No	4	4	Yes	4	No
19. Split-screen Format	No	Yes	No	Yes	No	No
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, AM	GR	GR, AM	GR, AM	GR, AM	GR, AM, WH
22. Size of Screen	12, 14	12	14	14	12	12
23. Sm. Vert. Scroll / Horiz. Scroll	No	Sm.	Yes	Yes/No	Yes/No	Yes/No
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	No	No	Yes
26. APL / Foreign Charac. Sets	No	Not Avail.	Not Avail.	No/Yes	No	No/Yes
27. ANSI x 3.64 Standard	No	No	No	Yes	No	Yes
28. Layout	IBM	TYP	TYP	TYP	TYP	TYP
29. No. of Keys	86	83	82	N/A	N/A	N/A
30. Numeric Cluster Pad	10	17	14	12	12	18
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	A = 1	P	P Nonvolatile	P = 18	P = 8	A = 12
34. Shift Rev. / Alpha Lock	Yes	No/Yes	No/Yes	Yes	Yes	No
35. Charac. Repeat	K	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B	F, B, A	F, B, A	F, B, A	F, B, A	F, B
43. Tabbing	No	80	80	Programmable	Programmable	80
44. Key Rollover	No	2	3	No	N	1
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	No	Yes	Yes	Yes	Yes	Yes
47. 20 mA Current Lp. / RS 422	Yes	Yes/No	Yes	Opt.	Opt.	Yes/No
48. Trans. Rate / Baud	300/19.2	50/19,200	50/19,200	50/19,200k	50/19,200k	50/19.2k
49. Charac. Transfer, TTY Mode	Yes/No	Yes	Yes	Yes	Yes	Yes
50. Block Transfer	L, P	L, P, UN, MSG	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN	No
51. Cpu Control of Block / Charac.	No	Yes	Yes	Yes	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes
53. Polling / Addressing	0	No	No	0	0	No
54. Emulations	Not Avail.	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes	Yes	Yes
56. Built-in Modem	No	No	No	Opt.	Opt.	No
57. Data Compression	No	Yes	Yes	Yes	Yes	No
58. Self Test	Yes	Yes	Yes	No	No	Yes
59. Status Indicators	No	15	13	N/A	N/A	27
60. Local Mode	Yes	Yes	Yes	No	No	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	Yes	Yes	No	Yes	No	No
63. Screen Tilt / Swivel	Yes	No	Yes	N/A	N/A	Yes/Opt.
64. Maximum Power	Not Avail.	40	48	55	55	110 or 220

Manufacturer Model number	General Terminals SW 80	GTE Communications Syst. XT300	Harris 1001	Harris 9178-02	Hewlett-Packard HP2382A	Hewlett-Packard HP2623A
1. No. of Display Charac.	1,920	128-64	2,160	1,920	1,920	1,920
2. Displayable Charac. Set	UL	UL, LWD	LWD	UL, LWD	UL, LWD	UL, LWD
3. Display Format	80x24	40/80x24	80x27	24x80	80x24	80x24
4. Charac. Format	5x9	10x12	7x9	9x14	9x15	9x15
5. Rev. Video-Screen Format	Yes	No	No	No	No	No
6. Dual Intensity	Yes	Yes	No	Yes	Yes	Yes
7. Protected Format	Yes	No	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	No	Yes	Yes
9. Blinking	Yes	Yes	Yes	Opt.	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B	B	BL, UL, B	BL	BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	No	Opt.	Opt.
14. Full Vector Graphics	N/A	No	No	No	No	Yes
15. Status Line	Yes	Yes	Yes	Yes	No	No
16. Security Blank Field	Yes	Yes	Yes	Yes	No	No
17. Display of Control Charac. / Prog. Mode	Yes	Yes	No	No	Yes	Yes
18. Paging	3	1	No	No	2	2
19. Split-screen Format	No	No	Yes	No	No	No
20. Non-glare Screen	Yes	Yes	No	Yes	No	No
21. Display Color	GR, AM, WH	WH	GR	GR, AM	WH	GR, WH, AM
22. Size of Screen	12	9	12	12	9	12
23. Sm. Vert. Scroll / Horiz. Scroll	Yes	No	Yes	No	No	No
24. Bright Controls / Cont.	Yes	Yes	No/Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No/Yes	No	Greek	Yes	Opt.	Opt.
27. ANSI x 3.64 Standard	Yes	Yes	Yes	No	Opt.	Opt.
28. Layout	TYP	TYP	TYP	IBM, TYP	TYP	TYP
29. No. of Keys	N/A	63	99	109, 108, 87, 75	100	100
30. Numeric Cluster Pad	18	No	14	12	14	14
31. Cursor-Control Keys	Yes	No	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	No	Yes	Yes	Yes	Yes
33. General Function Keys	A=24	P=4 plus 12 Memory Locators	K=11, P=15	A,K=24	P=8	P=8
34. Shift Rev. / Alpha Lock	No	No/Yes	Yes	Yes	N/A	N/A
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	No	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	No	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES	S, EL, ES, UP	S, EL, ES, UP	UP, S	S, EL, ES, UP	S, EL, ES
40. Insert / Delete Charac.	Yes	No	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	No	Yes	No	Yes	Yes
42. Tab to Unprotect. Flds.	F, B	No	F, B, A	F, B, A	F, B, A	F, B, A
43. Tabbing	80	No	80	N/A	80	80
44. Key Rollover	1	2	N Key	No	Unltd.	Unltd.
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	No	No	No
46. Buff. Printer Interface	Yes	Yes	Yes	No	No	Yes
47. 20 mA Current Lp. / RS 422	Yes/No	No	No/Yes	No	No	Opt./Opt.
48. Trans. Rate / Baud	50/19.2k	300/480	50/19,200	Coaxial	110/9600	110-9600
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	No	Yes	Yes
50. Block Transfer	L, P	No	L, P, MSG, UN	No	L, P, UN	L, P, UN
51. Cpu Control of Block / Charac.	Yes	No	Yes	No	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	No	Yes	Yes
53. Polling / Addressing	No	No	I	I	No	No
54. Emulations	Yes	VT100	Yes	Yes	Opt.	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	No	N/A	N/A
56. Built-in Modem	Yes	Yes	No	No	No	No
57. Data Compression	No	Yes	Yes	No	No	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	25	Yes	1	Yes	5-10	5-10
60. Local Mode	Yes	Yes	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	No	Yes	Yes	Yes	Yes
62. Composite Video Output	Yes	No	No	No	No	Opt.
63. Screen Tilt / Swivel	Yes/Opt.	No	Yes	Yes/Opt.	Opt.	Opt.
64. Maximum Power	110 or 220	35	100	172	50-135	120-170



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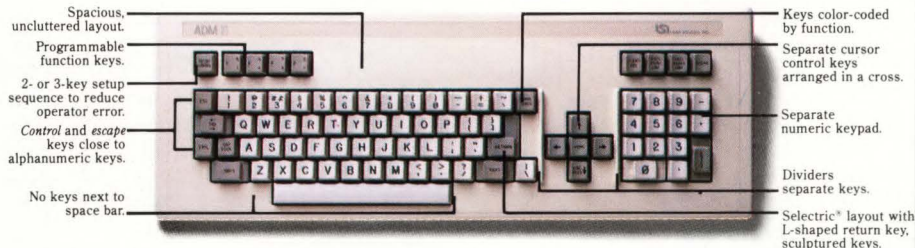
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	ADM 11	ADM 12	ADM 24E
	Conversational	Editing	Host Programmable
Programmable Function Keys	4 (Shiftable to 8)	16 (Shiftable to 32)	16 (Shiftable to 32)
Non-Volatile Function Keys	Optional	Standard	Standard
Function Key Legends on 25th Line	From Host	From Host	Standard Non-Volatile
No. of Pages of Display Memory	1	2	4
Display Memory Configurations (Plus 25th Message/Status Line)	24 Lines by 80 Characters	(2) 24 x 80 or (1) 48 x 80 or (1) 24 x 158	User Definable up to 96 x 80
Scrolling	Standard Scrolling	Smooth, Jump or Horizontal Scrolling Split Screen	Smooth or Jump Scroll Split Screen
Transmission Mode	Conversation Mode	Conversation or Block Mode	Conversation or Block Mode
Editing	Limited	Full Editing & Protected Fields	Full Editing & Protected Fields
Visual Attributes: Reduced Intensity, Blink, Blank and Reverse Video. Underline also on ADM 12 and ADM 24E	3 Embedded 1 Non-Embedded	4 Embedded, 1 Non-Embedded or All Non-Embedded, plus Full Screen Reverse Video	5 Embedded, 1 Non-Embedded or All Non-Embedded, plus Full Screen Reverse Video and Highlight
OEM Flexibility	Modifiable Set-Up Characteristics	Modifiable Set-Up Characteristics & Personality	Modifiable Set-Up Characteristics. Add to Program in ROM or Down-Line Load in RAM (56K ROM or RAM. Up to 22K Display Available) Room for additional Logic Boards.
Terminal Compatibility	ADM 3A, ADM 5, ADDS Viewpoint & Regent 25, Hazeltine 1400, 1420 & 1500, also available.	ADM 3A, ADM 5, ADM 31, ADM 32	ADM 3A, ADM 5, ADM 31, ADM 32, ADM 42

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LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

901 E. Ball Road, Anaheim, CA 92805 (714) 774-1010

Manufacturer Model number	Human Designed Syst. Concept GVT ⁺	Human Designed Syst. Concept AVT ⁺	IBM 3101-10	IBM 3101-20	ICOT Model 700*—Opt.	ICOT Model 701*—Opt.
1. No. of Display Charac.	2,000	2,000	128	128	2,000	3,564
2. Displayable Charac. Set	UL, LWD	UL, LWD	U, LWD	U, LWD	UL, LWD	UL, LWD
3. Display Format	80x25	80x25	80x24	80x24	80x25	45x14, 64x16, 64x31, 80x13 80x25, 80x33 80x44, 132x28
4. Charac. Format	10x12	10x12	7x9	7x9	N/A	N/A
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	No	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	No	No	Yes	Yes
9. Blinking	Yes	Yes	No	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	No	No	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, BL	B, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	Yes	No	No
14. Full Vector Graphics	Yes	No	No	No	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	No	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	No	No
18. Paging	4, 8	4, 8	No	No	No	No
19. Split-screen Format	Yes	Yes	No	Yes	No	No
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, AM, WH	GR, AM, WH	GR	GR	GR	GR
22. Size of Screen	12	12	12	12	12	14
23. Sm. Vert. Scroll / Horiz. Scroll	No	No	No	No	Yes	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	Yes	Yes	No	No	No	No
27. ANSI x 3.64 Standard	Yes	Yes	No	No	Yes	Yes
28. Layout	TYP	TYP	TYP	TYP	IBM	IBM
29. No. of Keys	101	101	87	87	87	87
30. Numeric Cluster Pad	12	12	Yes	Yes	12	12
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	A=14, P=4,6	A=14, P=4,6	A=8	A=8	A=24, K=24, P=24	A=24, K=24, P=24
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	No	No
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	No	No
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	No	F, B	F, B, A	F, B, A
43. Tabbing	80 or 132	80 or 132	80	80	Infinite	Infinite
44. Key Rollover	N-Key	N-Key	No	No	9	9
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	N/A	N/A
46. Buff. Printer Interface	No	No	No	No	Yes	Yes
47. 20 mA Current Lp. / RS 422	Opt.	Opt.	Yes	Yes	Yes	Yes
48. Trans. Rate / Baud	50/9,600	50/9,600	110/9,600	110/9,600	75/19,200	75/19,200
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	Yes	N/A	N/A
50. Block Transfer	L, P, MSG, UN	L, P, MSG, UN	No	L, P, UN	No	No
51. Cpu Control of Block / Charac.	Yes	Yes	No	Yes	No	No
52. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes
53. Polling / Addressing	No	No	No	No	No	No
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	No	No	Yes	Yes
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	No	No	No	No	No	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	4	4	No	No	Programmable	Programmable
60. Local Mode	Yes	Yes	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	Opt.	Opt.	No	No	No	No
63. Screen Tilt / Swivel	Yes	Yes	Yes/No	Yes/No	No	No
64. Maximum Power	40	90/35	110/220	110/220	65	65

Manufacturer Model number	Informer 304	Informer 401	ITT Courier 1700-21/22	ITT Courier 2700-13	Lear Siegler ADM 11	Lear Siegler ADM 220
1. No. of Display Charac.	128	128	1,920	1,920	128	255
2. Displayable Charac. Set	U, LWD	U, LWD	UL	UL, LWD	U, LWD	U, LWD
3. Display Format	80x24, 64x16 40x13, 32x16	80x24	80x24	80x24	80x24	80/132x24
4. Charac. Format	7x9	7x9	7x8	7x9	7x10	7x10 or 5x9
5. Rev. Video-Screen Format	Yes	Yes	No	No	No	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	No	Yes
7. Protected Format	Yes	Yes	Yes	Yes	No	No
8. Rev. Video Fields	Yes	Yes	No	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	No	Yes	No	No	Yes	Yes
11. Cursor Style	B, BL Opt.	B, BL Opt.	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	No	Yes/Opt.	No	No	Yes	Yes
14. Full Vector Graphics	No	No	No	No	No	No
15. Status Line	No	No	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	No
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	1, 2, 4	2	No	Yes	1	1—Add'l. 3 Opt.
19. Split-screen Format	No	No	No	No	No	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	WH, GR Opt.	WH, GR Opt.	GR/AM	GR	GR, AM	GR, AM
22. Size of Screen	6, 9, 12	9	12	15	12 or 14	12 or 14
23. Sm. Vert. Scroll / Horiz. Scroll	No	No	No	No	No	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes/No	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No	No	No/Yes	Yes	Opt.	No/Yes
27. ANSI x 3.64 Standard	No	No	Yes	Yes	No	Yes
28. Layout	TYP	TYP	IBM	IBM, TYP	TYP	TYP
29. No. of Keys	96	73	92/111	111	85	105
30. Numeric Cluster Pad	12	N/A	18	12	14	14
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes-Opt.	No	Yes	Yes	Yes	Yes
33. General Function Keys	P=28	P=8	P, F=24	P, F=24	P=8—Add'l. 4 Opt.	K=21, P=30
34. Shift Rev. / Alpha Lock	No	No	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	No	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	No	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	No	F, B
43. Tabbing	16	16	Yes	Yes	No	Programmable
44. Key Rollover	2	2	N Key	Yes	3	N-Key
45. Ext. RS 232 / On-Off Control	Yes	Yes	No	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	Yes	Yes	Yes
47. 20 mA Current Lp. / RS 422	Yes	No	No	No	Yes-Opt.	Yes-Opt.
48. Trans. Rate / Baud	50/19.2k	50/19.2k	19.2Kb max.	19.2Kb	300/19,200	75/38,400
49. Charac. Transfer, TTY Mode	Yes	Yes	No	Yes	Yes	Yes
50. Block Transfer	L, P, UN	L, P, UN	P	P	N/A	N/A
51. Cpu Control of Block / Charac.	No	No	N/A	N/A	No	No
52. Selectable Parity	Yes	Yes	No	No	Yes	Yes
53. Polling / Addressing	0	No	0	I	No	No
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	No	No	Yes/No	Yes
56. Built-in Modem	No	Yes	No	No	No	No
57. Data Compression	No	No	No	No	N/A	N/A
58. Self Test	No	No	Yes	Yes	Yes	Yes
59. Status Indicators	Yes	No	Yes	Yes	No	4
60. Local Mode	No	No	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	No	Yes	Yes	Yes	Yes
62. Composite Video Output	Yes	Yes	No	Yes	No	No
63. Screen Tilt / Swivel	Yes	Yes	Yes	No	Yes	Yes
64. Maximum Power	110/220	110/220	40	130	50	65

Manufacturer Model number	Lee Data 1216	Lee Data 1221	Liberty Electronics Freedom 110	Liberty Electronics Freedom 200	MDS Qantel 4032	MDS Qantel 4041
1. No. of Display Charac.	1,920	1,920, 2,560, 3,440, 3,564	128	128	1,728, 2,000	1,728, 2,000, 2,400
2. Displayable Charac. Set	U, UL, LWD	U, UL, LWD	U, LWD	U, LWD	UL, LWD	UL, LWD
3. Display Format	80x24	80x24, 132x27	80x24	80x24	27x64, 25x80	27x64, 25x80, 96x25
4. Charac. Format	7x9	7x9	7x9	7x9 DH/DW, SH/DW	7x9	7x9
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, BL	B, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes/No	Yes/No
13. LD Set, Charac. Graphics	Yes/No	Yes/No	15 Charac.	86 Charac.	No	No
14. Full Vector Graphics	No	No	No	No	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes 2, Opt. 4	No	No
18. Paging	No	N/A	1	Yes	1	1
19. Split-screen Format	No	Yes	No	Yes	No	No
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR	GR	GR, AM Opt.	GR, AM Opt.	GR	GR
22. Size of Screen	14	15	12	12	12	12
23. Sm. Vert. Scroll / Horiz. Scroll	No	No	No	4 Sm. Scroll Speeds	No	No
24. Bright Controls / Cont.	Yes	Yes	Yes/No	Yes/No	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	No	No
26. APL / Foreign Charac. Sets	Yes	Yes	No/Yes	No/Yes	No/Yes	No/Yes
27. ANSI x 3.64 Standard	Yes	Yes	No	No	Yes	Yes
28. Layout	TYP, TTY, IBM, O	TYP, TTY, IBM, O	TYP	TYP	TYP	TYP
29. No. of Keys	87	124 or 122	94	106	72	104
30. Numeric Cluster Pad	12	20	18	15	11	11
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	No	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	A=12, K=12	K=24, P=24	P Nonvolatile	P Nonvolatile	K=2, P=2	P=5, K=29
34. Shift Rev. / Alpha Lock	No	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	No	No
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	No	No
39. Clear	S, UP	S, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	No	No
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B	F, B	F, B, A	F, B, A
43. Tabbing	Programmable	Programmable	80	80	Unltd.	Unltd.
44. Key Rollover	N Key	N Key	N Key	N Key	2	2
45. Ext. RS 232 / On-Off Control	No	No	Yes	Yes	Yes/No	Yes/No
46. Buff. Printer Interface	Yes	Yes	Yes	Yes	No	No
47. 20 mA Current Lp. / RS 422	N/A	N/A	Yes/No	Yes/No	No	No
48. Trans. Rate / Baud	2,000/19,200 300/9,600	2,000/19,200 300/9,600	110/19,200	50/19,200	300/19,200	300/19,200
49. Charac. Transfer, TTY Mode	Yes	Yes	N/A	N/A	No	No
50. Block Transfer	L, P, UN	L, P, UN	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN
51. Cpu Control of Block / Charac.	Yes	Yes	Yes	Yes	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	Yes	No	No
53. Polling / Addressing	IBM	IBM	No	No	No	No
54. Emulations	Yes	Yes	Yes	Yes	No	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes	Yes/No	Yes/No
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	Yes	Yes	No	No	Yes	Yes
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	Depends upon mode	Depends upon mode	1	2	No	No
60. Local Mode	Yes	Yes	No	No	No	No
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	Yes	Yes	Yes	Yes	No	No
63. Screen Tilt / Swivel	Yes	Yes	Yes	Yes	Yes	Yes
64. Maximum Power	90	90	70	70	N/A	N/A



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Manufacturer Model number	Megadata 8188-3*	Megadata 8188-2	Memorex 2079*	Memorex 2051*	Micro-Term TWIST	Micro-Term ERGO-301
1. No. of Display Charac.	256	256	1,920, 2,560	1,920	256	256
2. Displayable Charac. Set	U, UL, LWD	U, UL, LWD	UL	N/A	U, UL, LWD	U, UL, LWD
3. Display Format	80x25 or 133x32	80x29 or 132x29	24x80, 32x80	24x80	80x25 80x72	25x80 25x132
4. Charac. Format	9x14	10x12	9x12	8x16 DM	29x16 7x10 DW/H	7x9 DW/H
5. Rev. Video-Screen Format	Yes	Yes	No	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL	B, UL, BL	B, UL, B
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	No	Yes	Yes
14. Full Vector Graphics	Opt.	No	Yes	No	No	Yes/Opt.
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	No
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	Depends upon operating mode	15	No	No	3	2
19. Split-screen Format	Yes	No	N/A	No	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, AM, O	GR, AM, O	GR	AM, GR	AM, WH	GR, AM
22. Size of Screen	15	15	13	15	15	12
23. Sm. Vert. Scroll / Horiz. Scroll	Yes/No	Yes	N/A	Yes	Yes	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	Yes	Yes	Yes	No/Yes	Yes	Opt.
27. ANSI x 3.64 Standard	Yes	Yes	Yes	N/A	Yes	Yes
28. Layout	TYP	TYP	TYP, IBM	TYP	TYP	TYP
29. No. of Keys	149	155 max.	75, 87	83	135	128
30. Numeric Cluster Pad	15	15	10	10	14	13
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	4	4
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	K=30, P=21	P=32	P=12	PF 24	A=10, K=8, P=30	A=4, K=4, P=4
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	No	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	Yes	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B	F, B	F, B, A	F, B	F, B, A	F, B, A
43. Tabbing	80 or 133	1,024	24, 32	Yes	N/A	N/A
44. Key Rollover	N	N	3	Yes	N/A	N/A
45. Ext. RS 232 / On-Off Control	Yes	Yes	No	No	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	No	No	Yes	Yes
47. 20 mA Current Lp. / RS 422	No/Yes	No	No	No	Yes	Yes
48. Trans. Rate / Baud	50/19,200	75/38,400	N/A	N/A	75/19.2k	75/19.2k
49. Charac. Transfer, TTY Mode	Yes	Yes	No	N/A	TTY	TTY
50. Block Transfer	L, P, MSG, UN	L, P, MSG, UN	No	N/A	L, P, MSG, UN	L, P, MSG, UN
51. Cpu Control of Block / Charac.	N/A	N/A	Yes	N/A	Yes	Yes
52. Selectable Parity	Yes	Yes	No	N/A	Yes	Yes
53. Polling / Addressing	I, U	No	I	I	0	0
54. Emulations	Yes	Yes	Yes	N/A	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	No	N/A	Yes	Yes
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	Yes	Yes	No	No	No	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	8	12	2	4	5	5
60. Local Mode	Yes	Yes	No	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	Yes	No	Yes	No	Yes
63. Screen Tilt / Swivel	Yes	Yes	Yes/No	Yes/No	Yes	Yes
64. Maximum Power	95	70	230	N/A	75	35

Manufacturer Model number	Northern Telecom Display Phone 1000	Perkin-Elmer 6100	Perkin-Elmer 6300	Phaze Information Machines P3278	Phaze Information Machines Gemini 3270	Plessey PT-100B
1. No. of Display Charac.	160	1,920	1,920	1,920	1,920	1,920 or 3,168
2. Displayable Charac. Set	U, LWD	UL, LWD	Not Avail.	UL	UL	UL, LWD
3. Display Format	80x24	24x80	24x80	80x24	80x24	80/132x24
4. Charac. Format	5x7	7x40	7x11	DW/H, 9x15	DW/H, Bus. Comp. 9x14; P3278, 9x15	7x9, DW/H
5. Rev. Video-Screen Format	No	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	No	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	No
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	No	No	Yes	Yes	Yes
11. Cursor Style	UL, BL	B, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	No	No	Yes
14. Full Vector Graphics	No	No	No	No	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	No	Yes	Yes	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	No	Yes	Yes	Yes	Yes	Yes
18. Paging	Yes	No	No	No	No	1
19. Split-screen Format	No	No	No	No	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	WH	GR, AM	GR, AM	GR	GR	GR, WH, AM
22. Size of Screen	7	12	15	12	12	12
23. Sm. Vert. Scroll / Horiz. Scroll	Yes/No	No	No	Yes	Yes	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No	No/Yes	No/Yes	Yes	Yes	Opt.
27. ANSI x 3.64 Standard	Yes	Yes	Yes	Yes	Yes	Yes
28. Layout	TYP	TTY	TTY	TYP, IBM, O	TYP, IBM, O	TYP
29. No. of Keys	55	84	106	87	87	85
30. Numeric Cluster Pad	12	14	18	12	12	18
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	No	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	P	A, P=4/8	A 16/32, P=16/32	A=34, K=87	A=30, K=87	A=22, K=22
34. Shift Rev. / Alpha Lock	Yes/No	No/Yes	No/Yes	Yes	Yes	Yes
35. Charac. Repeat	A	K, A	K, A	A	A	K, A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	256	Yes
39. Clear	EL, ES	S, EL, ES	S, EL, ES, UP	Yes	Yes	S, EL, ES
40. Insert / Delete Charac.	No	No	Yes	Yes	Yes	Yes
41. Insert / Delete Line	No	No	Yes	No	Yes	Yes
42. Tab to Unprotect. Flds.	No	No	F, B	Yes	Yes	F, B, A
43. Tabbing	No	No	Yes	Yes	Yes	Unltd.
44. Key Rollover	2	3	Yes	16	16	3
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	No	No	Yes	No	No	Yes
47. 20 mA Current Lp. / RS 422	No	Yes	Yes/No	No	No	Opt./No
48. Trans. Rate / Baud	300/1,200	300/19,200	110/9,600	Defined by IBM 3270 Network	Defined by IBM 3270 Network	50/19,200
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	N/A	N/A	No
50. Block Transfer	No	No	L, P, MSG, UN	L, P, MSG, UN	L, P, MSG, UN	No
51. Cpu Control of Block / Charac.	No	No	Yes	No	Yes	No
52. Selectable Parity	Yes	Yes	Yes	No	Yes	Yes
53. Polling / Addressing	No	No	Yes	No	No	No
54. Emulations	Yes	No	No	Yes	Yes	Yes
55. X-on / X-off on MP / PP	No	Busy	Yes	No	Yes	Yes
56. Built-in Modem	Yes	No	No	No	No	No
57. Data Compression	No	No	No	No	Yes	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	No	Yes	Yes	Yes	Yes	7
60. Local Mode	Yes	Yes	Yes	N/A	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	Yes	No	No	No	No	Yes
63. Screen Tilt / Swivel	No	Yes	Yes	Yes	Yes	No
64. Maximum Power	110	70	175	90	90	50

Manufacturer Model number	Qume QVT-108	Qume QVT-103	Raytheon Data Syst. R4078	Raytheon Data Syst. F8350	Racal Milgo 8015*	Racal Milgo 8220*
1. No. of Display Charac.	1,920	1,920, 3,168	3,564	2,320	1,920	1,920
2. Displayable Charac. Set	UL, LWD	UL, LWD	UL	UL	U, UL, LWD	U, UL, LWD
3. Display Format	24x80	24x80/132	132x27	80x29	80x24	80x24
4. Charac. Format	7x9 in 9x12 cell	7x9 in 10x12 cell, DW/H	7x8	9x12	7x9	7x9
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	No	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B	B
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	15	15	No	Yes	No	No
14. Full Vector Graphics	No	No	N/A	N/A	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	No	No	N/A	N/A	Yes	No
18. Paging	2	2/4	No	Yes	1	1
19. Split-screen Format	No	Yes	Yes	Yes	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR, AM	GR, AM	GR	GR	GR	GR
22. Size of Screen	14	14	15	12	15	15
23. Sm. Vert. Scroll / Horiz. Scroll	No	Yes	Yes	Yes	Yes	Yes
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	N/A	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	Yes	Yes	Yes	N/A	No	No
27. ANSI x 3.64 Standard	No	Yes	Yes	Yes	Yes	Yes
28. Layout	TYP	TYP	TYP, TTY, IBM, O	TYP, TTY, IBM, O	TYP	TYP
29. No. of Keys	103	103	87 or 108	92	113	113
30. Numeric Cluster Pad	14	14	10	10	15	15
31. Cursor-Control Keys	4	4	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	11 (22 user progr. functs.)	12 user progr. functs.	P=24	P=10	P=6	K=22
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	Yes	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	96+32	96+32	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	N/A	N/A	S, EL, ES, UP	S, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A
43. Tabbing	9	9	Programmable	Programmable	Unltd.	Unltd.
44. Key Rollover	3	3	N	N	8	24, 48
45. Ext. RS 232 / On-Off Control	Yes	Yes	No	No	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	No	No	Yes	Yes
47. 20 mA Current Lp. / RS 422	Yes/No	Yes/No	No	No	No	No
48. Trans. Rate / Baud	50/19.2k	50/19.2K	9,600/19,200	9,600/19,200	110/9,600	110/9,600
49. Charac. Transfer, TTY Mode	9,600 Baud	9,600 Baud	N/A	N/A	Yes	Yes
50. Block Transfer	L, P	L, P	L, P, UN	L, P, UN	L, P, MSG, UN	L, P, MSG, UN
51. Cpu Control of Block / Charac.	Yes	Yes	Yes	Yes	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	No	Yes	Yes
53. Polling / Addressing	0	0	IBM	IBM	0	U
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	N/A	N/A	Yes/No	No
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	No	Yes	Yes	Yes	No	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	34 Fields 5 Lines	64 Fields 10 Lines	Yes	Yes	1	1
60. Local Mode	Yes	Yes	Yes	No	Yes	No
61. Audible Alarm	Yes	Yes	No	No	Yes	Yes
62. Composite Video Output	No	No	Yes	Yes	No	No
63. Screen Tilt / Swivel	Yes	Yes	Yes	Yes	Yes	Yes
64. Maximum Power	30	30	120	120	65	65

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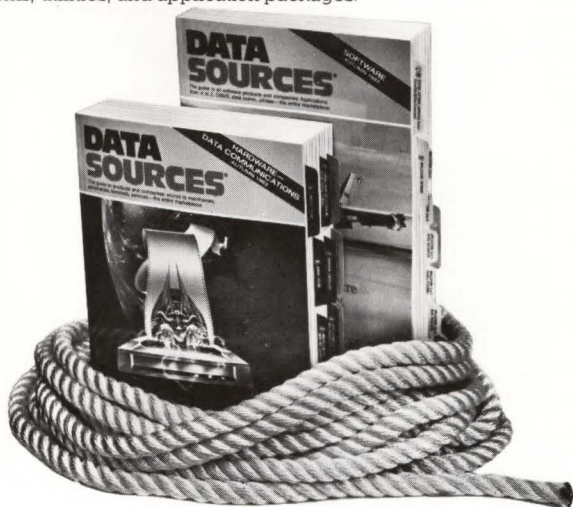
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Manufacturer Model number	Soroc C 530	TAB Products 132/15	TAB Products 132/15G	Tandberg Data TDV 2220 S	Tandberg Data TDV 2237 S	TEC ET 80B
1. No. of Display Charac.	2,000	3,168	3,168	1,024	1,024	1,920
2. Displayable Charac. Set	U, UL, LWD	UL, LWD	UL, LWD	U, LWD	UL, LWD	UL, LWD
3. Display Format	80x25	24x80, 24x132	24x80, 24x132	80x25	80x24	24x80
4. Charac. Format	8x10	7x11 DH, DW, DW/H	7x11 DW, DW/H	9x14	9x14	7x11 DW/DH, OW/H
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	Yes	Yes	Yes
14. Full Vector Graphics	No	Opt.	Yes	Opt.	Opt.	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	No	N/A	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	No	4	4	8	2	5
19. Split-screen Format	No	Yes	Yes	No	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR	GR, WH	GR, WH	GR, WH	GR, WH	0
22. Size of Screen	12	15	15	15	15	15
23. Sm. Vert. Scroll / Horiz. Scroll	Yes	Yes	Yes	Yes/No	Yes/No	Yes/No
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	Yes	No/Yes	Yes	No/Yes	No/Yes	No/Yes
27. ANSI x 3.64 Standard	Yes	Yes	Yes	Yes	No	Yes
28. Layout	IBM	TYP	TYP	TYP	TYP	TYP
29. No. of Keys	77	92	92	111	108	123
30. Numeric Cluster Pad	14	14	14	14	14	22
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	N/A	8=GP, 18=A, 22=PF	8=GP, 18=A, 22=PF	P=16, K=23	P=16, K=30	P=16
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	No/Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A
43. Tabbing	80	132 Max.	132 Max.	80 Max.	80 Max.	80/132
44. Key Rollover	4	N Key	N Key	N	N	N
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Opt.	Opt.	Yes	Yes	Yes
47. 20 mA Current Lp. / RS 422	Yes/Yes	Opt./No	Opt./No	Yes	Yes	Opt./No
48. Trans. Rate / Baud	45.5/38,400	50/19	50/19,200	50/19,200	50/19,200	50/19,200
49. Charac. Transfer, TTY Mode	Yes	TTY	TTY	Yes	No	Yes
50. Block Transfer	L, P, MSG, UN	L, P, UN	L, P, UN	L, P, MSG, UN	L, P	L, P, UN
51. Cpu Control of Block / Charac.	Yes	FF	FF	Yes	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes
53. Polling / Addressing	N/A	N/A	N/A	N/A	N/A	No
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes	Yes	Yes
56. Built-in Modem	Opt.	Opt.	Opt.	Opt.	Opt.	No
57. Data Compression	No	Yes	Yes	Yes	Yes	No
58. Self Test	No	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	Yes	Yes	Yes	9	Yes	4
60. Local Mode	Yes	Yes	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	Opt.	Opt.	Opt.	Yes	Yes	No
63. Screen Tilt / Swivel	No	Yes/No	Yes/No	Yes	Yes	Yes
64. Maximum Power	120	90	100	50	50	65

Manufacturer Model number	TEC ET 100B	Teleray 7 Series	Teleray 16 Series	Televideo 925	Televideo 924	Telex 278*
1. No. of Display Charac.	1,920	256	256	128	128	1,920
2. Displayable Charac. Set	UL, LWD	LWD	LWD	UL, LWD	UL, LWD	UL
3. Display Format	24x80	24x80	24x80	24x80	80x24	80x24
4. Charac. Format	7x11 DW/DH, DW/H	8x10	8x10	7x8	7x8	9x14
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	No
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	No
9. Blinking	Yes	Yes	Yes	Yes	Yes	No
10. Charac. Underlining	Yes	Yes	Yes	Yes	Yes	No
11. Cursor Style	B, UL, BL	BL	BL	B, UL, BL	B, UL, BL	B
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	No	64	No
14. Full Vector Graphics	No	No	No	No	Opt.	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	Yes	Yes	Yes	Yes	Yes	No
18. Paging	3	2	4	1	1	No
19. Split-screen Format	Yes	Yes	Yes	No	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	0	GR, WH, AM	GR, WH, AM	GR	GR	GR
22. Size of Screen	15	9, 12, 15	9, 12, 15	12	12	14
23. Sm. Vert. Scroll / Horiz. Scroll	Yes/No	Yes	Yes	No/No	Yes/No	No
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	No/Yes	No/Opt.	Opt.	No/Yes	No/Yes	Yes
27. ANSI x 3.64 Standard	Yes	Yes	Yes	No	No	No
28. Layout	TYP	TYP	TYP	TYP	TYP	TYP
29. No. of Keys	123	93	93	101	111	N/A
30. Numeric Cluster Pad	21	18	18	14	17	11
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	P=16	A=64, P=10	A=64, P=10	A=1, K=11/22	A=1, P=16/32	N/A
34. Shift Rev. / Alpha Lock	No/Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes/Yes	Yes/Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes/Yes	Yes/Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A	F, B, A
43. Tabbing	80/132	255 Max.	255 Max.	Typewriter & Field	Typewriter, Field	Programmable
44. Key Rollover	N	N Key	N Key	2	2	N/A
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes/Yes	Yes/Yes	No
46. Buff. Printer Interface	Yes	Yes	Yes	No	Yes	No
47. 20 mA Current Lp. / RS 422	Opt./No	Opt.	Opt.	Opt./No	Opt./Opt.	No
48. Trans. Rate / Baud	50/19,200	50/19,200	50/19,200	50/19,200	150b/19,200	N/A
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	Yes	Yes	N/A
50. Block Transfer	L, P, UN	L, P, MSG, UN	L, P, MSG, UN	P, MSG, UP	P, MSG, UN	N/A
51. Cpu Control of Block / Charac.	Yes	Yes	Yes	Yes/Yes	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	Yes	Yes	No
53. Polling / Addressing	No	No	No	No	No	No
54. Emulations	Yes	Yes	No	Yes	No	Yes
55. X-on / X-off on MP / PP	Yes	Yes	Yes	Yes/Yes	Yes/Yes	No
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	No	Yes	Yes	Yes	Yes	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	4	7	7	Yes	Yes	N/A
60. Local Mode	Yes	Yes	Yes	Yes	Yes	N/A
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	Opt.	Opt.	Yes	Yes	No
63. Screen Tilt / Swivel	Yes/Yes	Opt.	Opt.	Yes/No	Yes/Yes	Yes/No
64. Maximum Power	65	35	40	55	N/A	N/A

Manufacturer Model number	Telex 279*	Thomas Engineering TE-780xV	Thomas Engineering TE-780xA and S	Visual Tech. V102	Visual Tech. V300	Wicat T7000
1. No. of Display Charac.	1,920	2,000	2,000	1,920, 3,168	1,920	1,920
2. Displayable Charac. Set	UL	LWD	LWD	UL	UL, LWD	LCD
3. Display Format	80x24	80x25	80x25	24x80/132	80x24	80x24
4. Charac. Format	9x14	9x12	9x12	7x11	7x11	7x9
5. Rev. Video-Screen Format	No	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	Yes	Yes	Yes
7. Protected Format	Yes	Yes	Yes	No	Yes	Yes
8. Rev. Video Fields	No	Yes	Yes	Yes	Yes	Yes
9. Blinking	No	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	No	Yes	Yes	Yes	Yes	Yes
11. Cursor Style	B	B, BBL, UL, ULBL	B, BBL, UL, ULBL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes	Yes	Yes	Yes	Yes	Yes/No
13. LD Set, Charac. Graphics	No	Yes	Yes	Yes	Yes	Yes
14. Full Vector Graphics	No	No	No	Opt.	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	Yes	Yes	Yes	Yes
17. Display of Control Charac. / Prog. Mode	No	Yes	Yes	Yes	Yes	No
18. Paging	No	No	No	1	8	2
19. Split-screen Format	Yes	No	No	Yes	Yes	Yes
20. Non-glare Screen	Yes	Yes	Yes	Yes	Yes	No
21. Display Color	GR, 0	GR	GR	GR	GR, WH	GR
22. Size of Screen	14	14	14	14	1	12
23. Sm. Vert. Scroll / Horiz. Scroll	No	Yes	No	Yes	Yes	No
24. Bright Controls / Cont.	Yes	Yes	Yes	Yes	Yes	Yes
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	Yes	Opt.	No	No/Yes	No/Yes	Opt.
27. ANSI x 3.64 Standard	No	Yes	No	Yes	Yes	Yes
28. Layout	TYP	0	0	TYP	TYP	0 (VT100)
29. No. of Keys	N/A	95	95	93	95	62
30. Numeric Cluster Pad	11	14	14	18	14	18
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	Yes	Yes	Yes
33. General Function Keys	N/A	A=12, P=12, K=12	A=12, P=12, K=12	A=18, P=8	P=12	K=4
34. Shift Rev. / Alpha Lock	Yes	Yes	Yes	Yes	Yes	No/Yes
35. Charac. Repeat	A	A	A	A	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	Yes	Yes	Yes
39. Clear	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES, UP	S, EL, ES	S, EL, ES, UP	N/A
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F, B, A	F, B, A	F, B, A	F	F, B, A	F
43. Tabbing	Programmable	80	80	80	80	80
44. Key Rollover	N/A	N	N	N Key	N Key	2
45. Ext. RS 232 / On-Off Control	No	Yes	Yes	Yes	Not Avail.	Yes
46. Buff. Printer Interface	No	Yes	Yes	Yes	Opt.	Yes
47. 20 mA Current Lp. / RS 422	No	Yes/No	No/Yes	No	Yes	Yes/No
48. Trans. Rate / Baud	N/A	50/19,200	50/19,200	50/19,200	50/19,200	50/19,200
49. Charac. Transfer, TTY Mode	N/A	Yes	Yes	Yes	Yes	Yes
50. Block Transfer	N/A	L, P, MSG, UN	L, P, MSG, UN	L, P	L, P, UN	P
51. Cpu Control of Block / Charac.	Yes	Yes	Yes	Yes	Yes	No
52. Selectable Parity	No	Yes	Yes	Yes	Yes	Yes
53. Polling / Addressing	No	No	No	N/A	N/A	No
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	No	No	No	Yes	Yes	No
56. Built-in Modem	No	No	No	No	No	No
57. Data Compression	No	Yes	Yes	N/A	N/A	No
58. Self Test	Yes	Yes	Yes	Yes	Yes	No
59. Status Indicators	N/A	N/A	N/A	8	N/A	26
60. Local Mode	N/A	Yes	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	No	No	Yes	No	No
63. Screen Tilt / Swivel	Yes/No	Yes	Yes	Yes	Yes	Yes
64. Maximum Power	N/A	1	1	100	100	30

Manufacturer Model number	Wicat MG8000	Wyse Tech. WY 50	Wyse Tech. WY 75	Zenith Z-19	Zenith Z-29	Zentec 1021/1021A	Zentec 1051
1. No. of Display Charac.	1,920	128	128	80	80	128	128
2. Displayable Charac. Set	LCD	U, UL, LWD	U, UL, LWD	UL, LWD	UL, LWD	LWD	LWD
3. Display Format	80x24	80/132x26	80/132x26	80x25	80x25	80x25	80/132x25
4. Charac. Format	7x9	10x13	10x13	8x10	8x10	7x9, 10x12	7x9, 5x9 DW/H
5. Rev. Video-Screen Format	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Dual Intensity	Yes	Yes	Yes	No	No	Yes	Yes
7. Protected Format	Yes	Yes	No	No	Yes	Yes	Yes
8. Rev. Video Fields	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Blinking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Charac. Underlining	Yes	Yes	Yes	No	Yes	Yes	Yes
11. Cursor Style	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL	B, UL, BL
12. Addressable / Readable Cursor	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes
13. LD Set, Charac. Graphics	Yes	Yes	Yes	Yes	Yes	32	256
14. Full Vector Graphics	No	No	No	No	No	No	No
15. Status Line	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16. Security Blank Field	Yes	Yes	No	No	No	No	Yes
17. Display of Control Charac. / Prog. Mode	No	Yes	Yes	Yes	Yes	Yes	Yes
18. Paging	No	1	1	No	No	1	4
19. Split-screen Format	Yes	Yes	Yes	No	Yes	No	Yes
20. Non-glare Screen	No	Yes	Yes	Yes	Yes	Yes	Yes
21. Display Color	GR	GR	GR	GR, WH	GR, WH	GR	GR, AM
22. Size of Screen	12	14	14	12	12	12	12
23. Sm. Vert. Scroll / Horiz. Scroll	No	Yes/No	Yes/No	No	No	No	Yes
24. Bright Controls / Cont.	Yes	No/Yes	No/Yes	Yes	Yes	No	No
25. Cursor Wraparound / Scrolling	Yes	Yes	Yes	Yes	Yes	Yes	Yes
26. APL / Foreign Charac. Sets	Opt.	No	No	No/Yes	No	No	Downloadable
27. ANSI x 3.64 Standard	Yes	No	Yes	Yes	Yes	1021A	Yes
28. Layout	0 (VT100)	TYP	TYP	TYP	TYP	TYP	TYP
29. No. of Keys	62	101	101	72	91	91	103
30. Numeric Cluster Pad	18	14	14	14	14	18	26
31. Cursor-Control Keys	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Detachable Keyboard	Yes	Yes	Yes	No	Yes	Yes	Yes
33. General Function Keys	K=4	P=16	P=16	A=8	A	P=4	P=16
34. Shift Rev. / Alpha Lock	No/Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Charac. Repeat	A	A	A	K	K	A	A
36. Escape Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
37. Break Key or Equiv.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38. Gen. 128 ASCII Charac.	Yes	Yes	Yes	No	Yes	Yes	Yes
39. Clear	N/A	S, EL, ES	S, EL, ES, UP	S, EL, ES	S, EL, ES	S, EL, ES	S, EL, ES, UP
40. Insert / Delete Charac.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Insert / Delete Line	Yes	Yes	Yes	Yes	Yes	Yes	Yes
42. Tab to Unprotect. Flds.	F	F, B	No	F, B	F, B	F, B	F, B
43. Tabbing	80	18	No	8	8	10	10
44. Key Rollover	2	N Key	N Key	N/A	N/A	3	N Key
45. Ext. RS 232 / On-Off Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
46. Buff. Printer Interface	Yes	Yes	Yes	Yes	Yes	No	No
47. 20 mA Current Lp. / RS 422	Yes/No	No	No	No	No	Yes/No	No/Yes
48. Trans. Rate / Baud	50/19,200	110/38,400	110/38,400	75/19,200	110/9,600	50/19,200	110/19,200
49. Charac. Transfer, TTY Mode	Yes	Yes	Yes	Yes	Yes	Yes	Yes
50. Block Transfer	P	L, P, MSG, UN	No	L, P, UN	L, P	L, P	L, P
51. Cpu Control of Block / Charac.	No	No	No	Yes	Yes	Yes	Yes
52. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
53. Polling / Addressing	No	No	No	No	No	No	No
54. Emulations	Yes	Yes	Yes	Yes	Yes	Yes	Yes
55. X-on / X-off on MP / PP	No	Yes/No	Yes/No	Yes/No	Yes	Yes	Yes
56. Built-in Modem	No	No	No	No	No	No	No
57. Data Compression	No	No	No	No	No	No	No
58. Self Test	No	Yes	Yes	Yes	Yes	Yes	Yes
59. Status Indicators	26	4	4	4	No	7	10
60. Local Mode	Yes	Yes	Yes	Yes	Yes	Yes	Yes
61. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
62. Composite Video Output	No	No	No	No	No	No	No
63. Screen Tilt / Swivel	Yes	Yes	Yes	Yes	Yes	Yes	Yes
64. Maximum Power	50	50	50	45	45	35	35

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