Modular supermicrocomputer expands with user needs

Utility software: Development tools grow up
Disk emulators speed system performance
Introducing Model 6500 —

'the handful'

Kennedy’s Model 6500 5¼” Cartridge Recorder — it fits in your hand, but it’s more than a handful of new and unique features, such as:

• 16 KBYTE Buffer — Model 6500 can transfer data at a burst rate of up to 3 MBYTE/sec., and maintain streaming longer in systems with little buffering.
• 150 MS Ramp Time — Data access time and reposition time is cut in half; and it can better operate in a Pseudo s/s mode.

• Direct Drive Motor — Assures much higher reliability and lower I.S.V.

Finally, and best of all, Model 6500 features a simple mechanical design — loading is simple, moving the tape to the head instead of the head to the tape.

Model 6500 is one big handful of what you’ve been looking for in a 5¼” cartridge recorder. Write or call us.

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CIRCLE NO. 1 ON INQUIRY CARD

KENNEDY • QUALITY • COUNT ON IT
The most effective communications medium ever devised is still the human voice.

But now, technology makes voice go farther, faster, more efficiently—with the new VoiceServer™ from DSC.

VoiceServer is the low-cost OEM integration solution for digital voice processing and storage. From a stand-alone voice store and forward “mailbox” for any PBX—to applications like text-to-voice conversion and speaker/command recognition, VoiceServer handles them with plug-in hardware and UNIX-based software. DSC’s Open System Architecture™ means many OEM opportunities for adding value, and long product life cycles.

VoiceServer’s proprietary compression techniques yield high-quality digitized speech at only 8,000 bits per second. Use of standard peripheral interfaces and low-cost long-haul circuits simplifies the design of integrated voice/data systems.

So when you’re thinking business communications, be sure to talk with the experts at Digital Sound.

We guarantee you won’t be left speechless.

WHEN DESIGNING YOUR BUSINESS COMMUNICATIONS SYSTEM, DON’T FORGET THE MOST IMPORTANT PART.

I’m a (check one)

☐ Telecommunications OEM or distributor
☐ Computer or OA manufacturer/reseller

Send me details on the VoiceServer.

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Title __________________________
Company ______________________
Division _______________________
Address _________________________
City ___________________________
State _____ ZIP ________________
Telephone(______) ____________

Digital Sound Corporation

We speak the future.

2030 Alameda Padre Serra
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CIRCLE NO. 2 ON INQUIRY CARD
MINI-MICRO WORLD
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Five reasons why systems integrators use turboMUX-2.

More than just a multiplexer, turboMUX-2 uses advanced data compression to support two 2400 bps, full duplex channels over one 212A data link. TurboMUX-2 integrates these features into any system:

1. Simultaneous terminal and printer operation at 2400 bps FDX.
2. Increased performance for more uses with greater throughput, all at a lower cost.
4. Automatic error detection and correction.
5. Switch-selectable XON/XOFF and CTS flow control and built-in diagnostics.

TurboMUX-2. It's like getting a free 2400 bps line.
Our Firebreathers are scorching old performance standards.

Gould's PowerNode™ 9000 blasts through UNIX® benchmarks at 4.5 times the speed of the VAX™ 11/780. Sound impossible? Give us your real production code or benchmarks and let us prove it.

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Now you can run software development and production at the same time, with highly responsive performance. Tightly coupled dual processors nearly double throughput and virtual memory accommodates large programs. Hardware fixed point and floating point accelerators retain high performance in heavy number-crunching situations. The PN9000 handles mainframe jobs in a multi-user UNIX system or serves as a backend processor in a widely distributed network.

Unique UNIX Software.
Gould's own high performance UNIX-based operating system (UTX/32™)—a unique combination of Berkeley 4.2 with special Bell System V features—makes it easy for you to use your VAX-based UNIX software. This allows easy conversion from your system to the increased power of a Firebreather.

Compatible Family.
Gould's Compatibility Suite is a collection of application software packages that are compatible across the entire PowerSeries™ product line. Use C, Cobol, BASIC, or Pascal languages intermixed. This close-knit processor family offers all the advantages of a dedicated system plus the lower-cost-per-user option of sharing resources with Gould's standard networking capabilities including Ethernet™. The Firebreathers are the high end of the widest range of UNIX-based systems in the industry.

Gould's Firebreathers are scorching the UNIX market.

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Distributed Systems Operation
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VAX is a trademark of Digital Equipment Corporation

CIRCLE NO. 4 ON INQUIRY CARD
THE EVOLUTION

PBX
(Switchus interruptus)

LAN
(Linkus limitus)

*IBM is a trademark of International Business Machines, Inc.
VAX is a trademark of Digital Equipment Corp.
The first step up the data networking ladder was the data PBX. It was good. But not very intelligent.

Then came the LAN. It was quicker and more flexible. But limited to just one office, just one network.

Now there's no reason to monkey around with either a Data PBX or a LAN.

Now there's MAN.

**MAN: The Multiple Area Network.**

MAN links multiple devices, multiple users, multiple networks and multiple locations.

It's the most highly evolved, highly intelligent communications system there is.

Where Data PBXs struggle to provide single connections for slow terminals, MAN makes it easy to access multiple sources from low and high speed devices.

Multiple sessions per port let you connect to a VAX, then switch easily to an IBM mainframe.

And PBXs have a single point of failure. MAN doesn't.

**Survival of the fittest.**

The LAN was a big step up from the Data PBX. MAN goes way beyond any LAN.

It not only lets you connect all your personal computers, printers, terminals, and mainframes to Ethernet, it lets you link your Ethernet to other Ethernets, remote nets, X.25 public nets, and SNA.

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And MAN's Terminal Servers, Host Servers, and Gateways have the capacity to serve even the most demanding users like Sperry, NASA, GTE and Contel.

Call 415-969-4400. Or write us at 1345 Shorebird Way, Mt. View, CA 94043. We'll tell you all the reasons you should choose MAN over the competition.

It's the natural selection.
WE’VE BEEN DELIVERING 3 1/2” WINCHESTER DISK DRIVES FOR OVER A YEAR.

Rodime has been setting a new standard in Winchester disk drive storage for more than a year. Its 3 1/2" drive with 5 and 10 megabytes of formatted storage has become the industry leader for sub 4" Winchester disk drives. Rodime has now delivered tens of thousands!

The proven compact drive and proven quantity supplier

With thousands of its 3 1/2" Winchester drives in operation today Rodime has further demonstrated its reputation for reliability, a major design consideration for its 3 1/2" drive, and quality. It has a rugged design with high resistance to shock, an important consideration for portability and for vibration prone environments. Using advanced large-scale integration, the entire electronics for the drive are on a single compact board and there are no adjustments or select-on-test components.

New design horizons

The compact size of Rodime’s drive suddenly puts large-scale storage into areas never considered before. The 350 series is one-fourth the volume of a 5 1/4" Winchester drive. And the 250 series, which includes mounting brackets and a face plate, fits into the same space as a half-height 5 1/4" Winchester offering even further shock and vibration isolation. Now, system designers have a new level of flexibility. One area that has received attention is use with portable computers. Several major portable computer manufacturers have already incorporated Rodime 3 1/2" Winchester disk drives into their products. There are other equally exciting areas such as desk top computer systems, intelligent terminals, point-of-sale terminals, industrial controllers, telecommunications systems, navigation and guidance systems, and portable instrumentation. In fact, the list of potential uses is only limited by the imagination of the system designer.

A tradition of excellence

In a few short years, Rodime has established itself as a major force within the Winchester disk drive industry. Rodime is one of the few manufacturers that are delivering 5 1/4" Winchester drives with a broad range of capabilities up to 54 megabytes. And it is the only manufacturer delivering high-performance 3 1/2" Winchester drives in production quantities.

For the compact 3 1/2" Winchester disk or other 5 1/4" Winchester requirements, look to Rodime. Rodime delivers.

Western Sales Office: (714) 770-3085 • Eastern Sales Office: (612) 453-5335
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CIRCLE NO. 6 ON INQUIRY CARD
Optical disk technology fosters heady market projections

According to Freeman Associates, a Santa Barbara, Calif., management consulting company, the market for optical disk drives intended for data-storage applications is projected to expand significantly from just 600 units shipped worldwide in 1984, at a value of $9 million, to 2.4 million units in 1990, at a value of $7.3 billion. The company’s study report, “Optical Data-Storage Outlook,” further predicts that optical data storage is now approaching market feasibility after more than a decade of technology development. In fact, this development effort should culminate next month at COMDEX/Fall ’84 with a few 5½-inch optical disk-drive introductions. These units will likely be attached to small microcomputer systems.

But why choose optical disk instead of magnetic disk or tape? Because the seemingly insatiable demand for digital data storage has driven the peripherals industry to build lower-cost-per-megabyte devices as storage-intensive applications continue to gain prominence. Optical disk technology, therefore, meets the following system integration needs:

• Offers gigabyte storage capacities.
• Fills the performance gap between magnetic disk and magnetic tape, but does not replace either one.
• Competes favorably where moderately fast access times are required and large sequential-data transfers are common.

There are some shortcomings, though. For one, optical products will necessitate the conversion of many software programs and the implementation of new software. For another, non-alterable media might prove a disqualifying factor. More important, however, is the lack of format and interface standards. And yet another hurdle might be market reluctance toward an unproven technology.

Because optical disk technology presents system integrators with these new challenges as to evaluation, selection, integration and application, there is a need for well-researched, in-depth market and product analysis and information. And Mini-Micro Systems will meet that need—we will analyze and forecast the market for products that use this new technology. In forthcoming issues, we will also assess promising applications, evaluate technical issues and compare competing data-storage alternatives. And we ask our readers to participate, too. In addition to our expert staff-written articles, each issue of Mini-Micro Systems contains contributed features by industry leaders. The combination will result in your leading source of useful information on this important new industry.
YOU WON'T FIND MANY SHUGART DRIVES AROUND THESE PARTS.
You find Shugart new generation drives where they were built to be. In all kinds of systems. Under all kinds of conditions. Running. And running and running.

Setting a world standard for quality. A standard that doesn't allow room for failure. Because you don't.

To insure the reliability of your system, we begin with our suppliers. They go through a lot. Learning and qualifying, even building drives themselves.

We also involve our manufacturing engineers. And our quality control experts. From the very beginning. The design stage.

With their full collaboration, every new drive is designed for top quality. Unbeatable reliability. And ease of assembly. Using the fewest number of parts possible.

In other words, the same uncompromising quality you design into your system is designed and built into every new Shugart drive. Right from the start. So you can count on consistent reliability. For example, 20,000 hours MTBF for new generation Winchesters.

Of course, every Shugart drive is subject to the most stringent testing and inspection at every stage. But inspection doesn't insure quality. At Shugart, we believe there's only one way to insure a reliable product. By eliminating the cause of failure from the product design.

At Shugart, quality is designed in. Not inspected in.

Let us prove it. Call Doug Daetz, our Director of Corporate Quality at (408) 737-3009 for details.

Shugart

Right from the start.
Introducing the PC alternatives for the office and the factory.

For Office Control: ISI's 5160.

For Factory Control: ISI's 6160.


ISI International (formerly Intersil Systems) introduces two new IBM-compatible systems, one for the office and one for the factory.

Each is PC and XT-compatible in both hardware and software. But both offer significant advantages in flexibility, expandability and cost effectiveness.

**Office Control: ISI's 5160.**

The ISI 5160 office system looks like, and works like, the PC/XT, and it will run the software its more expensive counterpart will run. So you are assured of broad software availability.

But ISI designed the 5160 to be especially flexible in meeting the needs of different sized offices, with differing (and changing) processing requirements.

Expanding all the way from a single floppy to a fully loaded Winchester system is far easier with the ISI system. In fact, over 60 MB of on-line storage capacity is available. Half-height floppies, 10, 20 and 30 MB Winchester drives, cartridge tape backup, and a 130-watt power supply supports expansion.

The first step was to put all the CPU essentials onto the baseboard, leaving more open expansion slots and greater provision to meet users' changing needs. The standard 5160 system includes all these essential features on the baseboard: 8088 CPU and optional 8087 coprocessor; 128K memory (expandable to 640K); calendar/real-time clock with battery backup; two RS-232C ports; parallel printer port; floppy disk controller and SASI interface.

So for an office system that truly offers room to grow, choose ISI International's 5160 office system.

**Factory Control: ISI's 6160.**

The ISI 6160 is essentially the same easily expandable processor as the 5160, featuring the same PC and XT-compatibility, but with important additional features that make this the ideal system for factory applications.

For example, it's 19" rack-mountable RETMA enclosure is ruggedly designed and manufactured, and features fan cooling with positive airflow to eliminate hot spots; changeable filters for extra protection from contamination; and a key-lockable cover for limited access to power and reset switches, as well as to the shock-mounted disk drives.

Both the 5160 and the 6160 offer MS-DOS* and GW-Basic; in addition, the 6160 factory system offers VRTX; a multitasking kernel that permits you to run real-time, interrupt-driven control applications.

For operation in a more office-like setting, the 6160 can be dressed up in its own "office" style cabinet, just like the 5160. But underneath, it will still be the most versatile, expandable, functional computer available to run factory control applications.

For more information on either the ISI 5160 office system or the ISI 6160 factory system, call us in the West at (408) 743-4442, in the East at (201) 272-3920, or in the Midwest at (513) 890-6450.

*MS-DOS and GW are trademarks of Microsoft Corporation.
+VRTX is a registered trademark of Hunter & Ready, Inc.
Letters

DOMAIN'S FISCAL MUSCLE

To the editor:
I am writing in reference to the informative article on the thin-film media industry which appeared in the May issue (MMS, May 1984, Page 129). The article contained two errors about Domain Technology.

At the time the article was written, Domain had an equity base exceeding $11 million—obtained through two rounds of venture capital financing—though the article reported only $4 million. In May, Domain closed a third round of venture financing, and concurrently expanded its credit lines. Domain's total equity now exceeds $19.8 million, and total available credit exceeds $14 million.

A second correction—Domain is in the process of expanding its sputtering facility and is, therefore, a major contender not only in the plated media market (as reported in the article), but also in sputtered media.

We appreciate the opportunity to bring your readers up to date on recent developments at Domain.

Kate Spohr
Account Executive
New Venture Communications
Palo Alto, Calif.

STANDARDIZING WITH THE BEST

To the editor:
In your article on LAN standards (MMS, July 1984, Page 36) you quote Mike MacNaughton as indicating "I'd be surprised if any [small- or medium-sized companies] will meet the standards that are coming out of NBS." He obviously did not look at the list of vendors that have passed NBS testing.

Charles River Data Systems is not a large vendor (even medium-sized may be an optimistic representation), but we were at NCC in the Boeing Booth passing data with the best of them (or at least the biggest). Small vendors need standards more than the larger vendors. It is the point that allows us and our customers to get the facilities we need without having to do it all ourselves. This applies to networks (when I don't want to write the software on the other vendor's system to support my proto-

MULTIUSER SURVEY

To the editor:
You have done your readers and Molecular Computers a disservice in your June 15 survey of multiuser system (MMS Computer Digest). You have created the appearance that the Molecular SuperMicro series is among the most expensive multiuser system on the market when, in fact, it is among the least expensive.

The base retail price of the eight-user SuperMicro 8 is $5,995 (not $16,135) and the base retail price of the 32-user SuperMicro 32X is $18,995 (not $66,755). How can you compare the price of a fully loaded Molecular with a stripped-down Altos or Alpha Micro or Hewlett-Packard? You have not specified terminals (which could cost from $400 to $2,000) or printers (which could cost from $400 to $5,000).

A better method of comparison would be to specify the base price of the system, along with the incremental cost of adding each additional user. Or alternatively, specify the price of the systems in a comparable (say 4- or 8-users) configuration.

John J. Maurer
Iowa Computer Services Ltd.
Ames, Iowa

Editor's response:
MMS prints the price and configuration information provided by the computer manufacturer. In this instance, Molecular Computer provided us with "fully-configured" prices rather than "base" price. Manufacturers choose different ways to express their prices. As to using base prices, the problem is there is no "standard" configuration to which manufacturers comply. Our tables serve only as guidelines; price and configuration information is best obtained directly from the manufacturer's sales representatives.
OEM alert:
The new Perkin-Elmer 3205 packs supermini performance into a micro price tag.

Introducing the Perkin-Elmer 3205. Now OEMs and system integrators can provide 32-bit supermini computing power at micro system economics, without making any compromises.

No micro system can approach the per-terminal cost advantages of the Perkin-Elmer 3205 supermini. Or the migration paths. Or offer access to a common database.

No supermini system can touch the Perkin-Elmer 3205 proven price/performance statistics.

Small Investment. Big potential.

A basic 3205 costs just $6,169* and includes a ½ megabyte of memory, eight communications lines, floating point and a lot more. There's even a microprocessor handling just communications support that has more power than you get in most complete microcomputers.

The 3205 can be expanded to 4 megabytes of memory, 16 communications lines and 1.2 gigabytes of disk storage. And every configuration in the broad 3205 range offers a choice of operating systems: our own Real Time OS/32 or one derived from the UNIX** operating system.

Fully configured value.

50 megabytes of fixed/removable Winchester disk memory, 8 communications ports and a full complement of related capabilities are included in a fully configured 3205 computer for only $15,469.* That lets you supply powerful computer systems your customers can afford to buy.

The support you need.

Perkin-Elmer has been an OEM supplier for over 15 years. We know how to support you. We have a worldwide service network, powerful, quality software, reliable hardware and the terms and conditions you need.

Mini/Micro/Maximization.

The Perkin-Elmer 3205 gives you the small purchase price of micro systems, and the power, growth potential and common database advantages of supermini systems.

For the complete story, call or write the Perkin-Elmer Corporation, Two Crescent Place, Oceanport, N.J. 07757. 1-800-631-2154. In N.J., 1-201-870-4712.

*OEM quantity 100. U.S. only.
**UNIX is a trademark of Bell Laboratories.

PERKIN-ELMER
The science and computer company. Where solutions come first.

14
CIRCLE NO. 10 ON INQUIRY CARD
ELECTRONIC ‘ACCESS KEY’ TIGHTENS SYSTEM SECURITY
Startup company Gordian Systems Inc., Palo Alto, Calif., has developed what it considers to be a practical, low-cost solution to system security. The company’s first product, to be introduced this month, is a thumb-sized “access key” that must be held up to a CRT screen in order for a user to gain system access. The key consists of custom circuitry, optical sensors, a five-year lithium battery, a clock and a calendar. When the key is held up to a screen, it optically reads certain information, combines it with other pre-programmed information in its own circuitry and generates a unique password. The password is then displayed on the key’s LCD and the user types the password into the system on the keyboard. Volume price is less than $10 per key.—D. Bright

HEWLETT-PACKARD UPGRADES HP150 WITH WINCHESTER, HIGH-CAPACITY FLOPPIES
Hewlett-Packard Co. early this month planned two upgrades to its HP150 personal computer. The Touchscreen Personal Computer doubles the floppy disk storage of the HP150 by incorporating double-sided, 710K-byte, 3½-inch drives from Sony Corp. The Touchscreen MAX Personal Computer has one 710K-byte microfloppy and a 16M-byte internal Winchester disk drive. HP has upgraded its user manuals for the new models, bundled word processing and the Personal Card File programs, and added icon-driven configuration software. Suggested U.S. retail prices will be $3,495 for the Touchscreen Personal Computer and $5,495 for the Touchscreen MAX.—T. Moran

TIME RUNS OUT FOR BUSINESS SOLUTIONS INC.
Business Solutions Inc. (BSI), Kings Park, N.Y., the four-year-old software company that produced The Incredible Jack and Jack2 integrated programs, ceased operating last month. The company is now negotiating with potential buyers of its assets, according to David Gavrin of Windcrest Partners, New York, a major investor in BSI. Gavrin cited “an inability to penetrate the IBM market with the dollars available” as a key reason for the company’s problems, together with failing to establish a large enough dealer base. A major venture capital deal fell through this summer. BSI has sold more than 12,000 packages of its Jack software.—M. Stenzler-Centonze

OPTICAL DRIVE FOR PERSONAL COMPUTERS, UNDER $1,000 FOR OEMS
An optical disk drive with a full-height 5½-inch form factor for personal computers reportedly will be demonstrated privately to potential OEM customers on November 15 by Information Storage Inc., Colorado Springs, Colo. A company spokesman says the software drivers have already been written for PC-DOS and MS-DOS. The drive provides 100M bytes of write-once storage and should be priced less than $1,000 in OEM quantities. Other features include a data-transfer rate of 2.5M bits per second and a maximum access time of 200 msecs. Evaluation units are scheduled to be available in the first quarter of next year, and volume shipments should follow in the fourth quarter.—K. Jones
VERBEX VOICE RECOGNITION TERMINAL RUNS WITH IBM PC
Verbex Corp. early this month planned to announce its $4,900 Verbex 4000 speaker-dependent, continuous-voice recognition terminal for the IBM PC. Although the Bedford, Mass., company is a recognized leader in its chosen technology, it has had little success marketing a larger, more intelligent model, the $25,000 Verbex 3000, with a maximum vocabulary of 360 words. The 4000 has a vocabulary of 100 words and a claimed minimum-accuracy level of 98 percent against background noise as high as 85 dB. It connects to the IBM PC via a standard RS232C port. The unit should soon interface with Digital Equipment Corp. VAX superminicomputers and Hewlett-Packard Co. 1000 and 3000 minicomputers.—D. Bright

COMPUTERVISION ADDS COLOR WORKSTATIONS
Computer-aided design/computer-aided manufacturing (CAD/CAM) leader Computervision Corp., Bedford, Mass., has added two high-resolution models to its range: the CDS 3420 and CDS 3421. Both workstations feature raster-scan technology, 900-pixel-by-1152-pixel resolution and support for 16 colors out of a palette of 4,096. The $51,600 CDS 3421 is designed for standalone applications, and the $42,800 CDS 3420, which includes an Ethernet controller, is designed for networking applications. Volume shipments should begin late this year.—D. Bright

SPECTRAGRAPHICS ADDS IBM 5080 EMULATION, SOLID MODELING SOFTWARE
Spectragraphics Corp., San Diego, is coming out with a firmware upgrade to its System 1500 Multi-Station for IBM 5080 workstation emulation. Scheduled to be available at the end of this month, the upgrade will be offered to System 1500 owners for $3,000. Spectragraphics will also offer the SynthaVision solid modeling software from Mathematical Applications Group Inc., Elmsford, N.Y., and Automatic Dynamic Analysis of Mechanical Systems from Mechanical Dynamics Inc., Ann Arbor, Mich.—T. Moran

MEGAVALU L PUSHE S 8-INCH WINCHESTER CAPACITY BEYOND 500M BYTES
Megavault Corp., Woodland Hills, Calif., plans to ship in the first quarter of next year the model MV-300 8-inch Winchester disk drive with 331.8M bytes of storage. The price will be $4,200 in 100-unit quantities. Another model, the MV-660, planned for the second quarter, doubles the capacity to 660.4M bytes. The price will be $8,000, also in 100-unit quantities. The drives use seven platters and are available with either a Storage Module Device (SMD) or Small Computer Systems Interface (SCSI). The company also plans to provide the Intelligent Peripheral Interface-2 for the MV-660.—C. Warren

SEQUOIA BUILDS MODULAR FAULT-TOLERANT SYSTEM RUNNING UNIX
Three-year old Sequoia Systems Inc., Marlborough, Mass., has finally announced its first product: the modular, multiple MC68010-based Sequoia System. The system, which runs UNIX, is designed to compete against Tandem Computers Inc. and Stratus Computer Inc. in the burgeoning fault-tolerant computer market. The system can be expanded from two to 64 processors, tightly coupled via an 80M-byte-per-second bus; from 4M bytes to 256M bytes of RAM; and from two MC68000-based I/O channels to 96
Can You Print On All Of These Documents?

The CRADEN DP4 positions and prints on any document . . . automatically.

That’s why it’s no longer necessary to convert existing documents to continuous forms or limit your system capabilities. A single DP4 can be used for both rapid matrix printing and quality text output.

Our two line alphanumeric display allows your system to prompt an operator, who can then respond via the keypad. Several serial interfaces are included for easy connection to any system.

We have established a reputation for product quality and maintenance-free reliability with major OEM’s. If you have a unique printing problem, contact Craden and discover how responsive a vendor can be.

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CIRCLE NO. 11 ON INQUIRY CARD
NOTHING GIVES UNIX* MORE MUSCLE THAN SGS' NEW SAMSON.

Want to unlock more of the capabilities of UNIX? Want the best UNIX-based cost-per-megabyte system in the industry? Then you want the power of Samson.

Backed by more than a quarter of a century of technological strength, SGS' 32/16-bit multi-user, multi-task, virtual memory Samson packs large-mainframe power in a compact, rack-mountable cabinet. Standard features include a 70MB Winchester disk with the only 67MB formatted cartridge back-up warranted for interchangeability, plus the strength to support up to 34 ports.

Multibus* compatible, dual-bus, dual-port memory, 10-slot chassis.

Samson is more than muscle. It is designed for speed, flexibility and expandability. System architecture is based on industry-standard Multibus, enhanced by SGS' new P2 dual-bus structure (SAM-BUS™).

Samson permits the main processor to converse with memory, while allowing the other intelligent Multibus controllers direct access to memory (DMA) via the Multibus (P1) connector. Each bus can address the system's full 16MB range. The result is exceptionally high-speed operation and significantly improved throughput without the need for cache memory architecture.

32/16-bit Intelligent Serial I/O Controller.

Samson's Intelligent I/O incorporates the same 32/16-bit microprocessor strength as the master CPU. The microprocessor allows software originally handled by the CPU, to be executed directly by the I/O firmware, further increasing overall system speed and throughput. This, coupled with the compatibility of the powerful Z8030* Serial Controller, make the I/O extremely flexible.

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channels, with 256 ports per channel. Sequoia officials claim the system runs UNIX System V and Berkeley 4.2 applications simultaneously. Prices start at $290,000; each additional processor is $40,000 and each 2M bytes of RAM is $20,000.—D. Bright

DIALOG ADDS COMMUNICATION BOARDS FOR DEC PDP/VAX MINICOMPUTERS
Distributed Logic Corp. (DIALOG), Anaheim, Calif., is providing Digital Equipment Corp. (DEC) Unibus communications with its model CU160 asynchronous communications controller. The $3,000 board multiplexes 16 channels for terminals, printers, modems or serial communications equipment. It emulates DEC’s DH11 asynchronous communications multiplexer for the PDP-11 and the DMF32 multifunction controller for the VAX via onboard firmware.—C. Warren

TELEVIDEO’S INCOME SLIDES 84 PERCENT
TeleVideo Systems Inc.’s net income fell 84 percent for the third quarter, ending in July, to $994,000 from $6.1 million for the same quarter last year. Sales dropped to $40.8 million from $44.6 million a year earlier. Company representatives said the decrease was in line with earlier projections and blamed market uncertainty over IBM price cuts for lower sales of the company’s IBM PC-compatible products.—T. Moran

HARRIS OFFERS UNIX SYSTEM V ON ITS MODIFIED VOS OPERATING SYSTEM
Harris Corp.’s version of UNIX System V that is under development is more than UNIX running on top of a native operating system. Harris modified its proprietary VOS superminicomputer operating system, adding UNIX features such as system calls, subroutines, and libraries, so that VOS and UNIX share the same kernel. Beta testing for the product should begin in December.—D. Bright

TECH FILES: A QUICK LOOK AT INDUSTRY DEVELOPMENTS

MICRO FILES: The increasing availability of 256K-bit dynamic RAM chips has allowed Apple Computer Inc., Cupertino, Calif., to announce a 512K-byte version of its Macintosh microcomputer several months earlier than expected. The “Fat Mac’s” retail price of $3,195 includes MacWrite and MacPaint software. In addition, Apple reduced the price of the original 128K-byte Macintosh to $2,195. This month, customers who purchased the earlier version for $2,495 will be able to buy a dealer-installed memory upgrade to 512K bytes and the two software packages for $995.—T. Moran

TERMINAL FILES: Hitachi Denshi America Ltd., Woodbury, N.Y., has introduced the 14-inch model CU-1420 and 12-inch model CU1220 terminals, which should be available this quarter. Designed for biomedical and graphics applications, the monitors have a horizontal resolution of 540 lines and a dot-pitch size of 0.31 mm. Prices have not been set.—C. Warren

To enhance CRT images, Vivid Systems Inc., Palo Alto, Calif., has introduced the Limelight computer projector. Limelight connects to any personal

MINI-MICRO SYSTEMS/October 1984
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computer and projects a bright monochrome green image as large as 10 feet. Resolution is more than 700 lines. A special lens system can focus the image at its center and corners, and stretch it horizontally or vertically. The Limelight weighs 22 pounds, and measures 8 by 12 by 24 inches. Its price is $3,950.—C. Warren

COMMUNICATIONS FILES: Ungermann-Bass Inc., Santa Clara, Calif., has expanded its Net/One local area network with the NIU-130 network interface unit, which halves the cost of the Net/One interface. It enables two RS232 user devices to be connected to a Net/One network. The price is $1,400, and the unit should be available next month.—M. Stenzler-Centorze

RANDOM DISK FILES: Intel Corp., Santa Clara, Calif., plans to release a number of controller chip sets over the next 18 months. A company spokesman says the chip sets are for system integrators that plan products using the Small Computer Systems Interface (SCSI) and the Enhanced Small Disk Interface (ESDI). The sets should use two VLSI chips, and require the addition of analog circuitry. The chips will be programmable.—C. Warren

Adaptec Inc., Milpitas, Calif., is unveiling the model ACB-3530 tape controller. The controller, priced at $400 for 1,000-unit purchases, is scheduled for delivery next month. It provides Small Computer Systems Interface (SCSI) to Quarter Inch Cartridge (QIC)-36 interfacing, and can be formatted to QIC-24 specifications. The 3530 also reads QIC-11 formats. An onboard 8K-byte buffer supports continuous streaming operations.—C. Warren

Sysgen Inc., Fremont, Calif., is offering the Small Computer Systems Interface (SCSI) to Quarter Inch Cartridge (QIC)-36 multifunction disk/tape model SC4500 controllers for the IBM PC. The SC4500 is available in two models that control either a 10M-byte cassette drive or a 20M-byte or 45M-byte streaming cartridge drive. The OEM price is $296. System level software can by licensed from Sysgen for $12 per controller.—C. Warren

SOFTWARE FILES: The latest version of Oregon Software Inc.’s Pascal-2 compiler is being released this month for use on Digital Equipment Corp.’s (DEC) VAX and MicroVAX systems. It runs under DEC’s VMS, RT-11, RSX, and TSX-Plus operating systems. The Portland, Ore., company’s Pascal-2 supports data types that conform to the International Standards Organization’s standard. License fees begin at $4,950.—C. Warren

NOTES FROM OVERSEAS: The European computer industry suffered a blow last month when Denmark’s premier manufacturer, 20-year-old Christian Rovsing, suddenly declared bankruptcy after failing to pay its 1,200 employees. The company’s British subsidiary also was placed in receivership. The $60 million communications and networking company, whose largest customer is American Airlines, reportedly failed to negotiate a last-minute rescue package with its institutional investors.—M. O’Gara
## LINE PRINTER COMPARISON CHART

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<th>STANDARD FEATURES</th>
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<th>CIE TERMINALS CI-600</th>
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For two years Olivetti SpA, Ivrea, Italy, has been itching to get into the retail computer business in Europe. Recently, it purchased 31.6 percent of British franchiser Tabs Ltd. for $1.5 million. Tabs has about 60 franchises in the United Kingdom that sell about $40 million annually of IBM PCs, Olivetti M24s, ACT Apricots, Sirius microcomputers, and Tabs' PDQ IBM PC-lookalike. Tabs managing director Terry Poole says Tabs should have 100 British outlets by the end of this year. Olivetti's interest in Tabs was piqued by Tabs' desire to add the Olivetti/AT&T 3B computer line to its retail outlets by Easter. There is speculation now that Olivetti might expand its Arizona-based MicroAge store chain, in which it has a 48.8 percent interest, into Europe.—M. O'Gara

Also on the acquisition trail is ITT Corp., which has just purchased a 37.6 percent share of Holland Automation International BV (HAI), The Netherlands, for an undisclosed sum. HAI's forte is the HAI*BAS operating system, which has an integrated BASIC language and the HAI* applications programs that can be run on most popular microcomputers in the United States and Europe. ITT is believed to be looking to HAI as a springboard into Europe for ITT's software distribution business.—M. O'Gara

Joint development initiatives by European software companies already addressing the fledgling market for Ada programming products won't get much of a hoped-for financial boost. The projects will receive financial support worth only about $5 million over the next two years from the Commission of the European Communities. Four to five times that amount was desired by the Commission's Information Technology Task Force. A Commission spokesman blames the Community's overall shortage of funds.—K. Jones

Sord Computer Corp., Tokyo, is preparing to incorporate a software sales company, tentatively called the Image Partner Corp., this fall. The enterprise will focus on UNOS, the UNIX-compatible operating system from Charles River Data Systems Inc., Natick, Mass. Sord uses the operating system for its 32-bit M685 computer. The new sales affiliate will represent an 80 percent investment by Sord and a 3 percent investment from eight venture capital companies.—I. Kakehashi

C. Itoh Data Systems Company, Tokyo, is promoting a Japanese version of the IBM MVS/DECnet gateway system for IBM-to-DEC data transfer. The system, developed by ICS Inc., Fremont, Calif., is priced in Japan at $180,826 (36.5 million yen). The system provides an interface for 8M-byte-per-second communication to IBM machines and 10M-byte-per-second communication to DEC machines, converting signals to make the IBM machines look like nodes on DECnet. DEC users in turn can draw from IBM databases with DEC commands; no special software translation is required. C. Itoh does not expect a large market the first year, but compatibility should become an important selling point for IBM- and DEC-lookalike equipment.—I. Kakehashi
In response to pressure from the South Korean government, NEC Corp., Tokyo, has agreed to a venture in which the Samsung Electron Devices Co. in Korea will assemble NEC's personal computers, bank teller machines, and general-purpose office minicomputers from parts supplied by NEC. The Korean government has restricted imports to encourage domestic industry. IBM Corp. and Fujitsu Ltd. are expected to increase their Korean operations in line with the government's policy.—l. Kakehashi

**Matsushita Electric Industrial Co.**, Osaka, Japan, recently introduced the TQ-2300 optical disk file system that can record or play moving or still images and two-channel stereo sound. Priced at $14,463 (3.5 million yen) in Japan, the system applies the optical Kerr effect, in which materials change their structure when laser heat is applied. The file system uses a spiral tracking method with a track pitch of 1.6 microns rather than the 2.5 microns used on the earlier still-only equipment. The disks can store 24,000 still-image frames or 13 minutes and 30 seconds of moving images. The TQ-2300 includes an RS232C interface for use with computers and other I/O equipment for recording and replay. Next month Matsushita plans to ship a playback-only machine, the TF-2400F, priced at $3,512 (850,000 yen) in Japan.—l. Kakehashi

**Fujitsu Ltd. and Design Automation Inc.**, are developing the FC-AD11 personal computer computer-aided design system. The system is a two-dimensional drafting product based on Fujitsu's FM-11BS 16-bit microcomputer fitted with a mouse input device and an X-Y plotter. The price is expected to be about $9,421 (2.28 million yen) in Japan.—l. Kakehashi

**NEC Corp.**, should introduce a second round of V Series microprocessors next summer. The new chips will use the same CMOS construction and 2-micron patterns of earlier V Series chips. They should have a self-contained, four-channel DMA controller with 1M-byte addressing, and can be plugged into seven external interrupts. There are three 16-bit timers, and full-duplex serial sending and receiving capabilities for asynchronous data. The company also is working on the V60, a chip with a 16-bit external data bus and 32-bit internal processing, and the V70, a chip with a 32-bit external bus and 32-bit internal processing.—l. Kakehashi

Five of Taiwan's largest electronics manufacturers expect to begin producing 5½-inch half-height 10M-byte hard disk drives early next year. Each of the five—Tatung Co., Sampo Corp., Cal-Comp Electronics Inc., Vidar-SMS Co., Ltd., and Far Eastern Electric Industry Co., Ltd.—participated in a recent hard disk drive development project directed by Taiwan's Electronics Research and Service Organization, a government-sponsored R&D facility. The five will market the project's drive, which has a recording density of 9,100 bits per inch and a track density of 345 tracks per inch.—C. Hintermeister
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CIRCLE NO. 16 ON INQUIRY CARD
Minicomputer handles multiple needs, uses

Jesse Victor, Associate Editor and Carl Warren, Western Editor

By combining modularity, multiple processors and system executive software, the System 3000 minicomputer from Syte Information Technology Inc., San Diego, Calif., achieves 3.6 million-instruction-per-second (MIPS) performance for engineering and scientific users.

On-board floating-point capability and bit-mapped high-resolution graphics enable the multiuser, multitasking machine to perform high-speed number crunching and computer-aided design/computer-aided engineering (CAD/CAE) functions for 16 linked graphics terminals as well as simultaneously computing for 64 ASCII terminals. Dual operating system (OS) capability allows this OEM system to run different applications on two operating systems at the same time.

Targets diverse markets

Syte is aiming the system at OEMs who want premium performance but don't want to pay a premium price, says vice president of marketing, Robert A. Hahn. "The world is full of 68000 processors in a box running UNIX," Hahn says. "But, to get above the performance of a single 68000, the only solution has been to build it yourself out of bipolar logic."

The 32-bit system's modularity is one of its strongest points, Hahn says. The modularity allows OEMs or end users "to incrementally upgrade performance in the field without changing software" by adding processor boards. "The cost advantages gained by using standard microprocessors and being able to tightly couple multiple processors enable you to build a high-performance machine at very low cost," he says.

The 1.0-MIPS system with one processor board employs the National Semiconductor Corp. 16032 microprocessor. The four-processor version is upgradable to the National 32032 chip for 3.6-MIPS performance.

Using tightly coupled graphics

Hahn touts the System 3000's tightly coupled graphics capability as a major advantage for scientific/engineering applications. "I would position our system as a sort of [Convergent Technologies Inc.] Megaframe for people who want floating-point and graphics capabilities."

But the 3000, in contrast to the Megaframe, Hahn emphasizes, implements both high-resolution, 1024-bit-by-800-bit monochrome and optional 640-bit-by-480-bit color graphics without add-ons. "If you want to do serious graphics on the Megaframe, you have to add a graphics terminal to it. On the System 3000 you can put graphics capability right on the processor card and run it out of main memory"—an approach that is both less expensive and faster, Hahn claims.

The System 3000 supports as many as 16 1024-bit-by-800-bit-by-1-bit plane graphics terminals or one 1024-bit-by-800-bit-by-8-bit plane terminal per graphics module. One processor module handles four graphics terminals and 16 ASCII terminals.

The computer's 8-bit plane graphics capability suggests engineering design modeling applications, and Hahn sees OEMs using the System 3000 to go after the CAD/CAE market. "The low end of that market has been taken over by workstations like the Apollo," Hahn notes. "The high end is served by graphics terminals connected to an IBM mainframe. We are going after the middle market segment—graphics tubes connected to a VAX."

Indeed, Syte has marked out Digital Equipment Corp. (DEC) VAX superminicomputers and similar machines from Data General Corp. and Prime Computer Inc. as the 3000's main competitors. "We are not selling directly against DEC or Prime," Hahn states. "We are not going for the same accounts. We are selling to OEMs who will compete against VAXs."

Its 3.6-MIPS performance puts the System 3000 in the high end of the superminicomputer market, says Hahn, and makes it "faster.
than most VAX-type machines." Syte's use of VLSI technology, Hahn claims, gives the system a price-performance advantage in a total market that is expected to rack up a 50 percent annual growth rate and reach $22 billion by 1986.

Crucial to the System 3000's performance and its modular architecture are multiple buses and a global environment manager (GEM). A 50M-byte-per-second proprietary Syte bus handles intermodule transfers among processor, graphics and memory modules, while a 32-bit local bus controls traffic directly related to processor functions. An optional four-slot Multibus card cage accepts add-on boards.

**Task manager sets the pace**

The GEM task-oriented system executive is a general-purpose operating-system kernel that maximizes system performance, according to Syte's software technical specialist, Scott M. Dickson. Queuing up processes in a pipeline, it allocates them to available processors, avoiding processing bottlenecks and achieving true, tightly coupled parallel processing. Overseeing all system operations, the GEM also schedules I/O events, keeps track of file management, controls memory management and establishes a common interface to the user and peripherals.

To ensure speedy memory transfers, system main memory, which can be as much as 28M bytes with 256K dynamic RAMs, is global to all devices. "When a processor or other device writes or reads to memory," emphasizes Dickson, "it is always in the same location, so no memory transfers are needed."

The computer supports UNIXYTE, a version of AT&T Technologies' UNIX System V, and Xerox Corp's Smalltalk. The dual operating system capability permits an "OEM to port a proprietary operating system, say XYZ-DOS, on top of the GEM," Hahn says, "and run both XYZ-DOS and UNIX on the same processor at the same time, thus doing concurrent applications under each operating system."

GEM and Smalltalk provide the system with on-board window-management capability with graphics display processors. The GEM also handles specialized input devices such as mouse pointers or digitizers for bit-mapped graphics.

Each system processor board contains 1M byte of RAM (or 4M bytes with 256K chips); 4K-byte to 16K-byte cache buffer; floating-point and memory-management units; a graphics controller for one bit-mapped terminal; a high-speed I/O processor, which in addition to handling disk and tape drives also accommodates Ethernet; a terminal controller driving four RS232 ports; and a systems support processor for diagnostics and other functions.

The basic $21,900 system furnishes one processor module with 1M byte of memory and a monochrome display, plus UNIXYTE and the GEM system manager. Additional processor modules cost $9,900. Options include graphics modules; color graphics capability; 26M-, 52M- or 144M-byte, 5¼-inch Winchester disk drives (as many as four can be accommodated); a 45M-byte streaming tape drive; and a 1,600-bits-per-inch, half-inch, table-top tape drive. Two hundred or 600 line-per-minute printers are also available. The pricing depends on system configuration.

Languages currently supported are: UNIX System V-compatible C, ANSI X3.9-1979 FORTRAN and ANSI/IEEE 770X3.97-1983 Pascal. Production shipments are planned for this quarter.
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Call or write for more information on the 421, 422 and other Xylogics products.
IBM expands PC line with supermicro, LAN

Lori Vallgra, Senior Editor

IBM Corp.'s new supermicrocomputer and its local area network scheme most likely will create a bonanza of opportunities for third-party hardware and software companies.

The Intel 80286-based IBM Personal Computer-Advanced Technology (PC-AT) operates two to three times faster, has about five times the user memory and twice the storage capacity of the company's popular 8088-based PC. For use with the PC-AT are new version of PC-DOS called DOS 3.0 and the XENIX operating system, which is based on UNIX System III and has Berkeley and IBM-specified additions. The PC-AT can be used alone or shared by three users.

**Tape controllers head add-in list**

As with the standard PC, IBM gave the PC-AT an open architecture for third-party add-ins. Egil Juliussen, chairman of Future Computing Inc., Dallas, Texas, says one of the first add-ins third-party suppliers could provide would be a controller board for backup media, such as a tape drive. Other obvious add-ins, he says, include memory boards (the system can house as much as 3M bytes of add-in storage) and graphics boards. "The PC-AT will turn the market active [with products announced for it] in the fall," predicts Juliussen, "Announcements will start at the COMDEX show [next month in Las Vegas]."

Featured on the PC-AT are a 1.2M-byte floppy disk drive, a 20M-byte Winchester disk drive, an 80287 mathematics co-processor option, a 2½M-byte virtual RAM disk memory, a battery-backed real-time clock and a new 192W power supply.

IBM has revised some of the expansion chassis cards. For example, the parallel and serial interfaces are now combined on one card, as are the floppy and hard-disk adapters. In earlier PC models, the interfaces and adapters resided on two cards. The motherboard's memory can be expanded to 512K bytes using piggybacked 128K-bit RAM chips. The card cage has eight long slots which are ½-inch higher than PC-XT slots. Two versions of the system are available, one with six slots and one with seven.

Since IBM announced few applications packages for XENIX, analysts expect software houses to be quite active. However, Juliussen says supplying XENIX is not a principal activity for IBM, and its introduction was merely to cover IBM because other manufacturers offer UNIX-like operating systems. "IBM just threw it on the wall to see if it will stick," he comments.

"People said 'We want UNIX,' [and IBM said] 'here it is,'" says consultant Patricia Seybold of Seybold Publications, Boston, who also is unenthusiastic about the XENIX IBM offers. "IBM announced a three-user system for programmers. This is not useful in multi-user office systems. And you can't run XENIX over IBM's network," she says. The IBM PC Network uses another new operating system, DOS 3.1, which will not be available until the first quarter of next year.

Seybold expects XENIX-supplier Microsoft Corp., Bellevue, Wash., to provide a product that will combine XENIX and the DOS 3.0 operating systems.

IBM appears to have a secondary focus for its networking software as well. "It's useable, but not elegant, networking software," says Seybold. "If I were a system integrator, I'd write my own networking software." Seybold says the network software is not a strategic product for IBM. But she says the new basic input/output system for the networking DOS 3.1 has all the...
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information needed to write the software. She says the current network is a stopgap solution until IBM announces its token-passing software in 18 months. In the meantime, she expects IBM to announce software for the System 36 mini-computer that will enable that system to attach PCs more efficiently than the PC Network does.

So far, IBM has introduced a group of operating systems for its personal computers. Included are several versions of PC-DOS and the PC-IX single-user UNIX System III-based software. IBM sources explain PX-IX is for single-users, while XENIX is for multiusers as

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**IMB's interim local network links its microcomputers together**

Amid the critical clamor following the announcement that its token-passing ring local area network (LAN) wouldn't materialize for about two years, IBM Corp. has taken an interim step to interconnect its microcomputers.

The company will bring to market this month the PC Network, designed to offer peer-to-peer communications in offices and small businesses by joining together combinations of the PC, PC-XT, Portable Personal Computer and the new PC-AT. The PC Network will be tied to IBM's future LAN. The PC Network links as many as 72 personal computers, enabling them to share information, programs, messages, printers and mass-storage devices.

Some industry observers view the broadband, coaxial cable PC Network as a stopgap measure to provide users with some connectivity while waiting for the LAN, but they say it may not prove cost-effective.

Amy Wohl, president of Advanced Office Concepts, Bala Cynwyd, Pa., says the PC Network may be a short-term product. "If the relative cost of attaching the PC Network to the LAN architecture is high in relation to the cost of reattaching the PCs directly into the [LAN], then we are talking about a throw-away product here," Wohl says. She adds that it will be difficult for a company to make a well-informed buying decision for a network because IBM will not disclose prices on unannounced components.

Performance is another issue. The PC Network operates at a speed of two million bits per second. "It's a slow-speed network," Wohl says, "and if a user attaches a PC to a PC Network and then attaches the PC Network through a communications gateway to the ring [LAN] network, it's not clear whether performance would be less than if he had gone directly to the ring network."

Along with the economic and performance factors, users need to address voice capability, says Carol Snell, associate director for telecommunications industry services at Dataquest Inc., San Jose, Calif. "It's odd that not one word was spoken by IBM about digital PBX use anywhere within this whole networking scheme," she says. Snell says IBM will have to resolve the issue of voice and data integration and that the industry will have to know IBM's plans.

---

-Marjorie Stenzler-Centonze
They say programs compiled on XENIX can be run under DOS 3.0, which is suitable for all IBM personal computer models, including the PCjr. DOS applications must be recompiled or rewritten to run under XENIX. The operating system can be started from the diskette or fixed disk drive and uses about 36K bytes of RAM.

Seybold says the PC-AT is “wonderful for software developers. They get high performance [applications] with DOS 3.0.” She adds that very large memory-intensive programs can be written for the PC-AT.

Juliusen expects IBM to ship 60,000 PC-ATs worth about $300 million by the year-end. The PC-AT will be sold through IBM's 1,500 authorized Personal Computer dealers and through IBM's Product Centers and branch offices. IBM has expanded use of its credit card so purchasers can buy products at authorized dealerships as well as at Product Centers.

**Expanded memory available**

Available expansions from IBM are a 256K-byte memory module kit that lets users upgrade the base model from 256K bytes to 512K bytes. A 128K-byte memory expansion option can be used on both models to allow as much as 640K bytes of memory. The 128K expansion for the motherboard requires that 512K bytes of memory reside on the board. Another option is a 512K-byte expansion card. As many as five of these cards can be plugged into the expansion chassis to provide 3M bytes of internal storage.

The PC-AT with 256K bytes of memory and a 1.2M-byte diskette drive is $3,995. The enhanced PC-AT with 512K bytes of memory, the 1.2M-byte diskette drive, a 20M-byte fixed disk drive, and a serial/parallel adapter card, is $5,795. The 128K-byte memory expansion is $350, the 256K-byte memory expansion module kit is $495, and the 512K-byte memory expansion costs $1,125. The 20M-byte fixed-disk drive is available separately for $1,595. An optional 360K-byte diskette drive is $425. The parallel/serial adapter card is $150, DOS 3.0 is $65 and XENIX is $395. All products are available now.

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**BRIDGE ENHANCES SPERRY ETHERNET**

A joint effort by Sperry Corp., Blue Bell, Pa., and Bridge Communications Inc., Santa Monica, Calif., has produced a software package called SPMUX. The software enables Bridge Communications' CS/1 communications server to link Sperry's Uniscope display terminals to Sperry host computers by an Ethernet local area network. The package enables up to 32 terminal sessions to be multiplexed on a single host line.

**LUCASFILM DEVELOPS PC DESIGN SOFTWARE**

LucasFilm, San Rafael, Calif., has introduced the CADroid and WRAPdroid printed-circuit-board design tools. The $6,000 CADroid software package has a Xerox PARC computer-like user interface with pop-up menus. Function key macro commands allow unlimited hierarchical levels and support session logging. CADroid can zoom from one printed-circuit-board component level to another and store component libraries. WRAPdroid is an automatic component-placement and wire-routing optimization package. The packages run on the Apple Lisa, Sun, CADMUS 9790 and Apollo Domain workstations.
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<table>
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<th>168/336</th>
<th>671</th>
<th>474</th>
<th>24/48</th>
<th>84</th>
<th>168</th>
<th>7/13*</th>
<th>7/13/20/27</th>
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<td>27</td>
<td>18</td>
<td>70</td>
<td>20</td>
<td>20</td>
<td>95</td>
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<td>1229</td>
<td>625</td>
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<td>SMD</td>
<td>SMD (MOD)</td>
<td>SMD (MOD)</td>
<td>SA4000</td>
<td>SMD</td>
<td>SMD</td>
<td>ST506/SA4000</td>
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<td>Rotary Voice Coil</td>
<td>Rotary Voice Coil</td>
<td>Buffered Stepper</td>
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<td>Rotary Voice Coil</td>
<td>Buffered Stepper</td>
<td>Buffered Stepper</td>
<td>Rotary Voice Coil</td>
</tr>
</tbody>
</table>

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Demand soars for VT220 terminals, DEC and competitors ramp up

Tom Moran, Associate Editor

Since Digital Equipment Corp. began delivering its VT220 in November, 1983, the conversational alphanumeric terminal has grown so popular that DEC has been able to increase its price by $100 to $1,395 and, reportedly, is allocating it to all customers.

Smaller, lighter and less expensive than the VT100s, the VT200 family (of which the VT220 is a member) seems certain to become the next standard in the ASCII terminal market. The other members of the VT200 family are the VT240 monochrome text/graphics terminal, and the VT241, the color version of the VT240. Prepared to profit from the VT220’s upward climb were several manufacturers that expected to be shipping VT220-compatible products by late summer.

DEC gears up production

DEC makes the VT220 at its Taoyuan, Taiwan plant, which has the manufacturing capacity for 200,000 of the terminals per year. Production is below that now because the company is still in the process of gearing up to capacity (MMS, Sept., Page 89). Robert Sanekoff, vice president of the display terminals industry service for Dataquest Inc., a San Jose, Calif., market research concern, estimates that DEC shipped 50,000 to 60,000 VT200 family terminals in the second quarter of 1984. About 75 percent, he says, were VT220s. As to demand, Sanekoff says, “It’s our conjecture that the simple profile terminal has a very dominant role in the traditional marketplace, plus a very important role in the new emerging marketplace of the office.”

Analysts predict that DEC will continue to hold a 60-percent to 62-percent share of the DEC and DEC-compatible terminal market as the new VT220 grows in popularity. Emulators, however, may not be able to maintain their current percentages as new companies join the VT220-compatible terminal market.

TeleVideo Systems Inc., Sunnyvale, Calif., maker of the VT220-compatible TeleVideo 922, predicts that the shipments of DEC-compatible terminals may reach 300,000 units this year. “We believe the TeleVideo 922 will represent a large share of this market,” says TeleVideo executive vice president Richard DuBridge.

Sanekoff says that, despite the competition, DEC should still achieve a 60 percent to 62 percent share of the combined VT220 and VT220-compatible market, as it had for the VT100 and VT100-compatible market. Still, he adds, “It would be a tremendous accomplishment...in an expanding market—and with so many people biting at them.” Any of the companies that maintain their market share will be doing well, he says.

DEC’s competitors will abound

TeleVideo, Lear Siegler Inc.’s Data Products Division, Anaheim, Calif., Liberty Electronics USA, San Francisco, and CIE Terminals Inc., Irvine, Calif., have all announced terminals with a high degree of VT220 compatibility, but with a lower price. Industry sources expect that Visual Technology Inc., Datamedia Corp., TAB Products Co., and Wyse Technology are also expected to introduce VT220 compatibles. Mike Sukihara, Qume Corp.’s OEM marketing manager, says Qume, San Jose, Calif., will not have a true VT220 emulator until the first half of 1985. Analysts and industry sources expect most, if not all, of the approximately 25 current makers of VT100 compatibles to eventually enter the VT220 market.

CIE plans aggressive sales

Joseph Friedman, director of advanced planning for video terminals for CIE Terminals, sees a suitable
WHAT DISTINGUISHES DEC'S VT220 FROM THE FIELD OF COMPATIBLES

<table>
<thead>
<tr>
<th>DEC VT220 standard features*</th>
<th>List price ($)</th>
<th>132-column capability?</th>
<th>Keyboard</th>
<th>Non-volatile RAM programmable keys?</th>
<th>Other</th>
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<tbody>
<tr>
<td>DEC</td>
<td>1,395</td>
<td>yes</td>
<td>DEC Rainbow</td>
<td>no</td>
<td>• RS423 port</td>
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<tr>
<td>Liberty Freedom 220</td>
<td>795</td>
<td>must scroll</td>
<td>similar to VT220</td>
<td>yes</td>
<td>• no downloadable character sets</td>
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<tr>
<td>TeleVideo 922</td>
<td>995</td>
<td>yes</td>
<td>hybrid VT100/VT220</td>
<td>yes</td>
<td>• graphics upgrade</td>
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<tr>
<td>CIE Terminals CIE-220+</td>
<td>1,195</td>
<td>yes</td>
<td>same as VT220</td>
<td>yes</td>
<td>• vertical windowing</td>
</tr>
<tr>
<td>Lear Siegler ADM220</td>
<td>1,165</td>
<td>yes</td>
<td>same as VT220</td>
<td>yes</td>
<td>• hooded bezel</td>
</tr>
</tbody>
</table>

*all VT220 compatibles listed possess these features, except where noted

Sources: DEC, Liberty, TeleVideo, CIE, Lear Siegler

occasion to step up production while DEC is still gearing to capacity. "Our information tells us that DEC, with all its planning, is having a production or fulfillment problem on the VT220. We think DEC's manufacturing run rate is about 10,000 (per month) and their backlog is about 100,000 units. If our information is correct, and we believe that it is, this presents us with a window of opportunity. [It] won't last [for-ever], but in that window we can establish our product as a second source." Friedman says CIE Terminals expects to be making its $1,195 CIE-220+ at a rate of 2,000 per month by the end of the third quarter, and hopes to sell 50,000 of the 220+ terminals in 1985. A DEC spokesman refused to comment on any possible backlog on the VT220.

Friedman claims that the 220+ is 100 percent compatible with the VT220, while offering the added features of non-volatile RAM for the programmable function keys, a bi-directional printer board, and vertical windowing capability. Still, Friedman says, pricing may determine sales more than will compatibility.

Lear Siegler, Anaheim, Calif., is introducing the ADM 220, which lists for $1,165. According to Catherine Raftery, director of marketing, Lear Siegler will be building up
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production “rather dramatically over the next few months.” Lear Siegler has not been shipping into the DEC-compatible market since discontinuing the ADM 36, a VT100 emulator. “We plan to get a higher market share with the ADM 220 than we did with the ADM 36,” she says. “Backlog on the [ADM 220] product is already very strong” she claims, although she would not disclose figures. Features of the ADM which the company feels will give it a competitive edge include a full tilt-and-swivel monitor, an adjustable keyboard angle, a hooded bezel, non-volatile programmable function keys, and versions with both 12-inch and 14-inch screens.

Will DEC hold on?

Raftery says DEC’s market share will not change dramatically. “DEC has some users, OEMs and distributors that are extremely loyal, but there’s a big part of the market that’s not that loyal, so there’s room for all of us,” she says.

Liberty president George Chao disagrees, saying that DEC will not maintain its market share. “New entries will eat into DEC and into CIE terminals. Can DEC come close to holding its [60 percent] market position? And who is going to fall out of the 40 percent? [Those] are the bottom-line questions.”

Steve Mikulski, planning manager for terminals in the DEC marketing group in Marlboro, Mass., says that since deliveries of the VT220 began in November, “We have maintained our market share in both the VT100 and the VT200 [families].” Mikulski expects that DEC will follow the example set with the VT100 family and introduce a new VT200 family product about every 18 months.

Frank Orlando, DEC’s marketing manager for all terminals products, says that the $100 price increase on the VT200 was the result of a routine review of all prices. DEC was able to raise the price in July because, at that time, it was the only supplier during a period of very strong demand.

Differentiating compatibles

TeleVideo’s vice president of national sales, Steve Tatum, says the VT220’s keyboard may confuse experienced VT100 users. Instead of keeping the VT100 keyboard design for the VT220, DEC copied the one it has on its Rainbow microcomputer. The $995 TeleVideo 922 (MMS, August, Page 33) uses a keyboard that more closely simulates the VT100. Dataquest’s Sanekoff says TeleVideo made a good move in using a modified VT100 keyboard on its TeleVideo 922. However, should the VT220 keyboard become a standard, TeleVideo will change its design.

Liberty Electronics, in choosing to price its Freedom 220 aggressively, did not include either foreign character sets or downloadable character sets. Also, the Freedom 220 displays only 80 columns at a time, with horizontal scrolling needed to show its full 132 columns. Liberty has also shown the Freedom 222 at the recent National Computer Conference in Las Vegas. The 222 adds the modem and telephony features of the Freedom 212 (MMS, July, Page 34).

Dataquest’s Sanekoff says Liberty’s Freedom 220 is “a very attractively-priced product at $795, which, considering [OEM] discounts, could probably be bought at about $550.” Sanekoff says the Freedom 220’s lack of foreign character sets, downloadable character sets and full 132 column display will be “a restriction.” But, he says, “Liberty is an aggressive company moving into the marketplace, and their presence will be felt.”

---

**VERTEX 5¼-INCH WINCHESTER STORES 85M BYTES**

Vertex Peripherals Inc., San Jose, Calif., has boosted its 5¼-inch Winchester capacity to 85M bytes, unformatted. The model V-185 is an extension of the company’s V-100 family and has a voice coil actuator, a closed-loop servo system, and is priced at $1,695 in OEM quantities. Evaluation models are scheduled for the end of the third quarter, with production quantities scheduled for the end of the fourth. SyQuest Technology Inc., Fremont Calif., is also boosting capacity—and shrinking size as well—with a 12.75M byte (unformatted), 3.9-inch micro Winchester. The Model SQ-312RD is a half-height drive with a removable cartridge that’s less than ½ inch high.

**PHILIPS PERIPHERALS READIES 1.6M-BYTE FLOPPY**

Philips Peripherals Inc., San Francisco, Calif., the U.S. marketing arm of Philips Kommunikations Industrie AG, Siegen, West Germany, has unveiled a 1.6M-byte, half-height flexible disk drive. The model X3138, being sampled now by selected OEMs, carries a $295 price tag. Volume shipments are expected in December. The new drive uses large scale integration to reduce interface board size and heat dissipation. Philips is expected to broaden the line further by the year-end with a one-third-height 3½-inch flexible drive storing 1M byte.
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There are four 680 models. The 680/30 (shown above), 680/20 (on the right), 680/35 and the 680/40.

The 680/30 and 680/35 will accommodate up to eight interactive users. The 680/20 expands to four users. And the 680/40 expands to as many as 16 users.

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We'll give you all the details on our HP Plus Software Supplier program. And all the reasons why it will be rewarding for you to develop software for HP.
Data General takes IBM PC-compatibility into the portables market

Lori Vallgra, Senior Editor

The idea of a personal computer, complete in its contents and carried as one would transport a book, was planted at Xerox Corp.'s Palo Alto Research Center, but has germinated at companies such as Data General Corp. (DG), Westboro, Mass. The 9.1-pound Data General/One, code-named Book One, takes the company into new territory—IBM Corp. Personal Computer compatibility—while keeping some ties to its CEO office-automation equipment.

Priced at less than $3,000, the Data General/One contains all complementary metal-oxide-semiconductor (CMOS) parts to keep a lid on power consumption and heat build-up. The system includes an 80C88 CMOS processor; 128K bytes of CMOS RAM memory that can be expanded to 512K bytes; a 79-key DIN-standard keyboard; and a full 80-column-by-25-line liquid crystal display (LCD) with 256-dot-by-640-dot resolution. Also included are a 3½-inch, 737K-byte floppy disk drive; two serial ports; an AC power pack; and MS-DOS or CP/M-86 operating systems. Optional parts include a forthcoming expansion chassis for IBM PC and compatible plug-in boards; a 5¼-inch floppy drive; a second 3½-inch floppy drive; an internal 300-baud auto-dial modem; a portable thermal printer; a rechargeable battery pack; and carrying cases. The system measures 13.7 by 11.7 by 2.8 inches.

Ties to DG's CEO office-automation equipment can be made with CEO Connection software, resident in both the CEO MV/family superminicomputer host and in specific application packages running on the Data General/One. The software lets users transfer files in converted documents between the application programs in the portable computer and the CEO system. This means a document can be mailed to the host CEO in-box, an MS-DOS file can be sent to the AOS operating system in the MV host, a file can be retrieved from the MV host, MS-DOS files can be executed, and the Data General/One can act as an attached terminal to the MV/minicomputer. At last month's announcement, DG planned to offer CEO Connection software for Wordstar, PFS Write, Symphony and Multiplan application programs.

Integrated floppy drives

The Data General/One is one of the first lap-sized computers to integrate floppy disk drives. "This is a big step forward in portable functionality," says Egil Juliussen, chairman of market-research company Future Computing Inc., Dal-

The keyboard on the Data General/One (inset) is not identical to the IBM PC's, because the function keys are parallel to the screen rather than clustered on the left side of the keyboard. Also, the numeric keypad, which is on the right side of the IBM PC's keyboard, is incorporated in the character keys on the Data General model.
Mini-Micro World

NEWS

las, Texas. He explains that the computer is compatible with IBM's, and except for the different floppy-disk size it would be operationally compatible. "The product takes PC functions and puts the whole thing—a full display, keyboard, and floppy drives—into one unit. This is a first, he says, adding that it is also the key to the product's success. Juliussen says it would have been better had DG integrated 5¼-inch drives, but technology would not allow that to happen because the 5½s are too big. "They made the intelligent choice," he says.

Even though Hewlett-Packard Co. (HP) and Apple Computer Inc. have endorsed the 3½-inch floppy-drive format by incorporating such drives in major computer products, off-the-shelf software on 3½-inch diskettes still is not as readily available as on 5¼-inch diskettes. One move that could have changed that scenario would have been for IBM to use the small drives. "I was hoping the new IBM products [the Intel Corp. 80286-based Personal Computer AT] would have had 3½-inch drives. This would help [other products using them]," says Patricia Seybold, a consultant with Seybold Publications, Boston.

To try to attract software house support for its product, DG in June talked with software companies and sent 50 pre-production units to them. Software houses can purchase the machines at a 40-percent discount should they buy them for program development. "We recognized early on that we couldn't sell a product in this market without an incredible amount of software," says Agnes Imregh, manager for software marketing and acquisition for DG's Desktop division.

DG also has done much of the legwork to educate its buyers about 3½-inch drives and their availability. "To address the 3½-inch issue, we checked what the availability of media would be, and we were assured of a high degree of available media [upon the product's introduction in September]," she says. Maxell Corp., Sony Corp., BASF Corp., and Brown Disc Manufacturing Inc. all supply the small media. In turn, DG gave a list of the diskette suppliers to the software houses. Imregh expected 20 to 30 packages to be available at announcement time.

DG users will be able to get the packages in four ways. DG will both distribute and support the software; the company will distribute it and the software house will support it; DG will acknowledge a program will run on its system; or the third-party developer will claim the package works.

System boasts full display

Another feature DG touts is the full screen. The LCD and other components in the system are pur-
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DISPLAY (VP3012D). High performance, 12" diagonal, non-glare, green phosphor screen.

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Quite simply, matching features with price, there is no other professional quality terminal available today that can do as much at such low cost. APT terminals list for $498, in your choice of full stroke or membrane keyboard versions. Either style is also available with a display monitor for $697 list. The data display monitor alone, VP3012D, $199 list.


OTHER FEATURES
RS232C port for direct computer connections at data rates to 9600 baud, or for connecting high speed modems and other accessories. Parallel printer port for hard copy. Numeric keypad, can dial phone numbers not in terminal directory. Built-in speaker with adjustable volume control for audio monitoring of phone line. Smooth scroll display. Automatic screen blanking to reduce possibility of burn. Briefcase size: 17" x 7" x 2". Weight: under 4 lbs.

APT VP4801

Flexible membrane keyboard version designed for travel and hostile environments.

The new RCA APT (All Purpose Terminal) expands your data communications capabilities for a lot less money.
chased in Japan, where the computer was developed and will be produced by the Nippon Data General subsidiary.

The display technology and the CMOS parts are what keeps the price up, says Seybold, who adds, "The lower the price, the better." She says DG has one of the better LCDs she's seen.

Seybold's one disappointment with the Data General/One is the dearth of programs available in ROM. "Most competitors have a fair amount of programs in ROM—for example, word processing, communications, and notepads." She says ROM programs are one feature she likes about HP's model 110 lap-sized system, which runs MS-DOS but has a smaller display and no integral floppy drives (MMS, May, Page 33). Future's Juliussen is not as disappointed. "Applications in ROM mean a tradeoff in pricing. HP's machine is priced at $2,995 with a 16-line-by-80-column display. An external microfloppy drive is priced at about $700.

**Spec summary**

- **Processor**: 80C86 CMOS
- **Operating system**: MS-DOS or CP/M-86
- **Internal memory**: 128K bytes CMOS RAM, expandable to 512K bytes
- **External memory**: one 3½-inch floppy drive
- **Display**: 25-line by 80-column, 256-by-640-dot LCD
- **Communications**: two serial ports
- **Power requirements**: standard AC power pack
- **Keyboard**: 79-key DIN standard
- **Physical dimensions**: 13.7 by 11.7 by 2.8 inches, 9.1 pounds
- **Options**: socket for 8087 math coprocessor; second microfloppy drive integral to unit; external 5¼-inch floppy drive; expansion chassis; hard- or soft-sided carrying cases; rechargeable battery; pack and charger; portable thermal printer; internal 300-baud auto-dial modem

Another major competitor of DG is Applied Computer Techniques (ACT), Birmingham, England, which recently introduced its Apricot Portable in the United States. The unit lists for $2,695 with 256K bytes of RAM; an infrared keyboard and mouse/trackball cursor controller; a 25-line-by-80-column LCD; and a 3½-inch floppy drive. The Portable is based on the Intel 8086 processor, runs MS-DOS, and weighs 13 pounds.

Juliussen estimates the market for products in the Data General/One's class will be 100,000 units sold this year, representing $330 million in revenues. Both numbers will more than double next year he predicts, which is the first full year of shipments for DG, HP and ACT products.

**Selling the second machine**

DG is positioning its portable as a second computer for IBM PC owners, who can use it when they're traveling. "The office can be on the move, in a sense," says Arun Tan-
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Diconix, Ferix challenge non-impact printer technologies with innovative designs

David Bright, Assistant Editor

At least two of the many new non-impact printers promoted as alternatives to laser and traditional impact printers incorporate innovative technologies said to improve performance and reliability.

The first is a continuous-stream ink-jet printer introduced late last month by Diconix Inc., a Dayton, Ohio, subsidiary of Eastman Kodak Co. It uses binary deflection and multiple array technology to produce 300-dot-by-300-dot-per-inch (dpi) character resolution at speeds reaching 18 pages per minute (ppm). The new printer, which at press time was unnamed, is targeted at OEMs and value added resellers, with a quantity price between $5,000 and $7,500. The end-user price is about $12,000, depending upon configuration.

In another challenge to tradition, Ferix Corp., Fremont, Calif. is using thin-film magnetic recording heads on its desktop model 800 magnetic page printer to achieve 10-ppm output at an OEM price of about $2,500.

Diconix, formerly known as Mead Digital Systems, was a pioneer in using binary deflection in multiple-array technology. The company produced its first large scale commercial printer in 1973. Dijit and Admark machines, well known in the commercial printing industry, can print as fast as 100,000 lines per minute.

With binary deflection, droplets of ink emerging from nozzles are either electrically charged or left uncharged. The charged droplets are deflected to a gutter system for recirculation and re-use, while the neutral droplets travel directly to the paper.

Multiple-deflection, continuous-stream ink-jet printers normally have one jet, and the droplets’ trajectories and consequent placement on the page is determined by varying the charge levels. Diconix printer products director Loyd Tarver says binary deflection is more accurate for continuous-stream ink-jet printers because it creates a consistent aerodynamic force on each droplet. With multiple deflection, a range of aerodynamic effects and charge levels must be considered, thereby increasing the chances of errors such as collisions among droplets. The simplicity of the binary deflection method thus promotes superior print quality.

Diconix has 64 jets

Also contributing to high print quality is the fact that the Diconix printhead contains 64 jets, each of which can be individually addressed. Since continuous-stream ink-jet printers are sometimes plagued by ink clogging, having 64 jets would seem to increase the likelihood of clogging. But Tarver says four built-in clogging safeguards prevent that. In addition to four filtering stages (one in the ink bottle, one in the printhead and two lifetime filters in the system), there are acoustic crystals used to excite the jets and dislodge any attached particles, the materials used are
streamlined to prevent the trapping of particles, and the head is kept wet. At printer shutdown, the head is sealed with ink and at startup the jets are cleared during a wash cycle.

The printer has two modes, quality- and draft-output, both of which can combine text and graphics. Diconix says the quality mode, with a resolution of 300 by 300 dpi, provides near typographic quality. In draft mode, the head places an array of 200 by 300 dpi.

Duplex printing offered

The Diconix machine can print on both sides of a sheet of paper. The unit prints on plain cut-sheet bond paper, or transparencies in letter size, legal size or A4 (European standard) stock. Five hundred sheets can be loaded at one time.

Two MC68000 processors are used: one for image and data management and one for font control. Also included are 128K bytes of buffered RAM, a Centronics interface, and Xerox laser printer 2700 emulation and self-testing. Diconix will assist OEMs and value added resellers in developing other interfaces.

Ferix drum overlays images

Ferix's model 800 magnetic, desktop page printer also addresses each individual dot. Its 128 heads reside on a half-inch wide strip that moves across the drum, recording three lines of images with each revolution of the drum. The Ferix machine has no buffer, but the magnetic drum acts somewhat as a memory by storing latent images of both graphics and text, allowing them to be merged and overlayed until the print command is given and the toner is applied.

The model 800 prints at 10 ppm, but because of the drum's ability to retain images, the printer can duplicate 14 copies of the same page per minute without having to access further data. This frees the host computer to perform other work. (Laser printers do not have such an ability to retain images.)

A look at the Ferix head

Ferix sources say the company's innovative thin-film magnetic recording head design is more reliable and less expensive than conventional head design.

With conventional units, a coil is wound around a magnetic ring. When electrical current passes through the coil, the resulting magnetic charge disperses from the poles and travels along the underlying substrate before going onto the recording surface.

The Ferix head, however, is donut-shaped. Its coil is surrounded by the magnetic material, which sits on the substrate. The magnetic charge projects perpendicularly through the substrate's plane and onto the recording drum. Since most of the charge remains near the center of the donut, interference among heads is lessened. This containment provides sharper images, according to the head's inventor, executive vice president Gilbert Springer. Springer founded Ferix three years ago.

Shown is the "inside-out" architecture of the Ferix thin-film head. A top pole structure (1) covers a magnetic material (2), which surrounds the internal coils (3) on top of the substrate (4).
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printer industry service, says he is impressed with the capabilities of both the Diconix and Ferix printers. In both cases, however, his judgment was based on pre-production models. It remains to be seen, he says, if the companies can produce in volume with the same level of quality. Diconix plans volume shipments in the first quarter of 1985, and Ferix plans shipments late this year.

**More laser printers expected**

Meanwhile, more laser printers are in the works. Portland, Oreg. startup Concept Technologies Inc. last month planned to join the growing list of vendors with laser printers based on Canon U.S.A. Inc.'s LBP-CX print engine. Concept intends to integrate the 8-ppm printer, priced at $7,995, with its Concept 100 publishing system. And Dataproducts Corp., Woodland Hills, Calif., should this month introduce its first non-impact printer—a table-top, 24-ppm model with a resolution of 300 by 300 dpi. Dataproducts will offer the printer, which it originally purchased from Toshiba Corp., Tokyo, to OEMs with optional controllers. The top-of-the-line controller provides full bit-mapping on 11-by-17-inch paper. The end user price is approximately $15,000.

**GSA expands computer store program**

**Stephen J. Shaw**
Washington Editor

Testifying to the initial success of the federal computer store concept, the General Services Administration (GSA) recently opened its second commercially operated retail outlet in Philadelphia and plans to have a third in operation at an Atlanta federal building by November 1.

The GSA's first store, Office Technology Plus (OTP), is located at GSA headquarters in Washington. Operated by Math Box Inc., Rockville, MD, a computer retail chain, OTP has exceeded the GSA’s original sales projections by more than five times since the store opened in August 1983. By mid-June, a year after the contract was awarded, OTP had recorded $12.7 million in sales. The GSA had originally estimated that OTP would reach $2.5 million in sales during its first year of operation. Math Box has two GSA stores (one in Washington and one in Philadelphia) and eight commercial stores.

Through the end of June, the Washington store sold approximately 1900 microcomputers, of which almost 90 percent were either IBM Corp. PCs and XTs, or Compaq Computer Corp. IBM-compatible portable computers. According to GSA records, microcomputers accounted for 43 percent of total sales. Peripheral equipment, including printers and plotters, represented 38 percent of total sales. Sales of software and supplies, training and maintenance work comprised the remainder of business.

The GSA's contract with Math Box to run the stores currently restricts purchases to federal employees within a 50-mile radius of the facility. Additionally, employees may purchase equipment and services at between 15 percent and 30 percent below retail list price, but only for use on the job. In such cases, the employee functions much as a government purchasing agent. The government owns the ma-
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MINI-MICRO SYSTEMS/November 1984
Add the above together, and what do you get? The Mostek Matrix 68K™. It combines a multi-user, 16-bit microcomputer system based on the VMEbus architecture—with a UNIX operating system. The result is a powerful and cost-effective tool for system integrators.

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Negotiations are underway between Math Box and the GSA to liberalize those requirements. When complete, the contract modifications are expected to allow federal employees to buy their own computer equipment at any Math Box commercial store other than OTP at the discounted price normally reserved for government purchases. Additional modifications would allow government contractors to receive the preferred price through GSA stores and abolish the 50-mile limit in certain GSA regions.

The GSA is considering abolishing the 50-mile limit to more effectively serve GSA regions, such as Denver, that have a widely dispersed federal population. Allowing contractors to purchase equipment from the computer stores would enable government computer costs to be lowered in areas that have a large number of federal installations essentially run by "middleman" government contractors, explains Barry Petroff, the GSA's program manager for the OTP stores.

**May rekindle controversy**

Liberalizing the purchase requirements may rekindle the controversy that arose when the GSA first announced it was seeking a commercial operator for its planned computer stores (MMS, June 1984, p. 32). Computer retailers in the Washington area opposed the award of any contract to a single organization to run the GSA stores. The fear was that GSA's approach would create a federal retail monopoly, potentially worth hundreds of millions of dollars for the eventually successful bidder.

"I don't think the proposed contract modifications are going to go down too well with other computer retailers," comments Robert Dornan, a federal computer analyst with market research company International Data Corp., Framingham, Mass. Responding to criticism of Math Box's market advantage, GSA's Petroff points out that other retailers can, if they want, allow special discounts to federal employees. "Retailers can give any discount they want to whomever they want," he says.

**Big discounts for federal buyers**

Still, Petroff admits, some computer manufacturers allow government buyers greater discounts than commercial customers.

"We expect people to be upset, but that's business," says Avner Parnes, Math Box president, adding that 40 percent of his chain's current sales revenues are coming from the Washington OTP store. Under the terms of the contract, Math Box could potentially open two more stores in the Washington area, and one store each in the 10 remaining GSA regions, excluding New York City and San Francisco, which will be bid for separately. The GSA's Petroff says that the GSA is analys-
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ing the remaining regions to determine which could support a computer store. In addition to the three stores already in operation or announced, he says that only "two or three others" look economically viable.

The store's popularity with Washington-based federal employees took the GSA by surprise and caused some early problems for Math Box. The store's stock of IBM PC and XT microcomputers sold out within a week of the store's opening. Math Box consequently fell behind in deliveries, in violation of its contract with GSA. As compensation, the retailer was forced to provide an additional third month of equipment warranties, free delivery and free burn-in testing.

Math Box was able to increase its allocation of the popular IBM models from the manufacturer and diverted inventory from its commercial outlets to meet the unexpected demand. "We were aghast at the early backlogs," comments a GSA official. "But we weren't exactly snow White in this thing either. We failed to anticipate the heavy demand."

Another surprise for the GSA was the relative sophistication of the federal customers. Government officials expected customers to buy off-the-shelf microcomputers and peripherals in single-unit quantities. Instead, reports the GSA, most customers specified exact equipment configurations, including communications software, operating systems and memory capabilities. The average purchase order has been for four to five systems. "No one is walking out of the store with a single stock micro," comments a GSA official.

The computer store program is one part of the GSA's effort to increase the use of microcomputers within government. In 1983, reports the agency, the federal government spent approximately $12 billion dollars, twice the 1978 amount, to buy, operate and maintain 18,000 large and medium-sized computers.

Under a five-year GSA plan begun last year, the government's computer expenditures are expected to reach $28 billion by 1988. The GSA has raised the purchase ceilings on computer procurements, eased some procurement requirements, and introduced procurement schedules specifically for microcomputers and related equipment to speed the introduction of the new, small, more powerful generation of computers into the federal environment.

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**Ashton-Tate, Lotus, Informatics link IBM PCs to mainframes**

*Marjorie Stanzler-Centonze Associate Editor*

Software heavyweights Ashton-Tate, Culver City, Calif., and Lotus Development Corp., Cambridge, Mass., recently joined forces with Informatics General Corp., Woodland Hills, Calif., to develop separate but related products that link their IBM PC software with IBM or IBM-compatible mainframe data. The companies are following a lead set a year ago by VisiCorp, San Jose, Calif., which has a similar agreement with Informatics.

The latest products, called dBASE/Answer and Lotus/Answer, enable users to access and download mainframe data to the microcomputer in a format compatible with the particular software company's products; no conversion of data is necessary.

Users request data by going through a series of menus to identify and select the desired fields and selection requirements. The software then sends the request to the mainframe, where an Answer module extracts the specified information from the database and delivers it to the microcomputer.

Ashton-Tate's dBASE/Answer is compatible with its dBASE II, dBASE III, and Friday database programs and with Framework, the company's integrated software offering. Lotus/Answer delivers data to the microcomputer in a format compatible with the Lotus 1-2-3 and Symphony integrated packages. Installations with both Ashton-Tate and Lotus software need only one mainframe Answer module to mix and match the packages.

Merritt M. Lutz, software group vice president at Informatics, claims dBASE/Answer and Lotus/Answer represent the next step toward micro-to-mainframe integration. "There's been a big hole in the capabilities of the Fortune 1000 companies," Lutz says. "They need the full breadth of data on the mainframe to connect to the most popular personal computer software packages."

Despite a potential market for those types of products, analysts
say sales have yet to take off. “What's interesting about the market is that so many people are talking about how many people want that micro-to-mainframe link and how important it is. But sales just haven't been [as strong] as everyone predicted,” comments Maureen Fleming, senior analyst at International Resource Development (IRD) Inc., Norwalk, Conn.

IRD pegs the 1984 micro-to-mainframe communications market at $450 million. A recent survey of major corporations by the research company concludes that the market may surge to as much as $790 million by 1987.

Ashton-Tate and Lotus are confident their Answer products will start a mushrooming effect in the industry. Ashton-Tate will co-market and co-publish dBASE/Answer with Informatics, according to Ashton-Tate president David Cole. Ashton-Tate will sell to its traditional customer base through its distributors, 55 key dealers in the U.S. and its international subsidiaries. Informatics will market the product to data processing managers at Fortune-1000 type companies through its own direct sales force.

Informatics has exclusive rights to market Lotus/Answer. The two companies have not disclosed the financial terms of the agreement. Informatics will be given access to Lotus' Fortune 1000 account-dealers, Lotus president Mitchell Kapor explains.

While dBASE/Answer and Lotus/Answer offer a new-found freedom to many personal computer users, the three companies share concerns about mainframe data protection which is threatened by unauthorized access by PCs. Both Cole and Kapor say the security features of the Answer products are critical to data-processing managers. “We feel it is necessary to empower end users, but not to the point of sacrifice for the data-processing department,” Kapor states.

**Maintaining data integrity**

Users of Answer products are, for instance, issued an identification number that allows them to access the database at the segment, record and field levels. Microcomputer users can store data in files set up specifically for them. They cannot update the central databases maintained by the data-processing department, Informatics' Lutz explains, because that data is protected.

John R. Hollcraft, data-processing manager for the GTE Lighting Products division in Danvers, Mass., a beta test user of dBASE/Answer, says the security features are essential to the product's success. “There's an obligation to provide access to mainframe data in a secure way such that it does not jeopardize corporate information and that it does not impact existing
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Ashton-Tate’s dBASE III runs on 16-bit micros

While Ashton-Tate’s new dBASE III relational database-management software program for 16-bit and larger machines is an extension of dBASE II, it is an entirely new product with its own documentation. Written in C, “dBASE III is directed toward the future as more powerful, new products emerge,” says Harvey Jeane, vice president of product development.

The package has triggered a dBASE II price cut of about $200, to $495. The dBASE II product runs on 8- and 16-bit microcomputers. The company plans to continue selling and supporting dBASE II for the 8-bit world, says David C. Cole, president and chief executive officer at Ashton-Tate. “We expect dBASE II to remain the dominant database system in the world, since 8-bit machines continue to outsell 16-bit and larger machines in a variety of international markets.”

dBASE III stores as many as two billion records per file, limited by a user’s computer system, and 128 fields per database. As many as 10 database files can be used simultaneously. It offers a command-assistance mode that guides new users through the most common areas of database use. On-line and context help is available in order to make the product attractive to first-time users.

The package enables users to work with English-like commands. It also features full-screen entry, along with modification of data and reports, and the ability to create mailing labels.

The software runs on the IBM PC or PC XT computers and requires 256K bytes of RAM, two 5½-inch diskette drives or one fixed drive and one diskette drive, and the PC-DOS 2.0 operating system.

Programmable servo writer solves portability and cost problems

Carl Warren, Western Editor

A programmable servo writer designed to ultimately supplant units that are more than five times its size and three times its price has been developed by Pioneer Research Inc., Santa Monica, Calif.

The 30-pound, 7-by-19-by-15-inch PR1000 servo writer can create head positioning information for a range of disk diameters from 3½ inches to 14 inches, in any servo format desired. “The unit is designed to be flexible, since no two disk-drive manufacturers have the same needs. This way they can choose the desired format and servo technique,” says Pioneer president Sol Gindoff.

Although rigid-disk-drive manufacturers desire low-cost, portable programmable servo writers, Andrew Roman, vice president of marketing and sales for Cogito Systems, San Jose, Calif., is guarded on the subject of the PR1000’s potential. “There is definitely a need for a more cost-effective way of doing servo writing. But, it [the PR1000] may have the effect of giving some startups false hopes that another barrier to the high-performance rigid-disk business has been knocked down. There is more to making disk drives than writing servo information cheaply.”

But Gindoff says there’s a market beyond just disk-drive manufacturers. “A major problem area has been the repair of rigid drives. Most repair depots can’t afford to have a servo writer.” Typically, once the head-disk assembly is opened and a damaged platter replaced, servo information must be rewritten. “It’s a matter of economies. Right now, the only people who can make such a repair are the drive manufacturers,” says Gindoff.

Not everyone shares Gindoff’s
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There are, of course, many other unique benefits of the MiniFrame system. Convergent provides foundation software for office applications—including a powerful, Wang keystroke-compatible word processor, an advanced financial spreadsheet and complete electronic mail facility.

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CIRCLE NO. 38 ON INQUIRY CARD
opinion. Jim Porter, president of Disk/Trend Inc., Los Altos, Calif., and an industry consultant, discounts the repair market argument. "It doesn't seem that the interest is really there for repairing drives—in most cases it's better to [replace them]," he says.

But Porter points out, in the PR1000's favor, that the bulk of current market products use open-loop servo techniques. "The higher capacity drives are using servo methods, and that is growing, so there is an obvious need [to support servo writers]," notes Porter. Raymond C. Freeman, a storage system industry consultant and president of Freeman Associates, Santa Barbara, Calif., echoes Porter's statement. "The trend is toward embedded servo drives, and the tools have to be in place to maintain [servo drives'] growth."

Features versus price

Jess Rifkind, an Encino, Calif. independent consultant, says a servo writer's features are more important than price. "With servo writers, features are the most important factor. Everyone who does servo writing wants it their way. Virtually every servo writer sold today is customized to meet special needs."

Gindoff agrees. "Everyone wants something different. The PR1000 may look like one machine, but in reality it is several. The user can customize it for virtually any servo writing task desired," he says.

The PR1000 Servowriter is based on an Intel Corp. 8085 microprocessor, has 128K bytes of ROM, 64K bytes of RAM, a front panel keypad for entering the desired servo data, an alphanumeric display and an RS232C interface. The basic unit comprises four functional units: a precision clock writer for writing the reference track; a programmable servo pattern generator (data can be entered either from the keyboard or downloaded from a microcomputer); a programmable servo positioner (also programmed from the keyboard or from downloaded data); and a microprocessor controller for handling the read/write amplifiers and head positioners during the servo process. Volume shipments are scheduled to begin this quarter; the price is under $60,000.

Servo writers: more complex than the disk drive

The purpose of servo information—whether it is on a dedicated surface or embedded in the data surface—is to guide the read/write heads of a disk drive to the proper position. The servo writer is designed to establish the pitch (distance between tracks) and establish the operating characteristics of the drive. The process of creating the critical servo information is far more complex than what it may appear to be, says Theodore Oliver, director of technology for Northern Telecom Inc., Ann Arbor, Mich.

Servo writers are complicated because, Oliver explains, there are a number of critical steps that have to be executed to ensure that a proper pattern is written. An electronic servo writer interfaces with a drive's transducers (read/write heads) to write the servo information without additional mechanical devices.

Besides creating the drive's operating parameters, a servo writer also has the benefit of finding faults in media or transducers. Thus, repairs can be made before the head/disk assembly is sealed. Additionally, the servo writer's electronics handle the calibration of the drive's heads to ensure proper track pitch.

The importance of properly written servo information is amplified on embedded designs. On such designs, each surface acts as its own servo guide.

By contrast, a single-surface, dedicated servo dictates the position of all heads on all surfaces, and as a consequence is more subject to off-track errors due to jarring.

SGS ADDS INTELLIGENT MULTIBUS CONTROLLER

SGS Semiconductor Corp., Phoenix, Ariz., has introduced an intelligent 16-bit I/O Multibus communications board. The SAM-ISCC/8 includes onboard RAM and ROM. Single-unit price is $1,490; discounts are available for volume purchases. SGS has also added an Ethernet enhancement to its 32-port Sampson UNIX-based Z8003 system. That implementation, provided by Excelan Inc., San Jose, Calif., adds eight users per Ethernet board. The cost is less than $200 per user.

MONITRON OFFERS MONOCHROME MONITORS

Monitron Corp., San Jose, Calif., has unveiled a series of monochrome alphanumeric monitors based on its EK 9120, 15.75-KHz, 12-inch monitor. The EK series comprises 5-, 7-, 9-, 12-, 14-, 15-, and 19-inch monitors with horizontal sweep rates of 5.75 KHz and options up to 65 KHz. The video bandwidth of the series is 20 MHz, with options up to 75 MHz. All models have either TTL or ECL inputs. Quantity prices range from $65 per unit for the 5-inch model to $375 for the 19-inch model. The highest possible resolution for products in the series is 1056 dots by 1024 dots.
Cellular telephones promise efficient data communication

Stephen J. Shaw
Washington Editor

Squiggly antennae are appearing on automobile trunks in Washington, D.C. and the surrounding suburbs in ever-increasing numbers. They herald the arrival of the mobile cellular telephone, a new technology that will be available in 30 selected markets by the end of next year. Although cellular systems are designed for voice communications, data-communications applications that allow users to bypass local telephone companies may create a strong demand for the telephones.

Cellular technology owes its existence to increasing sophistication in data-storage techniques, computer-controlled switching systems, and data-transmission methods.

Conventional mobile telephone service uses one or two high-powered transmitters to communicate with car telephones in a 30- to 50-square mile metropolitan area. Cellular technology, developed at Bell Labs, divides each metropolitan area into “cells,” each with its own low-powered transmitter and receiver. Each cell is capable of handling more than 300 calls simultaneously. As the number of users grows, the cells divide into smaller cells to accommodate the demand for service. With low-powered transmitters, the same channels may serve non-adjacent cells.

However, because the voice-communications market is still much larger than data transmission, that’s where cellular operators are putting their emphasis. “Our whole focus had been getting voice customers,” comments an executive with Metromedia Telecommunications Inc., Secaucus, N.J., which is running the nation’s first operational non-wire cellular system in the Washington-Baltimore area. “Never having been really tried, no one really knows the capabilities of cellular data [on a widespread basis],” says the Metromedia spokesman.

The most obvious near-term application for cellular data is portable computers. The increasing popularity of the notebook-sized microcomputers, coupled with the cellular-marketing emphasis on attracting the businessman, means cellular systems could be employed by those who want to access a remote computer with handheld terminals. Another potentially widespread application is remote data entry from areas where it would be inconvenient to use a conventional telephone, such as a land surveyor sending data on boundaries back to the home office.

Million Inc., Washington, D.C., has under development a cellular handset with a built-in RS232 data interface that will allow the unit to be connected with a modem or terminal. The unit is being manufactured by E.F. Johnson Co., Waseca, Minn., which completed its first prototype earlier this year. The handset is expected to become available in mid-1985 at a retail price of approximately $1,500.

Bell Atlantic Mobile Systems, Basking Ridge, N.J., has conducted at least one successful demonstration of cellular data communications running at speeds up to 2400 bits per second (bps). In June, the company used a modem it had designed to relay weather information to the Pentagon through Bell Atlantic’s Washington cellular system. Bell Atlantic was called in after the test’s sponsor, a manufacturer of weather radar systems, could not obtain a conventional telephone line from the local telephone company in time for the demonstration. The cellular link worked so well that the radar company wound up buying several of the cellular phones and data transmission equipment for future use.

Still, there are problems with using cellular technology for data communications. Data transfer, for example, is much more susceptible than voice communications to signal fading, cross-talk and intermodulation interference. The most pernicious hazard to cellular data transmission, however, is the short electronic “blip” that occurs on a channel when its frequency assignment changes to handle a different call. The 200-msec pause plays havoc with the electronic communications. Many computer modems and digital transmission equipment disconnect automatically when the circuit is broken for more than 10 msec, according to a Bell Atlantic official. If the computer does not also disconnect, the data being transferred could be destroyed by extraneous high-frequency noise. According to one estimate, as much as 40 bits of data could be lost when transmitting at 1200 bps.

Dealing with the problem requires sophisticated cellular-tailored data communications protocol and software packages. The basic elements of such solutions are already commercially available, but they need to be customized to operate efficiently.

Given a little experimentation and the realization of the predicted price decreases in cellular equipment and services, data applications could become an important factor in the growth of cellular data. “People look at cellular for voice, and naturally overlook data,” says James Smith, marketing director for Bell Atlantic distributor Atlantic Cellular Telephone Inc. “But the real key for the long-term success of cellular is going to be data.”
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CIRCLE NO. 41 ON INQUIRY CARD
Hewlett-Packard streamlines to provide complete systems solutions

Tom Moran, Associate Editor

After more than a year of planning, Hewlett-Packard Co. has announced a corporate reorganization of its former product-based divisions into four major application sectors. Company officials say the new structure has been designed to provide customers with complete systems solutions.

The Palo Alto, Calif., company also announced the promotion of executive vice president Dean O. Morton to the newly created post of chief operating officer, allowing president and chief executive officer John A. Young to concentrate on broader, longer-range issues. Co-founder William R. Hewlett will remain as vice chairman of the board of the $4.7 billion corporation. HP representatives have denied reports that co-founder and chairman of the board David Packard will retire and be replaced by Young.

Sectors serve HP's markets

The four new sectors announced by HP are: Measurement, Design and Manufacturing Systems; Information Systems and Networks; Analytical, Components, Medical and Technology; and Marketing and International. The company's Finance and Administration division was left essentially untouched by the reorganization.


The Information Systems and Networks sector includes the Information Systems, Personal Computer and Information Products groups. The Information Systems group will provide business computer systems, while Information Products will produce peripherals and networks. Newly elected executive vice president John L. Doyle directs this sector.

HP Labs and the Corporate Engineering and Corporate Manufacturing groups fall under the Analytical, Components, Medical and Technology sector, as do the Components, Analytical and Medical groups. The latter three groups' sales functions were already aimed at complete customer solutions and weren't changed. This sector, which contains many of HP's most important operations, was placed under the direction of Paul C. Ely, Jr., an executive vice president since 1980.

The Marketing and International sector comprises the European Operations, Corporate Marketing, Major Accounts, and Intercontinental Operations groups. Recently appointed executive vice president Richard C. Alberding is responsible for the sector.

According to Young, the organizational changes will improve HP's ability "to provide our growing customer base, and especially our major accounts, with fully integrated product solutions drawn from anywhere in the company." Young says that HP's new market-oriented structure will make it easier to focus on customers' needs, but still allow for "single-product solutions in a more traditional selling environment."

'Error Signal' led to reform

The new chief operating officer, Morton, sees the changes as by no means complete. "The context and certain organizational principles have been established, but detailed decisions about precisely how we organize to do particular marketing or sales functions are still being
Hewlett-Packard's realignment into four new operating sectors is intended to more closely fit the company's sales and marketing structure to customer needs. Previously, some customers had to deal with several different divisions of HP to obtain a complete systems solution. The company's Financial and Administration sector has not been affected by the reorganization.

made. I think we felt we were sub-optimized, that having [one] organization for instruments calling on a particular customer, and one for computers calling on [the same] major customer, caused some organizational binds that were not always totally productive. We want to be sure that, as customers look at HP, they see one company.” Morton says that HP tries not to let the organization get in the way [of selling to customers]. “But when you find that you have to patch things, or you have to impose team efforts that don’t naturally fall out of the organization, it’s an error signal and a sign that you have to look at the way the fundamental framework is set up.”

David Crockett, president of the research concern Dataquest Inc., of San Jose, Calif., says of the long-planned HP reorganization: “It has taken maybe even longer than they have anticipated to implement fully. HP has a good share of the pieces, but they existed in different product groups.”

Crockett says that the changes are very positive and that dissatisfaction with the company’s performance was not an issue in the realignment. “If you look at the record, HP has had a very good growth rate, they have evolved their organization over time, they have adjusted the entrepreneurial strategy over the years, and have consistently made groupings of divisions to reflect the market.

“I view [the recent reorganization] as an extension of a trend that has been going on [at HP] for roughly 14 years,” he continues. “They’ve made a management change much in the way that IBM [Corp.] makes management changes—by doing it before there’s a problem, always looking for an organization to reflect the marketplace and the size of the company.”

Financings

Excelan Inc., San Jose, Calif., recently received its second round of venture capital funding. The $4.5 million will be used for producing the company’s Exos Ethernet processor boards and the Nutcracker local area network development and management system....At press time, Gavilan Computer Corp., Campbell, Calif., was working out a deal to bring in as much as $8 million in additional venture financing; the company has so far received about $30 million in venture capital for manufacturing and marketing of its portable computer. Delays in the computer’s shipping, which is now underway, caused Gavilan to lay off more than 70 of its 300 employees in June...Microrim Inc., the Bellevue, Wash., manufacturer of R:base relational database software for microcomputers, has closed a $5.3 million private stock placement.
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Advent of venture capital may fuel Taiwan’s high-technology businesses

Charles W. Hintermeister
Taiwan Correspondent

Venture capital, that glamorous, versatile and risky mechanism by which many of today’s successful high-tech companies originally were financed, has debuted in Taiwan. The establishment of Taiwanese venture-capital companies, and the anticipated arrival in Taiwan of at least five foreign venture capital outfits, falls in with the Taiwanese government’s goal of internationalizing the island’s young high-tech industries.

Taiwan’s first such venture capital company, Multiventure Investment Inc., is putting $750,000 into the establishment of MOS Electronics Corp., Republic of China (Mosel-ROC), which will produce the first Taiwanese very-large-scale-integration (VLSI) chips. Test production of CMOS 16K S RAM chips is underway. The chips will initially be manufactured by United Microelectronics Corp., Taiwan’s largest maker of integrated circuits, and then by Mosel-ROC when its planned factory is completed. Total investment in the new corporation — mostly earmarked for building the factory — is said to be $40 million, although Multiventure would not confirm this figure.

The Multiventure deal indicates that Taiwan’s computer industry, which grew 235 percent from 1982 to 1983 and rang up export sales of $383 million, may get the bulk of venture-capital funds from multiple sources expected to become available over the next several years. The United States is Taiwan’s largest trading partner.

Taiwanese companies could use the help on several fronts. Most of the island’s computer companies are seriously under-capitalized; the majority are capitalized at less than $1 million. And most companies spend little on research and development, as evidenced by a recent Taiwan Industrial Development Bureau proposal to have those companies spend at least 1.5 percent of revenues on R&D, a fraction of what most U.S. companies spend.

U.S. partners give expertise

U.S. companies that are now reportedly considering setting up venture-capital operations in Taiwan include such major corporations as Catalyst Technologies Inc., Citicorp and TA Associates. Irving Ho, vice chairman of Taiwan’s National Science Council and newly-appointed president of the Institute for Information Industry says, “Foreign venture capitalists will be able to offer local computer firms the benefits of their relatively longer experience in venture financing and their connections with foreign firms.”

Likewise, Taiwanese venture-capital companies are aiming to offer U.S. and European high-tech corporations their knowledge of Taiwan’s business environment and connect them, if necessary, with appropriate manufacturers. Stan Shih, president of Multiventure, estimates that half or more of Multiventure’s total investments will be in U.S. businesses. Shih, who is also president and chairman of Multitech Industrial Corp., a Taiwanese computer maker, says that capital gains on Multiventure’s U.S. investments will likely be re-invested in other U.S. companies. According to Multiventure vice president Jeff Chen, it is already involved in the financing of several U.S. integrated circuit design companies. Investment in U.S. companies designing 32-bit computers is also a strong possibility, he says.

Investments bring in technology

A chief reason Multiventure is investing in U.S. companies is that it hopes to attract technology to Taiwan via lucrative OEM deals. Shih says that computer products developed in the United States are considerably less likely to run into patent or copyright infringement problems than if they were developed in Taiwan.

Shih says that when Multiventure invests in a firm, it will often do so in conjunction with a second venture capital company, possibly one from the United States. One of the main reasons for this is that no Taiwanese venture capital firm may legally invest more than 15 percent of its total registered capital in any single enterprise.

Beyond OEM business

Underdeveloped distribution
channels, poor marketing and insufficient funds for foreign promotion have long plagued Taiwanese electronics and computer manufacturers, obliging even the largest among them to rely heavily on OEM business. More than 70 percent of computer exports from Taiwan last year were conducted on an OEM basis. Although the Taiwanese government is encouraging the continued development of the OEM sector as a necessity to gain international recognition of Taiwanese brand names, OEM manufacturers often find themselves with slim, and sometimes non-existent, profit margins. Also, the technology transfers that Taiwanese OEM manufacturers desire often don't materialize.

The Taiwanese government has for some years recognized the need for more versatile forms of financing than have been available from Taiwanese banks. It has set up a number of special funds for the island's high-tech industries. The Bank of Communications, following a reorganization in 1979, began financing high-tech projects, as have the China Development Corp., a large trust company, and the Development Fund of the Executive Yuan. Although the Taiwanese government is encouraging the continued development of the OEM sector as a necessity to gain international recognition of Taiwanese branch names, OEM manufacturers often find themselves with slim, and sometimes non-existent, profit margins. Also, the technology transfers that Taiwanese OEM manufacturers desire often don't materialize.

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While these organizations have done much to aid the development of industries they consider essential to the island's economy, they have tended to avoid the riskier product-specific investments in which venture capital companies specialize. For instance, out of a total of $33.6 million in investments made by the Bank of Communications between July 1982 and May 1984, only $2.2 million was invested in the information industry. The China Development Corp., according to one of its officials, placed only about 1 percent of its total investments last year in the computer industry.

One of the chief reasons that the U.S. venture capitalists have not yet formally applied to set up Taipei offices is uncertainty over the crucial issues of capital gains tax and repatriation, says Ted I, president of Investee (Taiwan) Ltd., a consulting company that acted as advisor to Taiwan's Ministry of Finance in formulating venture capital regulations.

The latest government interpretation of the relevant regulations, though not final, holds that corporate investors are subject to a capital gains tax of 20 percent, but that wholesale repatriation of capital gains may be allowed by the Ministry of Finance on a case-by-case basis. Ted I says the 20 percent tax to be levied on foreign corporate investors may seriously lessen the attraction of entering the Taiwanese venture-capital industry.

**PRECISION VISUALS ANNOUNCES GKS LIBRARY**

Precision Visuals Inc., Boulder, Colo., has officially climbed onto the Graphical Kernel System (GKS) bandwagon with the introduction of the GKS-2000. This subroutine library supports more than 80 output devices and adheres to the basics of the GKS standard. The package prices are based on machine size, and range from $4,500 to $21,000. An implementation for a DEC VAX-11/780 is about $8,000.

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CIRCLE NO. 45 ON INQUIRY CARD
Can Apple fill a bushel basket with Macintosh software for Japan?

Lori Vallgra, Senior Editor

Apple Computer Inc. recently took its aggressive campaign to sign up independent software sources for the Macintosh microcomputer to Japan.

Although the company hopes to replicate the successful Apple II microcomputer third-party software strategy—which resulted in 17,000 packages from independent programmers—with the Macintosh in the United States, its ambitions in Japan are more modest. "Our goal is to establish our presence and be known as a high-technology, high-quality provider of personal computers," explains Joanna Hoffman, international marketing manager for Apple's Macintosh and Lisa 32-bit microcomputers. "We will not gain substantial market share for two to three years."

Apple introduced its Macintosh technology to an audience of 100 Japanese independent software vendors in May. In late June, the company held a technical seminar, attended by 40 software developers and dealers that have programming staffs. By August, says Hoffman, four of them had purchased equipment at a 30-percent to 50-percent discount.

Independents are key

Apple's success with the Macintosh is instrumental to the company's future growth, according to analysts and Apple officials (MMS, February, Page 71). The Cupertino, Calif., company already has spent $70 million on research and development for its 32-bit Lisa and Macintosh microcomputers, and has spent more than $25 million in U.S. advertising in the first quarter of this year. Apple sold 72,000 Macintosh computers in the first 100 days the machine was on the market. By comparison, it took the Apple II two and one half years to reach the same figures. Apple officials have said publicly that the company hopes to sell 250,000 Macintosh computers in the United States by the year-end.

The company's U.S. application software efforts center on independent software producers, whom Apple officials credit with being a major part of the product's success. An Apple representative reiterated that theme to the Tokyo audience in late May. "We are sincerely interested in your success, because it is necessary for ours," Dan Cochran, product marketing manager for Macintosh third-party software, told the audience. "We need you more than you need us," Cochran said.

Hoffman explains that most software for the Apple II in Japan is not

**BUSINESS DEMAND DOUBLES IN JAPAN'S BURGEONING SOFTWARE MARKET**

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**Source:** "PCS IN JAPAN," U.S. Department of Commerce National Technical Information Service

Business use of personal computers should continue to gain over hobby use, indicating a demand for more business software. Business use of microcomputers may be as high as 40 percent now.
for business use, because Apple never modified the machine or the software to meet Japanese language requirements. Users of the Macintosh, however, most frequently request word-processing and database programs, says Hoffman. All functions required to design and produce sophisticated applications are resident in Macintosh firmware, Cochran explains.

The quest for Kanji

Apple's goal is to get Japanese programmers to produce business software in the Kanji "alphabet." Ideogramatic Kanji is one of three "alphabets" (actually syllabaries) used in Japan. It requires high-resolution screens and printers to produce a clean image. Another popular "alphabet" is Katakana, which translates foreign words into Japanese phonetically.

For its part, Apple plans to modify basic Macintosh software tools for use in program development, but has not decided which ones yet. Hoffman says MacWrite and MacPaint software probably will be modified into Katakana. The company also is translating the Macintosh's documentation into Japanese. A Katakana version of the Macintosh with a fully-translated manual should be available by now.

Hoffman elaborates that any translating related to art work is done in the United States, while language-specific modifications are performed in Japan at Apple Japan, a company subsidiary. Apple Japan also is charged with handling third-party developers, and supporting sales made by Apple's agent, Canon Sales.

Coming from behind

Apple faces its stiffest competition from NEC Corp. An NEC spokesman says his company holds a 45-percent share of the microcomputer market and has contracts with more than 35 percent of the personal computer software houses. To make some headway into NEC's territory, Apple is promising support that it claims is unequaled by other U.S. manufacturers. "We are the only U.S. hardware manufacturer supplying a high level of technical support to software developers," Cochran says. Technical support is done both on-site and via hot line to Canon and Apple Japan.

NEC has a low-end computer called the PC-100 that competes with the Macintosh. It uses a mouse and has windowing capability. "We are looking at it closely and evaluating it to see what they [NEC] did right," such as their word-processing software, states Hoffman. Hoffman expects Apple's high level of technology to attract the knowledgeable Japanese users. "Our technology is so far ahead, we can compete on this basis. There has never been an Apple in Japan to put in a technological counterpoint to NEC or Fujitsu," elaborates Hoffman.

Differences in language and in how jobs are performed pose the major challenges to U.S. companies trying to sell software in Japan. Attending to those distinctions with programs tailored for Japanese users will determine a product's, and company's, success.

Some differences in the Japanese and U.S. markets were outlined by William Smale, executive vice president of Software International Inc., a Tokyo software modification company and reseller, in an article in The Journal of the American Chamber of Commerce in Japan. Last year, he said, U.S. retail sales of microcomputer software matched that of hardware. In Japan, however, hardware outsold software by 90 percent, he said.

Smale points out that the Japanese software market lags behind that of the United States because of the relatively small market size and lack of standardization. There are many standards in Japan, because each major hardware manufacturer offers its own operating system. Smale notes further that more than 1.2 million copies of CP/M and MS-DOS operating systems are used in U.S. businesses, while only 10,000 of these standard operating systems are in use in Japanese offices. This means that software developers are writing to several standard operating systems.

It is relatively expensive and time-consuming to address the comparatively small Japanese market, Smale writes. In Japan, only 20 percent of the $100 million in software sold in 1983 was for business. For example, he notes that suppliers of a best-seller in the United States, such as dBASE II or MicroPlan, with retail prices of about $700, will ship about 50,000 copies of that software a year. In Japan, a maker of a popular file manager priced at about $200 will be able to ship about 4,000 copies.


Modification is not limited to code. Documentation must not be merely translated, but modified to include phraseology and methodology used when performing tasks in Japanese offices.

All this modification takes time. Presuming the product is right for the market, says Smale, the maximum time for the developer to create a Japanese version is four months.
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Software publishers toughen stand against pirates and pilferers

Industry battles huge revenue losses by supporting stronger legislation and developing anti-theft techniques

Marjorie Stenzler-Centonze
Associate Editor

The unauthorized duplication of software may be siphoning billions a year in sales from software publishers, distributors and dealers, according to industry estimates. Software publishers say that for every package sold, between two and 15 unauthorized copies are made.

Software vendors are joining forces to combat pilferers—who make copies for their own use or for acquaintances—and pirates—who duplicate disks for resale. The vendors' goal is to combine public education with clearer legislation, better law enforcement and more sophisticated software protection schemes to make copying more difficult. Their get-tough policy is designed to ensure self-preservation and keep the industry growing, publishers say. Most at jeopardy is the microcomputer segment of the software industry. At stake, according to International Data Corp., the Framingham, Mass., research outfit, is a business that accounted for revenues nearing $2 billion last year and which could gross more than $5 billion by 1986.

While software publishers acknowledge major pilferage and piracy problems, they agree it is difficult to assess exactly how much illegal duplication exists. In fighting the problem, "We don't really know if we are using a sledge hammer to drive in a thumbtack or a two-ounce hammer to drive in a railroad spike," comments Marvin Goldschmitt, vice president of business development for Lotus Development Corp., Cambridge, Mass. "We hear estimates that, for every..."
"We hear estimates that, for every legitimate software product sold, between three and 10 copies are made," says Marv Goldschmitt of Lotus Development Corp. "If that were the case, there would be a whole lot more personal computers in use than we thought there were."

David Cole, president of Ashton-Tate, of Culver City, Calif., says of trying to estimate pilferage, "We [monitor] support telephone calls for redundant serial numbers. We track the requests for technical and customer support, and we see a huge volume of calls from people who have unauthorized copies of our software."

Cole, who also is head of the Microcomputer Software Association, believes the pilferer represents a bigger threat than the pirate, who duplicates for resale. Pirates are visible and easily prosecuted, while users who duplicate disks to share with friends may not even be aware they are committing a crime. They may view copying as a legitimate way to offset the cost of software, he says.

A strong motive for software copying is the feeling among many users that software is overpriced, and that software houses are all making "billions of bucks," says E. Ric Giardina, executive director and general counsel at MicroPro International Corp., San Raphael, Calif. "But the last several months' returns for major software companies have pretty much burst that bubble," he claims.

High-priced packages suffer most

Although high prices may fuel pilferage, the resulting losses, in turn, drive prices higher. Ashton-Tate's Cole figures that software prices could drop by as much as 30 percent if the industry were to wipe out pilferage.

Goldschmitt of Lotus warns that losses could drive prices even higher. "If we acted on the belief that the numbers being bandied about the marketplace on illegal disks are correct, then software could be priced at two to three times today's costs," he says.

Lotus and many other companies selling higher-priced business software report more pilferage than companies with products focused on the low end of the market. For example, Software Publishing Corp., Mountain View, Calif., which prices its top-selling PFS series of software in the moderate $100 to $150 range, claims to experience little trouble with illegal duplication.

Signe Ostby, director of marketing at Software Publishing, believes its packages' comparatively moderate prices and popularity with novice users discourage pilfering. "The more experienced users who go after products like Lotus 1-2-3 or WordStar are much more likely to break copy protection," Ostby says. "With our prices as reasonable as they are, users feel it makes sense to get their own copy of the software, complete with documentation, support and product upgrades."

Software vendors start to fight

Wiping out piracy and pilferage is a long road beset with legal issues, moral issues and technical problems raised by software-protection techniques. The Association of Data Processing Service Organizations (ADAPSO), the Washington, D.C.-based, non-profit trade association, is rallying its members to help control the software duplication problem.

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"We [monitor] support telephone calls for redundant serial numbers," David Cole of Ashton-Tate explains. "We track the requests for technical and customer support, and we see a huge volume of calls from people who have unauthorized copies of our software."

"People have to feel it's just as wrong to pilfer software as it is to take a package off the shelf and walk out without paying for it."

**Introducing legislation**

Promising help is bill H.R. 4646, introduced this year by Rep. Barney Frank, D-Mass., which is designed to increase the pursuit of offenders by raising the penalties for willful or criminal infringement of software copyrights. The bill proposes five-year jail sentences for those who make 65 copies of a program within 180 days. Those who make fewer copies could receive two years in jail and a $250,000 fine. No companion bill has been introduced in the Senate, however, and H.R. 4646 is likely to languish in subcommittee for the remainder of this congressional session. Sources expect the bill to resurface next year.

While clearer laws and stricter enforcement should cut down on illegal disk duplication, legislation won't end the battle in the opinion of industry observers. "People will always break the law, no matter what it says, when it comes to something as easy as copying a disk," argues Kenneth T. Lim, an analyst for Dataquest, Cupertino, Calif.

Although methods to prevent disks from being copied are improving, they are far from perfect (MMS, April, Page 109). "Most of us do some sort of protection now, but the fence on the property hasn't been tall enough," Lotus' Goldschmitt quips.

One solution may lie in developing a basic software protection methodology. But it still should allow users to: copy software for backup; use both flexible and hard disks; use packages in a network and transfer them from one machine to another.

ADAPSO's approach is to define an overall protection context. Its Software Protection Committee is currently reviewing the design specifications of a protection mechanism it intends to place in the public domain that could be used for all popular machines, Ashton-Tate's Cole says.

Specific implementation will be left to software vendors. "We do not see everyone using the same protection," Lotus' Goldschmitt says. "But we do think that there are certain basic elements on the hardware side . . . that everybody would want."

Vendors also predict that the percentage of users capable of breaking copy-protection schemes will de-
increase. "Certainly, as we move down the pyramid of sophistication to a wider user base, we are getting people less likely to break copy protection," MicroPro's Giardina, points out. Dataquest's Lim agrees: different suppliers will interface with various protection schemes.

**Networks create additional problems**

Although sophisticated protection devices are beginning to impede software pilferage, some additional areas for concern loom. "Unquestionably, there are problems to come with networking," says Ashton-Tate's Cole. One is determining how software from different suppliers will interface with various protection schemes. Cole cautions software publishers to be sensitive to the user's need for flexibility. "Users need to be free to select products from several different vendors without battling protection schemes that are fundamentally incompatible with one another."

On the positive side, Cole notes that network vendors are including features that will make it easier to protect software in the networked environment. For example, local area networks being released this year will have unique serial numbers on board each station that can be used to limit access to software.

MicroPro's Giardina contends that software vendors can combat many of the pilfering problems networking presents only by emphasizing the advantages of ties between user and vendor. Since networking makes it possible to acquire software updates and instructions, it will be more critical than ever for software vendors to excel in service, Giardina says.

Lotus' Goldschmitt agrees that how a company supports its customers may ultimately be most important. "If we service our markets well and start shifting the value [from] the disk to the relationship with our company through support, then the problem will diminish," he says. "It will never go away—it will just be controlled."
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Utility software streamlines program development and operation

No longer simple scraps of code, software utilities are becoming integral to development languages and operating systems

Carl Warren, Western Editor

Serving as specialized tools for software development, utility programs are maturing into complex applications. In addition, utility software—ranging from simple sorting algorithms and routines that control peripherals, to screen generators that define complex data formats—has become integral to many development languages and operating systems.

The most representative example of the integration of utilities as part of system software is the UNIX operating system. In fact, UNIX could be described as a superior set of utilities composing a rich software-development environment. “The key to achieving a high level of program productivity is the environment. UNIX provides this by incorporating a wide range of utilities that take the burden off the programmer,” says Robert Anton Byers, an independent software engineering consultant based in La cresentia, Calif.

But admiration for UNIX tools is not unanimous. “Because UNIX has been around for a long time and universities and the scientific community have been encouraged to use it, a lot of functions have become part of the total UNIX environment,” observes Don Baccus, president of Oregon Software Inc., Portland, Ore. But longevity doesn't imply superiority, he contends: “Clearly, many UNIX utilities taken alone are inferior to those found as separate products on the commercial market. Each utility in UNIX represents the capabilities of its creator. Thus, the quality varies.”

Because so many UNIX utilities exist, though, many computer manufacturers are migrating toward UNIX—not only to provide a powerful operating environment but also to ease software development. One such company is SGS Semiconductor Corp., Phoenix, Ariz. Director of systems Jean-Claude Monney contends that UNIX has spared the company from many extra hours of programming. “We make serious use of the system-level utilities UNIX provides,” he says. “Because we have in-depth knowledge of both the system hardware and UNIX, we can enhance the operation of the software. For example, our word-processing software makes use of the UNIX utilities for sorting and for a spelling dictionary.”

Despite the praise, Monney is quick to note weaknesses among the operating system's 120 utilities. For
example, SGS had to modify the tool that allows UNIX machines to communicate. “Since this is basically a public-domain program, it had some problems that we [legally could] fix, and now we have a powerful tool in the utility library,” explains Money.

Building special-purpose tools

Besides containing a large library of integrated utilities, UNIX lets programmers create other utilities to solve specific problems. UNIX's command-language utility, another integrated function, also provides this capability and includes pipes and filters that can redirect output and delete or add specific characters, including control codes. UNIX also allows programmers to call additional utilities that can perform yet other actions during piping.

Such tools are now appearing in operating systems besides UNIX. For example, Microsoft Corp., includes many UNIX concepts in its MS-DOS operating system and its IBM PC version, PC-DOS. Programmers can use functions built into the MS-DOS/PC-DOS environment to create utilities much as they would under UNIX, comments Richard Steincross, a free-lance hardware engineer and president of RMS Laboratories, Long Beach, Calif., “Frequently, it is necessary to create a new tool,” he says. “The result is a function-specific utility.”

For example, a simple utility that reads a directory and pipes data to a blank portion of a disk could be specified under MS-DOS/PC-DOS as “COPY *.* NUL” and could command the system to write all files to a null area of memory. Programmers can just as easily create tools to sort files and direct them to other devices. That's the beauty of a utility-oriented operating environment, Steincross and Byers emphasize. “No matter how good the utility library is, there is never exactly the function needed for a unique situation,” says Byers. “Therefore, having the ability to create exactly what is needed is important. UNIX and similar operating systems such as MS-DOS provide that capability.”

Languages establish the environment

Many software experts contend that programming languages establish the development environment. Removing the programmer from “the intricacies of the machine” is the “goal of a modern high-level language,” says Dave Cloutier, vice president of marketing for Oregon Software Inc. of Portland, Ore., which creates Pascal compilers for Digital Equipment Corp. (DEC) machines.

The task is no longer as simple as creating a compiler, he maintains, and developers need the help that only specialized utilities can give. “Now, we concern ourselves with how to properly document the source code, manage the program in the creation process, locate points that need to be optimized and locate bugs. Thus, we have to create other utilities that handle these functions,” Cloutier explains. “In some cases, they are an integrated part of the compiler, and, in others, separate programs.”

One product Oregon Software has created to improve programmer productivity is Pascal-2, for DEC's VAX and MicroVAX computers running the VMS operating system. The key to Pascal-2's implementation is that it remains the same across a variety of machine types, so linking, compiling, editing and debugging facilities remain consistent. The company also provides other elements of a complete development environment, including a range of supporting utilities. For example, its Profiler utility allows users to pinpoint where the CPU is spending most of its time, thus allowing the code to be optimized to enhance CPU operation.

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Bloomfield, Conn., creates applications with help from utilities in the environment created by Lotus Development Corp.'s Lotus 1-2-3 integrated package. Although 1-2-3 is usually described as an application package, some programmers argue that it's a specialized software-development language. DSS company president Ian A.R. Boyd explains that 1-2-3 shoulders the burden of sorting and of manipulating data in the data file, much as a high-level language does.

**Utilities improve performance of other software**

Software developers can often enhance a program's performance by taking advantage of features in both computer operating systems and languages, contends Richard Heaps, director of marketing for Oracle Corp. The Menlo Park, Calif., company makes the Oracle, a database-management system. What we call Oracle is really two things: the database kernel and a set of utilities that allows manipulation of the data file," says Heaps. "In some cases, we rely on the [operating] system to provide us with certain functions. In the VAX world, this is possible, and we can rest easy [knowing] that system functions such as 'index' will remain relatively stable from one VAX installation to another. The problem occurs when you plan to be portable across many machines. As a result, you have to build various utilities into the application."

Even though it thwarts consistency, using existing operating system utilities is sometimes more logical than creating new application program utilities, Heaps says. This is true especially when maximum speed is required. However, because operating system utilities differ—even among UNIX implementations—the application will be less portable, requiring the software developer to modify it for each type of machine. When speed is less critical, embedded application program utilities, such as screen builders maintain, portability across many machines.

Some software tool makers create a development environment by providing a complement of operating systems, languages and high-level utilities that function together. One company following this philosophy is Digital Research Inc., Pacific Grove, Calif. Defining a utility as an aid to programmer productivity, Lowell Wolf, a Digital Research product marketing manager, points to productivity as a key issue for the software industry. "The growth of the industry hinges on the number of skilled programmers," he says. "We can provide tools to leverage the growth." Modern software tools, Wolf explains, are actually combinations of many simpler tools.

Both Wolf and Oregon Software's Baccus assert that tools, especially utilities, are worthless unless they are easy to use. "We have spent a great deal of time ensuring that our products have a simple learning curve," claims Wolf. Toward that end, Digital Research has developed a standardized environment, which retains much consistency from one kind of computer to another. "We try to remove the learning-curve obstacle," says Wolf. "As a result, we are putting more emphasis on the user interface. This isn't for end-user consumer products, but for development tools."

In addition, Digital Research is—like Microsoft—creating standard utility tools that enable software writers to locate problems quickly. The company also plans to include these utilities in supersets of development languages. "These 'super languages' don't currently exist," Wolf states, "but they are the next step up the ladder."

**A 'building-block' approach helps**

Even now, developers can save time by using a standard set of products from one vendor to create an application. To this end, Digital Research has developed a series of tools that can be linked to create applications. "By providing the proper tools, we can improve the overall productivity of a programmer," claims Wolf.
Chas-Moore Inc., Bakersfield, Calif., is taking a similar tack with its XT-Driver, a series of utilities. According to company president Charles Moore, the product is not just a utility; it is also an application that extends the usefulness of the IBM PC. XT-Driver features password protection, a directory manager, a message center, a user-tracking log and a programmable calculator.

Still another company building packages from small utility modules is Softcraft Inc. The company's BTRIEVE file-management system combines such utility functions as sorting, file compression and key indexing. Moreover, BTRIEVE/N incorporates local area network handlers with file lockout and multikey access.

**Have utilities become applications?**

Utility software has so matured that the dividing line between utilities and applications is blurring. Because these tools are so vital to the total system, many software developers are creating products based on utility functions that work with other applications. Examples include the products from TouchStone Software Corp., Seal Beach, Calif. According to company president Larry W. Dingus, the company's aim is to improve the usefulness of the computer. Stressing the overlap between applications and utilities, he notes: "Today's utilities serve as complements to—and are complemented by—the rest of the system."

Bernd Walter, president of Advanced Software Technologies, Bloomfield, N.J., concurs. "A utility serves the role of a system assistant and, as such, must be carefully integrated into the development strategy." Walter agrees that utilities are becoming more application-like and, as a result, now often include features to make them easier to use. For example, in creating the Micro/VERSAL utility program, which reads and writes more than 20 types of 5½-inch CP/M-80, CP/M-86 and MS-DOS disk formats, his company decided to include a menu-user interface, rather than producing just a bare-bones software tool. Micro/VERSAL also provides developers with disk-handling routines that can be customized to handle "foreign," or unknown, formats.

The future of utility software is unclear. What is clear is that the trend to free programmers from dealing with the basic machine, by creating a programming environment. "It has been the goal of the computer industry to remove the programmer from the machine for the last 20 years," says Oregon Software's Baccus. "Therefore, it is incumbent on us, the tool makers, to help create an abstract programming environment... by developing sophisticated high-level languages." Rather than simply creating utilities, he emphasizes, "We are trying to improve the utility of the machine."
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UniSoft has been delivering AT&T's UNIX adapted for 68000-based microcomputers for two years. More than 75 different computer systems run the UniSoft software, UniPlus+™. At each Bell release level, all these systems are object code compatible. This means that applications software developed on any UniPlus+ system will work on any other. This is where software portability pays off.

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If you're building or selling a 68000-based UNIX system, your operating system should come from UniSoft Systems, the UNIX experts.

THE BERKELEY PORT AUTHORITY

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New Tested Pairs

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OEMs face major problems trying to decide which hard disk drives to build into their microcomputer systems. What with the wide range of drives, and so many hidden costs associated with evaluation, testing and integration, the process becomes a time-consuming and costly hassle.

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With its new tested pairs program, Xebec solves a major industry problem: post-delivery drive failure when interfaced to the controller. Having to do "after the fact" drive testing for many of our OEM customers, we have decided to offer a “before the fact” program. We'll guarantee quality and reliability by assuring a match between our zero defect controllers and a choice of drives in different capacities and form factors.

It's simple. Tell us which drives you're considering and we'll test them on Xebec-designed equipment against the most rigorous standards in the industry. Standards we at Xebec have set. Then we'll tell you which of our controllers is the best match for that drive—or we'll customize a controller for you—and accelerate your time to market.

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command set and other performance and reliability features.

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We were recently asked to design and build a disk drive tester for one of the world's largest OEMs. We'll be using that tester to analyze disk drive performance for you. Full environmental testing, including shock and vibration. Full functional testing at elevated temperatures, with read/write tests at marginalized voltages. Careful calculation of hard and soft bit error rates. Complete checking of FCC and other agency emission standards. We'll make sure any drive meets its stated specifications and performance and quality claims.

How Xebec Does It. And Why.

Xebec can offer its tested pairs service to OEMs because of our commitment to quality. Zero defect quality symbolized by our “Xero D” signature and demonstrated by our superior computer-aided design, manufacturing and testing. Our talented people. Our experience. That's how we can provide high-quality products for prices no more than products that deliver a lot less.

Why offer our tested pairs? Why originate a new concept in quality? Enlightened self-interest. Because if we don't, someone else will. Frankly, we want to continue to enjoy the benefits of our leadership position as much as our customers do.

Call Xebec today. Pair up with one of our representatives to find out more about how Xebec tested pairs can benefit you.
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CMOS provides a cost-effective solution for harsh industrial environments

Although slightly more expensive than NMOS, CMOS technology can be a better choice for factory applications requiring low power dissipation and portability

Steven McGinness, National Semiconductor Corp.

Board-level monitoring systems for applications in harsh industrial environments—such as pipeline monitoring and control, food processing and robotics—must meet demands different from those of office systems. Unlike systems in clean, air-conditioned offices, factory systems must be capable of high uptime in widely fluctuating temperatures and continue to work during power failures. Developers of these systems must also consider such matters as power dissipation and form factor.

To meet the needs of factory environments, developers of industrial systems traditionally choose N-channel metal-oxide semiconductor (NMOS) technology because of its high level of performance. However, it is not cost-effective for all applications. What's more, because NMOS devices are so power-hungry, they are infeasible for applications requiring portability.

An alternative—but traditionally more expensive—choice for industrial environments is complementary metal-oxide semiconductor (CMOS) technology. A drawback of CMOS is that it permits fewer devices within a die area, thus requiring more space per board and more boards. However, thanks to the scaling down of the CMOS designs, newer CMOS circuits are nearly as compact as—and only slightly more expensive than—NMOS circuits.

<table>
<thead>
<tr>
<th>MULTIBUS SOLUTION</th>
<th>CIMBUS SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>No. of boards</td>
</tr>
<tr>
<td>$1,843</td>
<td>3</td>
</tr>
<tr>
<td>0 C to 55 C (32 F to 131 F)</td>
<td>Enclosure</td>
</tr>
<tr>
<td>159</td>
<td>NEMA 4</td>
</tr>
<tr>
<td>190</td>
<td>Power dissipation</td>
</tr>
<tr>
<td>30</td>
<td>Card cage</td>
</tr>
<tr>
<td>554</td>
<td>Installation*</td>
</tr>
<tr>
<td>15</td>
<td>Power supply</td>
</tr>
<tr>
<td></td>
<td>Installation*</td>
</tr>
<tr>
<td></td>
<td>Cooling fans</td>
</tr>
<tr>
<td>48</td>
<td>Integration*</td>
</tr>
<tr>
<td>12</td>
<td>Vents and filters</td>
</tr>
<tr>
<td>15</td>
<td>Installation*</td>
</tr>
<tr>
<td>1,300</td>
<td>Backup source</td>
</tr>
<tr>
<td>uninterruptible power supply</td>
<td>65</td>
</tr>
<tr>
<td>1 hour</td>
<td>Backup time</td>
</tr>
<tr>
<td>$4,181</td>
<td>Total costs</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Installation costs include the hourly rate of assembly personnel, plus the burden of employing them (health and insurance benefits, holiday pay, etc.). Hourly rate used is $5, and burden rate is 200 percent.

Source: National Semiconductor Corp.

A CIMbus monitoring system required more boards than a Multibus system would have, but using CMOS chips eliminated the need for installing a separate power supply and heating and cooling equipment.
Building a factory-monitoring system

Developers at National Semiconductor Corp. performed an internal comparison of a Multibus application using NMOS and an application using the company's CMOS industrial microcomputer bus (CIMbus). The CIMbus is a synchronous bus with 64 lines replicating about 30 of the functions of National's NSC800 microcomputer bus, while adding required timing and control signals. It incorporates a system-level, fail-safe timer that informs the rest of the system whenever the microcomputer fails. This allows the other boards to reset, disengaging machinery in an orderly way.

The developers of the board-level industrial monitoring system at National wanted it to provide two basic functions: to monitor a factory environment and to provide intruder-alarm and entry control. Specifically, the system had to monitor temperature sensors, heating and air-conditioning systems, the flue angles in the building's ventilation system, the magnetic switches on all doors and windows and the door locks and intrusion alarms. It also had to allow data entry via badge readers and keyboards and the setting and resetting of entry-authorization codes. In the event of a power failure, the system had to continue to run the alarm and entry-control functions.

To perform all these tasks, the factory-monitoring system required a CPU for system control, RAM to store variable data such as environmental parameters and authorization codes, and PROM and ROM to store the CPU control program. It also required digital I/O to support the interfaces to the magnetic switches, door locks and alarms. A serial port was needed to interface with the CRT and the printer, to allow changes of environmental parameters and authorization codes and to monitor and log the system's activity. Digital-to-analog converters controlled the flue angle in the ventilation system, and analog-to-digital converters ran the temperature-sensor interfaces.

Lower power dissipation means less equipment

One advantage of CMOS chips is that they dissipate less power and thus can be more densely packed with

![Diagram of a factory-monitoring system](image-url)
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M-100L MATRIX PRINTER

B-600 MEDIUM SPEED BAND PRINTER

8010 MATRIX PRINTER

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transistors than can conventional NMOS chips, without needing special packaging. In tests on 8-bit CPU boards for the Multibus (using NMOS chips), STD-bus (using NMOS chips) and CIMbus (using CMOS chips), National Semiconductor found that the Multibus has a power dissipation of 20W; the STD-bus, 7.5W; and the CIMbus, 0.3W. In comparing the two solutions for this specific implementation, power dissipation using the CIMbus is 9W, while that of the Multibus system is 115W.

Because it eliminates the need for some system components but also because it reduces the costs of hardware installation and cabinet modification.

CIMbus boards are 69 percent smaller than Multibus boards, and the CMOS-based factory-monitoring system required six of them to the NMOS implementation's three. The larger boards can incorporate more functions, but the developers questioned whether they needed that much functionality. If not, they argued, why pay for it? The CIMbus uses the single-width Eurocard format, which measures approximately 3.9 by 6.3 inches. In contrast, Multibus boards measure 6% by 12 inches, and STD-bus boards measure 4½ by 6½ inches.

**CMOS survives extremes, uses less power**

Another problem the developers encountered was the existence of extreme temperatures in industrial environments. Because typical NMOS boards can operate only in temperatures from zero to 55 degrees Celsius (32 to 131 degrees Fahrenheit), they may need elaborate cooling or heating equipment. For example, many process-control systems are housed in refrigerators to allow NMOS electronics to survive the ambient heat.

The developers did not need to add heating and cooling equipment, however, when they used CMOS technology because CMOS circuits operate in temperatures from minus 40 to plus 85 Celsius (minus 40 to plus 185 Fahrenheit). This translated into a 25 percent wider operating range, eliminated the use of heating or cooling equipment and reduced the reliability and maintenance problems that industrial users most want to avoid.

**Separate power supply not required**

Closely allied with the problem of maintenance in industrial applications is the need for power backup systems so that industrial processes can continue to perform in the event of a power failure. Industrial environments also require the use of portable equipment. Had the system developers used NMOS boards, they would have had to purchase an uninterruptible power supply to support the intruder-alarm and entry-control functions in the event of a power failure. An uninterruptible power supply, with prices starting at around $1,300, would provide only 1 hour of full operation and would not be highly portable.

The developers found the power requirements of CMOS chips to be so low that they did not need to use a separate uninterruptible power supply. Instead, the CMOS-based system used a small lead-acid battery...
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An uninterruptible power supply, with prices starting at around $1,300, would provide only 1 hour of full operation and would not be highly portable.

that—for $65—supplied sufficient backup power for 24 hours.

The CMOS system required a voltage-regulator board, a DC-to-DC switching converter that allowed the system to use unregulated DC power, and a battery-charger board that monitored the discharge rate and output voltage of the external battery. These boards, in conjunction with a 10V to 17V battery and an external 24V DC power supply, essentially provided a portable, low-cost, uninterruptible power supply that users could simply plug into the card cage. The developers did not have to add any more emergency equipment because the system was capable of full operation whether or not the primary power source was present.

The developers found that an NMOS implementation of the monitoring system would cost $4,181—$485 more than if they had used the $3,696 CMOS. This included the costs of electronics, the enclosure and its required modifications; the time of the draftsmen who generated the assembly drawings and of the manufacturing personnel who assembled and tested the system; and the other costs of constructing the system. It excluded the devices with which the system interfaced. Thus, the system developers concluded that the harsh environment and need for portability made using CMOS more economical than NMOS, although CMOS was more expensive on a function-by-function basis.

Steven McGinness is product marketing manager for OEM microcomputer products at National Semiconductor Corp., Sunnyvale, Calif.

Interest Quotient (Circle One)
High 807 Medium 808 Low 809

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MEMORY: Because applications that require disk-intensive operations are slowed considerably by sluggish disk-response times, users have turned to disk emulators for higher throughput. For an analysis of the disk-emulator market, turn to p. 139.

The market for removable drives continues to soar due to an increasing demand for low-cost, high-performance mass storage in personal and portable computers, workstations and test devices. The two major market segments, magnetic-tape and disk-drive devices, stay competitive with Winchesters through lower prices and increased storage capacities. See p. 155 for more details.

As memory capacities improve, OEMs and end users seek greater reliability and lower cost. High-performance rigid disks are expensive, while affordable diskettes have limited capacities. Stretched-surface-recording (SSR), detailed on p. 165, combines the best of both medias.

COMMUNICATIONS: Telex has entered automated offices with the help of SofGram, a UNIX-based software package from SoITest Inc. With SofGram, users can create, transmit and receive messages on Telex and TWX between different computers and between operations on the same computer. See p. 171.

GRAPHICS: To answer the growing demand for color and monochrome graphics, personal-computer makers are incorporating more graphics capability into their machines, and board vendors are offering more sophisticated add-in graphics-adapter boards. Our view of the market begins on p. 185.

SOFTWARE: Database design architectures, a transplant from mainframes and minis, were not designed to maximize the capabilities of microcomputers in the personal and business environments. DayFlo, a word-oriented, database package from DayFlo Inc., bridges the gap between powerful but complex products that require detailed programming and software that is easy to use but limited in performance. Turn to p. 197.

The use of microcomputers to develop COBOL applications for mainframes has come of age. Micros no longer function as mere standalone systems; today, they can serve as both mainframe program development stations and as delivery vehicles for distributed processing. To find out how, see p. 207.

OFFICE PRODUCTS: Today's automated office is a crowded place; a variety of unifunctional office machines is inefficient, expensive and takes up valuable office space. One multifunctional machine, such as the M3071 integrated-printer module from Fujitsu America Inc., which combines printing, copying, image scanning and optical image overlay functions, can help alleviate space problems. See p. 221.
Zetaco's latest inventions make 86 disk and tape drives Data General BMC compatible.

Zetaco's BMX-1 disk drive controller and BMX-2 mag tape coupler give the user of Data General's high-speed BMC (Burst Multiplexor Channel) full compatibility with the newest high-speed, high-capacity, non-DG drives.

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Zetaco's full emulation of DG's 60XX and 61XX series disk and 6026 and 4307 tape subsystems means no software patching is required. E² PROMs eliminate switches, making drive configurations and functions selectable via downline loaded software. And Zetaco's exclusive backplane cable design is plug-and-go compatible with DG's FCC and non-FCC compliant chassis.

Disk emulators accelerate computer system performance

Formatting RAMs to mimic disk drives improves speed sixfold

Paul Sniger, Senior Editor

Because applications that require disk-intensive operations are slowed considerably by sluggish disk-response times, users have turned to disk emulators for higher throughput.

“The future for disk emulators seems obvious,” states Richard McCormick, marketing manager for Intelligent Computer Integration Inc., Brea, Calif., a maker of disk emulators. “Almost all advances will be concurrent with advances made by the RAM makers, be it more bits per chip, lower costs, increased speeds, [or] smaller size and the like.”

Define the field first

Floppy and hard disk drives involve mechanical movements, rotational latency and seek times, and thus are slow compared to CPU operations. In contrast, disk emulators—boards and boxes that are based upon semiconductor RAM—prove faster than disk units. They provide driver software and operate like one or more disk drives. They, too, have a directory, and permit files to be written, read, executed or modified. On the other hand, disk emulators do not generally require extended-addressing, and data goes through I/O ports that can be easily re-addressed. In short, disk-emulator software formats the RAM to mimic a disk drive.

Disk emulators can be categorized by their associated operating systems and computers. They also can be distinguished by their memory capacity, which runs the gamut from small microcomputers to large minicomputers.

The backbone of the disk-emulator business is to be found within the minicomputer marketplace. The mini-computer-type disk-emulator cards and boxes predominantly sell in small quantities. George Boardman, marketing manager for Ampex Corp., Cupertino, Calif, says, “Most minicomputer disk-emulators are sold in low quantities, if they go to end users. They are certainly sold in greater numbers if they go to system integrators, but still not in the volumes of microcomputer disk emulators, which are beginning to resemble commodity items.” Despite this rapid growth in the microcomputer market, Boardman says the minicomputer markets still provides the cornerstone for disk emulators, with many products available.

For example, MiniMeg, a disk-emulator board from Integrated Digital Products provides as much as 2M bytes per board and compatibility with Nova-type computers and stores the most frequently used data. The MiniMeg costs $4,200 to system integrators, but the price drops to $2,400 in OEM quantities. By com-
No claims. No boasts. Just straight facts and commitments from Jeffrey Liu, president of Microscience, on our growing family of half-height Winchester disk drives.

"By introducing the new HH-725 20 MB 5.25" and HH-312 10 MB 3.5" half-height Winchester disk drives to our product line, we now offer the proven quality and performance most OEMs need in volume today.

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"Time after time, we have proven that Microscience has the performance, quality, and price personal and portable computer manufacturers demand.

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President, Microscience International Corporation

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CIRCLE NO. 68 ON INQUIRY CARD
Versatile uses of disk emulators

- Disk swapping
- Image processing
- Array processing
- Seismic processing
- CAD/CAM/CAE
- Data acquisition/capture
- Shared memory
- High-capacity buffering
- Main memory
- Disk cache memory
- Dual-port memory
- Swapping files
- Rapid data interchange formatting
- Graphics
- Interactive applications
- Word processing
- Real-time systems

MORE RAM FOR THE BUCK

ROM disk prices vary as a function of memory capacity. Their price range was determined by plotting 65 IBM PC RAM disks. Price variations are due to several factors, including functions per board and board sophistication. As 256K-chip prices decline, the lower boundary slope will decline.

RAM disk prices vary as a function of memory capacity. Their price range was determined by plotting 65 IBM PC RAM disks. Price variations are due to several factors, including functions per board and board sophistication. As 256K-chip prices decline, the lower boundary slope will decline.

Although greater-capacity minicomputer disk emulators with high performance are extending this traditional mainstay of disk emulators, microcomputer applications are seeing new developments.

Disk emulators for the microcomputer market fall into several groups, and the Apple and IBM PC/XT microcomputers control market share.

The Quadboard II disk emulator board, available from Quadram Corp., holds 384K bytes maximum, incremented in 32K segments, and draws on or subtracts from the IBM PC's RAM space. Its Quadram Multidrive creates one, two or three RAM disks. To save time, several applications can run at once, with files transferred between them. The board uses the Qspool print spooler, and the Qswap utility permits switching between two matrix and character printers. It has a clock/calendar, battery backup, I/O expansion bracket (to organize expansion port connectors) and a serial and parallel port. For high-capacity requirements, another similar board, the Quad 512+, offers 64K, 256K and 512K bytes.

Dilog PC Products Corp. states that its 388K-byte Electronic Disk board does not require special software or operating system modification, and does not use up program memory because it has an on-board Z80A. Such boards run faster, but also cost more.

Image Technology Inc. provides a 512K-byte RAM interface to Wide Word's unique board size and interface. As many as 16 WBT modules can be packaged on one board. Wide Word units interface with more than a dozen brands.

PC RAM disks offer multiple utilities

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CIRCLE NO. 70 ON INQUIRY CARD
Pak 512 combination board. It can quadruple this capacity to 2M bytes by repopulating with 256K chips. The board comes with disk emulation and print-spooling software, and has serial and parallel ports, a clock/calendar and battery backup. It is also available with 64K (at under $350) and can be customized to specific needs. Depending on price, boards can have no memory, a minimum amount, or various increments. This variable memory feature permits capacity upgrading.

JRAM (under $800) from Tall Tree Systems can provide 640K bytes. And three such disk-emulator boards can add an extra 512K-plus of RAM to the 256K of the IBM PC motherboard. Its JFormat utility includes a high-speed file transfer, print spooler and disk emulator. It supports quad density and 8-inch floppies and Winchester.

Some disk emulators offer extra features at increased costs. The Versa-RAM Plus II from Memory Technologies Inc., offers all the multifunctions of other boards, but accepts optional Versa-modules up to 512K (at under $1,130), and offers a second modem, color graphics board, and an SDLC/HDSL synchronous/asynchronous board for PC-to-370 linking. Offering more functions per board saves slots, but also means less disk-emulator space may be available for memory.

Versions compatible with 8-bit systems

Non-IBM microcomputer users have many disk-emulator offerings to choose from, as well. For example, the SemiDisk disk-emulator board from SemiDisk Systems, has versions for the S-100/IEEE-696 bus, and the IBM PC microcomputer. The IBM PC disk emulator offers as much as 1M byte per board. By installing additional boards—one set for each different address space—the board is expandable to 8M bytes.

Self-installing driver software on the disk emulator links into the PC-DOS operating system without modifications, and an extra driver is available for running CP/M-86 programs. Program run-times are claimed to be five to thirty times faster than with floppy and two to five times faster than with Winchester for access-intensive activities. Such activities include editing Pascal and using assemblers, compilers, spelling checkers and database managers. However, these activities require print jobs that can tie up a computer for hours. SemiDisk's SemiSpool with its built-in print buffer frees the computer for other tasks while printing is carried on from the print file.

Board specifications include 110K-byte-per-second data-transfer rates and 250-nsec DRAMs. As for power consumption, a 512K-byte board consumes 600 mA at 5V DC (typical); a 1M-byte board draws 900 mA at 5V. A blackout battery provides backup time of four hours. It is specified for an ambient range of 10°C to 40°C and can withstand humidity extremes that disk drives cannot. Moreover, Winchester are heavily heat-sinked, use noisy fans and cannot tolerate high altitudes.

Another SemiDisk board offers IEEE-696 bus compatibility for the CP/M 2.2 operating system. Like the PC-DOS version, the installation program patches into the operating system as a disk drive. Programs need no modification to run.

SemiDisk is hardware compatible. It does not require extended-addressing or complex bank-switching to store data. All data goes through I/O ports, which are easily re-addressable.

SemiDisk boards' speed-ratio improvement is 20-to-1 over a 5-inch floppy disk drive, and 2-to-1 over a Winchester for disk-intensive applications. Ratios vary from 5-to-1 to 3-to-1 for loading, and can reach 5-to-1 for...
a save-to-disk operation. For sequential operations, the ratio decreases, perhaps offering only a 2-to-1 advantage. Obviously, non-disk activities involving assembler operation, such as generating symbol and macro tables in RAM, will not improve the ratio.

Another IEEE-696 bus disk-emulator board, the M-Drive/H from CompuPro Systems contains 512K-byte unformatted storage and can be expanded to 4M bytes by plugging in eight more boards. The involved operating systems—CP/M-80 and -86 and MP/M-816—all provide built-in board support, and an install procedure permits integration into any CP/M 2.2 implementations. Power consumption is 900 mA typical; 1,200 mA maximum.

**Apple RAM disks boost performance**

Apple Computer disk-emulator makers include companies like Axlon Inc., Synetix, Micro Products, Legend Industries Ltd. and Fion Inc. “Key factors to look for before buying Apple disk emulators include compatibility with other hardware and software,” states David Miller, engineering support director for Axlon. “It helps if it is slot-independent, so it can be used with slot-dependent peripherals, such as 80-column boards and printers. Memory capacity is important, as is whether or not it can function like two 35-track drives, two 40-track drives or one 80-track drive. Expandability permits several disk emulators to be hooked up to give more megabytes.”

Miller also feels that special features should be considered, such as a self-contained power supply with a rechargeable-battery backup system that lasts for several hours in the event of a blackout. Other firms concur. McCormick at Intelligent Computer Integration, feels that backup is critical. “Volatile memory is probably the single largest problem with RAM disk emulators. Any type of power failure anywhere at anytime will cause total loss of data in the emulator,” he warns. “The solution is battery backup to keep power applied to the RAMs to maintain data integrity.

The disk emulator Ramdisk320 from Axlon boasts a 400K-byte-per-second data-transfer rate and emulates as many as 12 drives under the Apple DOS 3.3 operating system, six drives under Pascal 1.1 or 4.0, and one drive under CP/M. It also runs under Apple III SOS, the predecessor of ProDOS, and under Apple II and IIe software. Its 320K-byte RAM emulates two 40-track floppy disk drives or one 80-track drive.

Physically, the 320 is an externally connected 8-pound, 8.625-by-6.125-by-3.750-inch box with a 9.5-by-2.875-inch interface card and ribbon cable. The box contains its own 3-hour backup battery in case of power failure. Its 40-by-64K DRAM matrix and logic consume 30W during access, 21W in standby memory refresh mode, and 8W in battery trickle-charged mode.

The Flashcard disk emulator from Synetix Micro...
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 MEMORY

Products offers 147K- and 294K-byte boards for the Apple II computer, and can emulate as many as 12 drives with six 11½-inch cards running under CP/M software. The latest CP/M software permits a 2-card configuration to emulate one 576K-byte drive. Utility programs segment and reconstruct large files for backup on 126K-byte floppies. The 294K-byte version can run under DOS 3.3 as a single 32-segment drive.

The 7½-inch Legend Industries 128 DE Sofdisk expansion card features 128K bytes; a 64K-byte card is also available. It emulates as many as four drives under DOS 3.3 (four cards) or under CP/M (four cards), and six drives under Pascal (six cards). The cards do not need refresh straps to the motherboard, as earlier versions did, and each has its own refresh circuitry.

The Pion Interstellar Drive, an external box emula-

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### Disk emulator manufacturers

<table>
<thead>
<tr>
<th>Company Name</th>
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148 MINI-MICRO SYSTEMS/October 1984
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STDbus Bubble Systems are available for 8086, 8085, Z80, 6809

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CIRCLE NO. 74 ON INQUIRY CARD
tor, measures 9 inches by 8½ inches by 4 inches and houses a half-hour-rated backup battery; it therefore does not need reloading. It emulates two drives under DOS 3.3, two under Pascal and one under CP/M.

Its 256K bytes are expandable in 256K-byte increments to 1M byte, so it can thus emulate eight drives by using mapping software, or large 1,768-block drives under Pascal or CP/M. Hardware-error detection circuits prevent faulty data. Using different host interfaces, this disk emulator runs on IBM PC and IEEE-696 bus systems, and many others. It supports such operating systems as MS-DOS, DOS 3.3, MP/M, CP/M and TURBODOS.

Operating systems affect disk emulators

A discussion of disk emulators that support DOS 3.3 is incomplete without mentioning the ProDOS single-user, single-task operating system. ProDOS promises easier use and integration with less patching. Its performance surpasses that of DOS 3.3, although software written under DOS 3.3 will run under ProDOS. When accessing text-file records, it runs six times faster than DOS 3.3. Indeed, ProDOS's read/writing of files and records represents a five-fold speed improvement over DOS 3.3, except for binary file-storing or writing, which still can be tripled. ProDOS uses Apple's 64K-byte extended 80-column text card as a disk emulator. File-buffer opening and directory-accessing overhead time aside, ProDOS transfers data to or from disk at 8K bytes per second, an eightfold increase over the DOS 3.3 rate.

The ProDOS disk-emulator capability is also improved over DOS 3.3. Randomly accessible, ProDOS file sizes range from 1 byte to over 16M bytes. ProDOS organizes disk and disk-emulator storage by its UNIX-like hierarchical directory structure. Because ProDOS reads/writes 512-byte blocks, each disk's drives convert sectors to 512-byte blocks. Thus, ProDOS is independent of physical disk-sector sizes or sectors per track. A growing-tree-file storage structure automatically handles file-size variation.

The future of the disk emulator appears bright. With 256K chip prices dropping, the cost advantage of a disk emulator over a second floppy disk drive will further improve. And the incorporation of higher-capacity chips onto motherboards by computer makers will also accelerate the trend to widespread disk emulators use.

Innovative packaging also will enliven the disk-emulator industry. To maximize expansion slot usage, many memory-expansion boards are multifunction, combination boards populated with 64K chips that can be replaced later with 256K chips, thus quadrupling memory. Other techniques include Wang Laboratories Inc.'s Straight-In-Line Memory Modules (SIMMs) that hold nine 64K chips, permitting a SIMM and 256K RAM mix to reach 8M bytes per board.
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CIRCLE NO. 75 ON INQUIRY CARD
Removable mass storage market sales remain strong

Despite inroads by fixed-disk drives, removable magnetic-tape and disk-drive models stay competitive through lower prices and increased storage capacities

Larry Sarisky, SyQuest Technology

Although fixed Winchester drives dominate the trade news, the largest selling storage devices are still removable drives. The market for removable drives continues to soar due to an increasing demand for low-cost, high-performance mass storage in personal and portable computers, workstations and test devices.

The removable drive market can be divided into two major segments: magnetic-tape and disk-drive devices. Of the two, the disk-drive market is larger and growing faster.

Three types of disk drives

Disk drives are random-access devices using either of two basic storage media—flexible diskettes or rigid disks. These media are further divided into three types of devices: floppy disks (flexible), cartridge disks (rigid) and removable pack drives (rigid).

Over the past 10 years, the floppy disk drive industry has grown to include more than 50 manufacturers selling more than 300 models. The market is growing quickly: floppy-disk sales rose from $2.2 billion in 1982 to near $4 billion in 1983.

The floppy industry is classified by drive size. Current sizes available include the established 8-inch and 5¼-inch models and, below them, the 3½-inch, 3¼-inch and 2½-inch competitors. Important to the floppy industry's revenues is the annual disk-to-drive consumption ratio of approximately 50-to-1.

Although storage capacities have increased greatly (from the original 0.125M byte to 1M byte), floppies pose problems of access time and unit degradation. Other technologies have evolved to combat these problems with alternative products. The most important of these is the cartridge disk drive, which today is the second most popular random-access removable storage device.

The storage capacity of cartridge disk drives is now 10M bytes per cartridge—five times that of floppies.
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CIRCLE NO. 77 ON INQUIRY CARD
Since their invention more than 15 years ago, cartridges have increased in capacity tenfold, decreased in physical size threefold (from 14 inches to 3.9 inches) and dropped notably in price. Wherever a floppy is used today, a cartridge can be used tomorrow with significantly higher capacity and performance.

Approximately 350,000 cartridge units will be sold this year, creating a $175-million market. This market will grow rapidly, due in part to a continuing drop in cartridge and drive prices. In 1985, 1.3 million cartridge drives will be sold and, in 1986, approximately 2.5 million will be sold. Although those numbers are still considerably less than comparable figures for floppies (manufacturers will sell 16.5 million floppy drives in 1986), the situation might reverse later. Compare the dollar cost per M byte of floppies to that of cartridges. By this measure, cartridge cost is now almost twice that of floppy diskettes; by 1986, the two costs will be equal. The fastest growing segment of the cartridge market will be the smaller-sized devices, which will be integrated eagerly by portable- and personal-computer vendors and used to protect data.

**Magnetic tape devices re-emerge**

At the high-end capacity of the disk market is the removable pack drive, which stores from 80M bytes to 600M bytes. These devices, designed for integration into large computer systems, retain an active market acceptance. This should continue for several years because of the large installed base and the large cash outlay associated with replacing them.

Magnetic-tape products—serial access devices for archival-applications—are used to store large off-line databases for future recall. Apparently in danger of extinction a few years ago, magnetic tape devices were saved by the emergence of nonremovable drives, themselves a $9-billion industry in 1983. Nonremovable devices require much attention to backup procedures that prevent data loss. Large organizations typically turn to removable magnetic tape to protect their data.

The five categories of magnetic-tape products will create a combined market worth more than $700 million in 1985, but their limited growth as compared to disk drives is apparent from the projected 1987 sales figure of $825 million.

The five magnetic tape devices include the 0.15-inch-cassette; three different cartridge models (0.15-inch, ¼-inch and ½-inch) and reel-to-reel tapes. Cost effectiveness is related to the amount of data stored.

Cartridge drives are the most successful group when measured by quantity of units shipped and number of companies shipping. The ¼-inch cartridge drive is currently the most popular, but it might become eclipsed by the arrival of a reliable ½-inch cartridge. Approximately 775,000 ¼-inch cartridges will be sold in 1984; that number will jump to 750,000 units in 1986. Only about 10,000 ½-inch cartridges will be in the field this year. But that number will dramatically increase to
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*CIR Unit Price

CIRCLE NO. 79 ON INQUIRY CARD

REMOVABLE STORAGE

HOW MAGNETIC TAPE DEVICES COMPARE

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Performance</th>
<th>Cost Effectiveness</th>
<th>Product (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5M bytes</td>
<td>low</td>
<td>fair</td>
<td>cassette 0.15</td>
</tr>
<tr>
<td>5-60M bytes</td>
<td>medium</td>
<td>fair</td>
<td>cartridge 0.25</td>
</tr>
<tr>
<td>100-350M bytes</td>
<td>medium</td>
<td>good</td>
<td>cartridge 0.5</td>
</tr>
<tr>
<td>1G byte +</td>
<td>medium</td>
<td>excellent</td>
<td>reel-to-reel 0.25</td>
</tr>
</tbody>
</table>

Source: SyQuest

about 100,000 units in 1986.

The most cost-effective units are the reel-to-reel tapes but, because of their high price tag, these units are found only on large computer systems. Nevertheless, their acceptance should grow at a healthy 25-percent annual rate for the next few years.

The one dark spot on the reel-to-reel tape’s future is competition from the optical disk drive. This non-erasable device will be random-accessible and hold upwards of 1G byte of data. Though none has yet been shipped, the optical disk could eventually replace tape for high storage.

Larry Sarisky is vice president of sales and marketing and co-founder of SyQuest Technology, Fremont, Calif. He has been in the disk-drive industry for 15 years.

Interest Quotient (Circle One)
High 813 Medium 814 Low 815

NEXT MONTH IN MMS

The November issue of Mini-Micro Systems focuses on terminals. MMS will present an overview on alphanumeric terminals, the key products and expected market trends.

In a comprehensive software profile, MMS studies terminal emulation and control software. Through the use of this type of software, display terminals can emulate the features and performance of other, often superior terminals at a much lower cost. MMS will examine networking opportunities and software compatibility advantages of various product offerings.

Be sure to watch for your issue of Mini-Micro Systems’ next Fall Peripherals Digest, coming November 15. This comprehensive reference guide will cover the following topics:

- disk drives (up to 5¼-inch)
- disk subsystems
- cartridge tape drives (up to ¼-inch)
- alphanumeric terminals
- serial printers

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Stretched-surface-recording boasts attributes of floppies and Winchesters

SSR technology uses ‘stretched’ media, flying heads to achieve high densities

David L. Cross, 3M

Stretched-surface-recording (SSR) combines the performance characteristics of rigid disks with the low cost and environmental tolerances of flexible media. The media incorporates an injection-molded substrate with raised rims at the outer edge of the disk and around the center hole. A magnetic-coated film base is stretched and bonded to the rims, resulting in a compliant surface with a 10-mil gap between the substrate and the media.

The substrate layer is a composite polymer, in contrast to aluminum substrates used in rigid oxide and rigid thin-film media. The magnetic layer of SSR disks is random particulate. Rigid oxide disks employ oriented-particulate magnetic layers, and rigid thin-film disks have plated or sputtered magnetic layers. The coercivity of SSR disks is 570 oersteds, compared to 330 oersteds for rigid-oxide media and 600 oersteds for rigid thin-film media.

Stretching and bonding the media to a support system reduces anisotropy to 1/40th that of a diskette. Anisotropy is the tendency of a material to expand more along one axis than the other because of heat or other forces. This reduction makes possible denser track spacing. Prototype SSR media support the 345-tpi (tracks per inch) density of stepper-positioned fixed-disk drives. In contrast, most diskettes have 48 or 96 tpi.

Because of the relatively high velocity of the disk (3,600 rpm), the read/write head flies above the surface of the media. (Most floppy disks operate at 360 or 600 rpm.) Although the head is flying, its force produces a small “dimple,” or flexing on the media surface. This compliance between the flying head and the SSR sur-

Signal-to-noise ratio comparison between stretched-surface-recording (SSR), rigid oxide and rigid thin-film disks shows that as flux changes per inch (fc1) increase, SSR disks consistently exhibit higher signal-to-noise ratios.
The media surface "dimples," or flexes, as the head flies above it.

face is largely responsible for reduced head/disk interactions.

SSR fills storage gap

SSR media currently address the 3M to 12M-byte range falling between high-end diskettes and low-end fixed and removable rigid disks. As storage capacities fill the requirements of OEMs and end users, reliability and cost become increasingly important. Rigid disks provide high performance and high capacity, but are relatively expensive. Diskettes are reliable and affordable in the less-than-one-megabyte range, but requirements for increased capacities are stretching the limits of diskette technology.

SSR technology bridges this gap by providing competitive capacities and performance. It also provides a lighter, more durable cartridge than that used with removable oxide or plated media, as well as minimized

<table>
<thead>
<tr>
<th>Head type</th>
<th>Track width (in.)</th>
<th>Data band (in.)</th>
<th>Record current (ma)</th>
<th>Amplifier gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>manganese-zinc monolithic</td>
<td>0.0022</td>
<td>2.34</td>
<td>36/40</td>
<td>1X</td>
</tr>
<tr>
<td>manganese-zinc monolithic with 3M contour</td>
<td>0.0017</td>
<td>2.212</td>
<td>35/50</td>
<td>0.3X</td>
</tr>
</tbody>
</table>

The evolution of stretched-surface-recording disks will go from the current prototype version to 48M-byte disks using run-length-limited recording techniques, 20,400 fci and 728 tpi. Vertical recording and thin-film media will further increase densities and transfer rates.
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shock problems due to reduced media mass.

Relative to diskettes, SSR offers increased ease of handling because it requires fewer loadings. It also provides cost-per-megabyte improvements. SSR manufacturer, 3M, estimates that 12M-byte SSR disks will cost less than $10 per disk in OEM quantities once production levels are reached.

Laboratory and OEM beta-site testing has shown the SSR disk to have high data reliability. For example, soft error rates in laboratory tests are equivalent to those of sealed disks: less than 1 in 10^10.

**Future generations promise increased capacities**

SSR prototype disks operate in a drive with open-loop positioning at 345 tpi with a capacity of 3M bytes per side (formatted) on a dual-sided disk. The next generation will use modified frequency modulation (MFM) recording with track-following servos. Fixed and removable capacities will be 16 and 12.6M bytes, respectively.

The succeeding generation will offer further capacity increases and higher data rates via higher linear recording densities using run-length-limited coding techniques. These disks could store 48M bytes on a 5¼-inch disk with 728 tpi and 20,400 flux changes per inch (fci). Perpendicular recording and thin-film media will lead to the next generation of disks.

SSR disks are the same size as 5¼-inch rigid disks, which facilitates head/disk performance evaluation. OEMs can use standard 5¼-inch drives with minor modifications.

One required change is the contouring of the head profile. This provides stable flight characteristics with head/disk separation of approximately 5 µin.

Another required modification is that the OEM or drive manufacturer raise the record current from the 36/40 milliampere range to the 35/50 milliampere range to accommodate the high coercive force of the particulate material. In addition, the amplifier gain must be attenuated two to three times to compensate for high head output. SSR disks produce two to three times more signal output than do Winchester-based oxide disks.

Prototype versions of the media were introduced by 3M at the fall 1983 COMDEX. The 5¼-inch fixed-media prototype holds 6.3M bytes per disk with 9,795 fci and 345 tpi. Limited quantities will be available in the fourth quarter.
Write your own success story with Epson.

You've had the idea for years. Or maybe you just got it. But no matter what application you have in mind, Epson has the hardware to make it work. And the sales and technical support to make it a success.

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Within Epson, we've formed a nationwide program to support VAR marketers. Your initial inquiry will immediately be directed to one of our 12 regional VAR support centers. Then to one of our representatives who will contact you for further details. Each of our VAR representatives is well-versed in the hardware and software aspects of Epson machines. There's no runaround, just answers.

OTHER SUCCESS STORIES ARE ALREADY BEING WRITTEN.

The Epson HX-20 has been used in many applications that would have been impossible without it. A major overnight delivery service uses it in their trucks, to input airbill data for tracing packages. It's also been developed into an on-site estimating system for everything from insurance to interior decorating.

How about the pilot who uses the HX-20 as his electronic co-pilot? The QX-10 has seen duty as a medical/dental accounting system and on-line commodity quoter with high-resolution graphics.

Of course these are only a sample. But if you're interested, Epson has an up-to-date directory of VAR applications using our machines. Just another way we can help you develop your own successful system.

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Epson has put together a complete development kit for each of our machines. The kit includes all the detailed technical specifications you need to develop your software around our directory. Our VAR rep will continue to work closely with you and your programmers until the job is done. If necessary, he has ready access to a VAR technical group back at Epson headquarters.

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MINI-MICRO SYSTEMS/October 1984
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UNIX-based software introduces Telex to office automation

With SofGram, users can transmit and receive Telex communications over different computers

Michael J. Heffler and Betsy Longendorfer
SofTest Inc.

Telex, a communications method long used in international business, has entered automated offices with the help of SofGram, a UNIX-based software package that has recently been ported to MS-DOS. SofGram sends and receives Telex and TWX messages via the Telex, TWX and Direct Distance Dialing (DDD) networks and stores them in computerized filing systems. It can retrieve messages created by a word processor, or create them with its own screen editor. Users can create, transmit and receive messages on Telex and TWX between different computers and between operations on the same computer. The interface is user friendly and its operation hides communication protocols from the end user.

The alternatives are either a room full of Telex and TWX terminals to receive and send messages or a message switch, which requires a dedicated computer and customized software. SofGram is general-purpose, not customized for a particular application, and runs on low-cost computers.

For users communicating over public networks, getting on the networks and organizing their messages is difficult. SofGram solves the problem through its line handling, menus, forms, message formatting and database services. It lets the computer handle drudge work and organize data. More important, it enables a UNIX computer to replace Telex machines.

Communications abound in the office

In a typical office, people mail out orders, send and receive messages, leave notes on co-workers' desks, Telex, TWX, DDD—what do they mean?

**Telex**
Telex is a worldwide, highly reliable communication network which has been in existence for over 45 years. There are over 200,000 Telex subscribers in North America and over 1.5 million worldwide. Telex communicates reliably with hard-copy (paper) output and verifies that messages are received. Telex runs at 50 baud (approximately six characters per second), using the baudot character set. International Record Carriers (IRCs) include Western Union, IT&T, RCA and several smaller companies.

**TWX (Telex II)**
A communications network available throughout the continental United States. It is the second generation of Telex technology. It runs at 110 baud, approximately 11 characters per second, and uses the full ASCII character set. The delimiting sequences used within a message are ASCII control sequences, as opposed to the character sequences used in Telex.

**DDD (Direct Distance Dialing)**
A communications acronym for the telephone network. There are many ways to communicate between computers over a phone network, such as X.25 and its derivatives, packet switching networks, X.75 and the like. There are also several database services available that can be accessed through a phone network, such as Dow Jones, CompuServe and many others. When a computer tries to communicate with another computer, there must be a protocol set up between the two, plus knowledge of what to expect on each end of the communication line. For example, when a computer user dials up another computer, the modems and computer exchange handshaking protocols to log on in several levels.
miss telephone calls, and receive memos and inter­
office mail. Much of the automated communications
pass through Telex or TWX networks. And use of
computer communications systems with on-line data­
bases providing news and stock market information is
increasing.

Consider a scenario in which all messages sent are
created on a word processor, automatically time­
tamped and stored in a special, computerized filing
system. At the same time, messages received are
stored in the filing system, making each one easy to
peruse at the user's choosing.

If these functions are handled by Telex, TWX, inter­
computer and intra-computer mail, they probably re­
quire an expensive corporate message switch. But
message switches run on either mainframes or large
minicomputer systems that cost $250,000 or more.

Corporate message switches are usually manned by a
specialized staff. Existing and future offices need to
have communication capacity for everyone. So an office
workstation user-interface must hide the computer's
command language and the communication networks' 
protocols and commands. SofGram handles all these
communication functions. It encourages and simplifies
the use of existing data communication networks and
their databases. Often, the complicated procedures
necessary to access the communication network or
database—dialing, redialing, formatting messages to
conform to strict network standards—discourage use of
these services. But with SofGram, office workers can
interact easily with computerized menus and forms and
thus concentrate on obtaining or distributing informa­
tion, with fewer details to handle.

Package customizes the user-friendly interface

Easy use is essential for software packages. SofGram
allows users to make a single numeric choice from a
displayed menu to initiate an action. The menu then
gives way to a form the user fills in with all the
information needed to send a message. Reverse-screen
video supports this feature, and a cursor prompts the
user for data. Once address information is entered, it is
automatically retrieved the next time the information is
requested.

The menus and forms provided are stored as ASCII
text within the system and can be modified or ex­
tended. This allows users to customize the interface to a
particular specification and makes it easy to add new
features.

An integrated, easy-to-use screen editor permits
users to create messages more readily. The editor
permits data entry, moves the cursor around the screen
and inserts and deletes lines and characters. It can also
retrieve computer system files, such as letters created
Kimtron delivers terminals that are not only pretty and smart, but so reliable they seldom fail. Kimtron technology enables many useful features to be available at no extra cost like user selectable Hidden/Embedded attributes, so you’re not limited to Embedded attributes as you are with the others. Plus, we make the only low-cost terminals to take true Ergonomic standards that extra step—to provide adjustable display height in addition to swivel and tilt. Kimtron terminals are designed to be flexible and compatible to systems like IBM PC/XT/AT, DEC, DG, and many more to avoid obsolescence.

**COMPARE** - We give you more for less.

<table>
<thead>
<tr>
<th></th>
<th>Kimtron KT-7</th>
<th>Wyse 50</th>
<th>Qume 102</th>
<th>TeleVideo 925/925E</th>
<th>Features</th>
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</tr>
</tbody>
</table>

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Kimtron, a 5-year technology leader - we're going places and want you to join the Kimtron family of satisfied users. For more information about our KT-7 or KT-10, call the Kimtron Corporation. (408) 727-1510

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If you're in the business of configuring computer systems for businesses, you know the importance of quality and reliability.

That's one good reason to trust the telecomputing leader. Hayes Smartmodems (300, 1200 and the 1200B board modem for the IBM* PC and compatibles) have an unsurpassed record of reliability. And when Smartmodem is combined with Hayes Smartmodem II* software, you have the most complete and dependable telecomputing system available!

Smartmodem II is flexible. Use it as is or customize it for particular applications. Smartmodem II makes telecomputing simple for beginners, with sophisticated programming options for you.

Now Smartmodem II does even more to streamline business communications.

More connection capabilities. Our new Smartmodem II is available for more than 16 personal computers (with more to come). Now the DEC Rainbow in purchasing can swap data with the HP 150 in accounting. While the IBM PC in sales gets updates from the TI in the southeastern office. Quickly and easily, Smartmodem to Smartmodem. And with no handholding from you.

XMODEM protocol. In addition to the Hayes Verification protocol, Smartmodem II includes the XMODEM protocol, for error-free transmission to even more micros, as well as to mainframes at the information services.

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phone call. This saves the user time and the company money.

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**Follow the leader!** If you're involved with linking micros or setting standards for configurations, let Hayes provide the definitive connection. With our feature-rich, direct-connect modems. Easy-to-use, menu-driven software. Concise documentation. And a customer service organization that is second to none!

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Available for: IBM PC and compatibles, plus HP 150, DEC Rainbow 100, Texas Instruments Professional and Portable Computers and Wang Professional.

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Introducing the SMS 1000 Model 40
DEC-Compatible Microcomputer System

SMS has been listening: You want microcomputer systems that can meet your current needs and can be expanded to handle future requirements. Our new SMS 1000 Model 40 is designed to do just that!

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We knew what the end product had to do before we started, so we designed it based upon an integrated foundation architecture that optimizes performance and flexibility. The foundation module interfaces to Winchester, floppy and tape peripherals; serial communication ports; and the Q-bus backplane. It also includes a sophisticated Support Monitor Subsystem which makes the system easy to use and maintain. And we put it all on one board that doesn’t require any backplane space!

Compatibility
The SMS 1000 Model 40 contains a Q-bus backplane and emulates the DU handler/device driver. All LSI-11 software will operate with no modifications.

Flexibility
This system provides you with the widest choice of peripherals available in any microcomputer on the market. The options include 8 or 5¼ inch floppy drives, up to 140 Mb of 5¼ inch Winchester and a soon-to-be-released streaming tape drive. All this in one 5¼ inch rack mount or floor stand enclosure.

Performance
The Model 40 allows non-interleaved disk transfers using an enhanced version of DEC’s MSCP storage architecture. It is offered with fast access Winchester disk drives and either LSI-11/23 or LSI-11/73 processors. So you can optimize your application software performance whether it runs on RT-11, RSX-11M*, RSX-11M-PLUS, RSTS/E*, or TSX-PLUS*.

Reliability
High reliability is essential to your business. The SMS 1000 Model 40 is designed to provide your users the uptime both you and they dream about. And if things go wrong, the Support Monitor Subsystem is there to help you or your end users get back on the line quickly. The system was designed to minimize parts count and maximize access to all components. This allows replacement of any failed component in less than 5 minutes!

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The SMS 1000 Model 40 is really a family of products, available in over 150 different configurations—today—with more to come in the near future.

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*DEC, RSX and RSTS are trademarks of Digital Equipment Corporation. *TSX-PLUS is a trademark of S&H Computer.
by a word processor, and send them as messages.

**Eases the communications interface**

The Telex system requires special, noisy and costly terminals that run at a slow 50 baud, or approximately six characters per second (cps). Most dial-up terminals transmit at 1200 baud, or approximately 120 cps. Worse, all Telex messages must be typed in, or fed in through a paper-tape reader when transmitted. For each message sent, the Telex machine operator per-

SofGram filefolders, which are Indexed Sequential Access Method (ISAM) UNIX files, are analogous to drawers in a file cabinet.
ly, you can connect to the Telex or TWX network by renting an electronic "mailbox" from an IRC and accessing it through the DDD network. Examples of such a service are Western Union’s EasyLink, IT&T’s Time Tran and RCA’s Telextra. This mailbox is stored on the IRC’s central computer and can be accessed by dialing a number, provided by the IRC, on the telephone network. The user can then access the contents of the mailbox or send messages over the phone-line connection to the IRC. Thus, a Telex machine is unnecessary. Message formats, as always, are strictly enforced.

SofGram can connect to the Telex/TWX network in either way. A computer can be connected directly to an existing Telex line using commercially-available modems. However, connecting directly to the Telex line limits transmission speed to its sluggish 50 baud. By renting a mailbox from an IRC, users can connect a common modem to a computer and transmit at 1200 baud. In either case, SofGram handles the receiving, transmitting and formatting of messages, and the accessing of different network services. Renting a mailbox is the fastest, least expensive and most convenient choice.

C language eases portability

SofGram is written in the widely used C language, making it generally easy to port to new systems that also support C. The code is modularly written so that the operation-specific system calls are localized.

SofGram stores all messages and system-related information in filefolders—UNIX files with certain special attributes. Filefolders are sequentially indexed.

Inputs and outputs to filefolders take place through a virtual memory package. The virtual memory package ensures that the most recently accessed information remains in primary memory for as long as possible so it can be quickly re-accessed. This cuts down on disk reads and writes, and speeds user response time.

Filefolders maintained at all times are:
- **Address filefolder**, for information on people who have been sent messages including their addresses, the networks they use and other information relevant to communications.
- **Mass mailing filefolder**, for mass mailing lists and information.
- **Chronological filefolder**, for every message sent and received. Many companies rely upon this feature for legal and corporate-accounting purposes.
- **In filefolder**, for all incoming messages that have not been distributed to users.
- **Out filefolder**, for all outgoing messages.
- **User filefolder**, for all messages to be sent, plus messages that have been sent and messages received by a user, a group of users, or by subject matter.
- **System filefolder**, for system-related information including message and screen templates and system configuration.

Every message received is stored in the recipient’s filefolder. Upon logging on, a user is informed of the number of messages that have been received. A filefolder display gives a summary, starting with the most recently received message. The summary includes the sender and the first line from the message. Having a list of all messages greatly simplifies perusing and

The message form appears on the top of a split screen, making it easy for the user to get all the signals straight. The bottom portion is for the message and may be scrolled.
Hewlett-Packard introduces the HP 2392A.

When you get this new HP display terminal, suddenly you’ll be running applications with less effort. In less space. For less money. And with more confidence, having HP’s reliability and quality to count on.

Less effort.
The first thing that will impress you is how easily everything fits into place. Integral tilt and swivel make screen and keyboard adjustments easier. Power and brightness controls are right up front, at your fingertips.

Working becomes more pleasant, thanks to the non-glare, high-resolution screen and well-defined, smooth scrolling characters. Up to four pages can be stored in display memory, with up to four more pages available as an option.

And all that happens on a 12-inch display that only takes up about one square foot of your desk.

More helpful.
With eight non-volatile, programmable function keys, it will take you less time to enter complex or repetitive commands. A handy terminal status line tells you what mode you’re working in. And 17 national language keyboards are available to make work easier for everybody, just about everywhere.

You get more speed, too. You’ll communicate with your computer at up to 19,200 bps in block, line or character mode. So your information will get around in less time. It’s also easy for you to get hard copy, since our terminal has an optional printer port you can install yourself.

If you’re an ANSI user, you’ve also got more going for you. The HP 2392A has ANSI capabilities making it an ideal terminal for your DEC system.

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HP engineered the HP 2392A using state-of-the-art VLSI technology to minimize component count and increase reliability.

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With all these features, you’d expect to pay more than $1,295* for our new display terminal. But that’s all we’re asking. So why settle for less?

To get more information, call your local HP sales office listed in the white pages. Or get in touch with Terry Eastham, Hewlett-Packard, Dept. 008199, 8020 Foothills Blvd., Roseville, CA 95678. Phone (916) 786-8000. In Europe, contact Michael Zandwijken, Hewlett-Packard, Dept. 008199, P.O. Box 529, 1180 AM Amstelveen, The Netherlands.

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Of course we offer an industry-standard bus, Multibus* IEEE-796. Of course we offer SA400, ST506, SMD and QIC II, so you can attach additional mass storage devices. And of course we support RS232C communications. ASCII TTY. And Bisync (2780/3780). Allowing Tower 1632 to connect and communicate with terminals, printers, mainframes, minis, personal computers and numerous special devices, from optical character and code readers to data tablet digitizers.

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Of course, we have a very good reason for offering all this flexibility. It’s part of our commitment to providing OEMs with the prime requisite for success. A system built expressly for systems builders.

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CIRCLE NO. 90 ON INQUIRY CARD
Telex Shamrock 9250 has everything you want in a GCR tape subsystem. Right down to your favorite color.

It's the color of the money you stand to save with the new Telex Shamrock 9250. The most affordable GCR subsystem in its class.

Telex engineers have been making advancements in GCR technology for over a decade. The Shamrock 9250 is the biggest breakthrough yet. It gives you the faster access and throughput, greater storage efficiency and higher data reliability you look for in a full performance GCR subsystem. And it does so with the kind of cost efficiency other tape drives just cannot match.

The savings start right up front. The unit price of the Telex Shamrock 9250 is half that of previous GCR subsystems. Its compact design frees up valuable space. And with the assistance of Telex Engineering experts, your interface development will be fast and efficient.

Down the road, the savings continue to add up. Cost of ownership of the Telex Shamrock is truly attractive. There are no planned service calls because the 9250 requires no preventive maintenance. Self-calibrating capability eliminates the need for scheduled adjustments. When service is required, the resident diagnostics hold costs to a minimum. Lower power consumption (typically 100 milliwatt) of the 9250 gate arrays increases reliability and keeps energy costs in line.

There are more reasons why the Shamrock 9250 is today's best value in full GCR performance. For the rest of the story, call your nearest Telex OEM Sales Office or our OEM Marketing Department at 918-627-1111. And let us show you how good you'll look in Telex Shamrock green.
Spec summary

- Manufacturer: SofTest Inc., 555 Goffie Road, Ridgewood, N.J. 07450, (201) 447-3901
- Product: SofGram communications software
- Compatibility: systems supporting all UNIX versions and MS-DOS
- Suggested end-user price: $2,500 for minicomputer systems, $750 for multiuser microprocessor-based systems, $500 for single-user systems
- Communications hardware required: Hayes Smartmodem-compatible modem for DDD communications (Hayes Microcomputer Products Inc., Norcross, Ga.) or Teleplug (by Teleface Inc.) for Telex communications
- Memory required: 256K bytes
- Disk storage required: 2MB bytes

maintaining the information. Messages that have not been read or acknowledged are specially marked by SofGram to distinguish them from messages that have been read. The user can call up the full text of a message, make copies, distribute them, print messages, print copies of summaries and perform additional housekeeping tasks.

Finally, a terminal or computer need not be solely dedicated to SofGram use. SofGram can operate in the background while the terminal is used for other activities.

Michael J. Heffler is a product manager for SofGram and executive vice president of SofTest Inc., a Ridgewood, N.J., company specializing in UNIX-based software packages. He holds a master's degree in computer science from the University of Massachusetts (Amherst) and previously worked for Bell Telephone Laboratories, Holmdel, N.J.

Betsy Longendorfer is a senior programmer with SofTest. She holds a master's degree in electrical engineering from Rensselaer Polytechnic Institute and previously worked for Western Electric Co.

Interest Quotient (Circle One)
High 819 Medium 820 Low 821

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Graphics boards rejuvenate microcomputer displays

Windowing and integrated software packages boost the capability of microcomputer displays. And improved add-in graphics boards contribute further enhancements

Carl Warren, Western Editor

Personal-computer makers are incorporating more graphics capability into their machines, and board vendors are offering more sophisticated add-in graphics-adapter boards. For one thing, improved application programs with integrated functions are forcing hardware makers to add even more display capability. For another, users are asking for presentation graphics in both monochrome and color.

Thomas Dodge, president of the Irvine, Calif.-based distribution company, Premier Source, notes the growing call for graphics. "We have found that a system without graphics just isn't wanted. We carry systems such as the Zenith line of microcomputers that do have graphics, and our dealers are asking for add-in boards for the IBM [Corp.] PC and compatibles," says Dodge. "It's a growing market and we see a great deal of support not only from the hardware vendors, but also from the software people as well."

Andrew Czernek, director of marketing for Zenith Data Systems, adds, "The emphasis [on graphics] is definitely there. The number of color monitors sold is rapidly increasing. We estimate that only 18 percent to 20 percent of the IBM-type systems were being bought with a color monitor and a graphics adapter a year ago. Now, it exceeds 24 percent. And no one knows the real number of systems that are being upgraded with graphics capability."

IBM sets the pace

The IBM PC sparked an accelerated interest in graphics functions on microcomputers. The basic IBM system is designed for a monochrome monitor and for handling alphanumeric outputs. However, because the success of software that provide graphics capability—e.g., Lotus Development Corp.'s Lotus 1-2-3—and the explosion of windowing software on microcomputer CRT screens, the IBM PC is quickly becoming populated with sophisticated color and monochrome add-in graphics boards.

To extend the PC, IBM offers a color graphics board adapter that also provides black and white resolution as high as 640 dots by 200 dots. This resolution allows some of the more sophisticated programs, such as Open Access from Software Products International (SPI), to operate at maximum efficiency in various text type modes. However, for graphics such as a rotating 3-D type, a resolution of 320 dots by 200 dots permits the simultaneous display of three colors and a choice of one of eight background colors.
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GRAPHICS

The IBM graphics board allows more display functionality, but most users prefer improved display characteristics, especially for text. Therefore, a variety of approaches have emerged to improve the graphic and textual display. For example, the IBM PC Portable comes with a graphics display adapter.

Graphics play a key role

Zenith is one of several manufacturers aggressively pursuing the graphics market. The Zenith microcomputers, including the Z-100 and IBM-compatible Z-150, come with graphics capability. The Z-100, for example, always resides in graphics mode and provides a full bit-mapped display, even for alphanumeric characters.

The Z-150 is, however, conceptually closer to the IBM PC and thus offers similar attributes in order to take advantage of the growing base of software written for the PC. It handles both monochrome and color outputs and can support an interface mode as well, thus improving its display characteristics.

For graphics design packages supporting CAD/CAM applications, a Z-150 software switch selects a pixel resolution of 320 dots by 400 dots or of 640 dots by 425 dots. Moreover, the carefully matched board output ensures that text material can be handled correctly, overcoming character ballooning (the fuzziness characteristic of the IBM-card display).

Another system manufacturer taking graphics demand seriously is Pronto Computers Inc., Torrance, Calif. Although the Pronto system runs much of the PC-DOS software, this wasn't a design goal, company president Henry Gasbarro says. "We created a professional product to solve various business needs. We didn't aim at being PC-compatible, but we do get some of the fallout."

And like IBM and Zenith, Pronto realizes that graphics are important in business computer systems. Thus, the company provides a graphics adapter card that generates graphics with a resolution of 640 dots by 480 dots. Moreover, the card implements three full-bit planes that permit either eight levels of gray scale or eight colors chosen from a 16-color palette.

The sophisticated Pronto graphics adapter uses the NEC 7220 graphics display controller. "This chip ... gives us some classy capabilities," notes vice president of engineering Skip Hansen. Among these capabilities are the ability to have a 13.3-MHz video-dot rate, thus providing speed in drawing lines. The use of three-bit-plane display-storage-areas and RAM-based look-up tables combines color and screen attributes in virtually any manner. Thus, the system is well suited for specialized applications.

Observers expect that, to solve immediate needs, many systems will include one monitor for text and another for graphics. Although a capable color monitor costs about 10 percent more than for monochrome, it accommodates extra bandwidth and thus offers more benefit per dollar. In the long-term, users will require single monitors supporting color.

Many users avoid color graphics because of the extra cost or because it often produces inferior graphics. And in many cases, color graphics are unnecessary. For example, database-management systems, spreadsheets and other packages work well without color. And word processing rarely requires color. More realistically, monochrome displays can be improved by use of sophisticated monochrome graphics boards.

Color is possible by coupling monochrome terminals to hard-copy devices, such as printers or plotters with color capability. With such devices just becoming available at low cost, personal computer owners will invariably be led to their use.

Systems get smarter

Most graphics adapter board enhancements are more powerful than those on the IBM PC adapter. Although many adapter boards are available, Kevin Jenkins, president of Hercules Computer Technology, Berkeley, Calif., talks of confusion surrounding graphics display adapters. "When this started, no standards existed. There was only the IBM way. Then, everyone improved on IBM, resulting in many ways of implementing a graphics display board." Jenkins continues, "It didn't make sense until Lotus brought out 1-2-3. That [software] required graphics capability, and the ideal was to be Lotus compatible." Jenkins says that while many
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CIRCLE NO. 97 ON INQUIRY CARD

MINI-MICRO SYSTEMS/October 1984
claims are made for boards, there is still not much software that takes advantage of their capabilities.

Hercules was one of the few companies to deliver a graphics adapter board that handles software like Lotus 1-2-3. Their 720-dot-by-348-dot resolution graphics card supports Lotus 1-2-3, Microsoft Corp.'s Word and other graphics packages. The $499 card was designed to work in monochrome, notes Jenkins, because many systems come with monochrome monitors, and users want graphics capability without buying another CRT.

The Hercules card also supports alphanumericics, with up to 90 characters per line and 43 lines per screen. This attribute is especially useful when the board is used with Microsoft's multiple-window-featured Word.

AST Research Inc. of Irvine, Calif., maker of the MonoGraphPlus display adapter, still views the graphics market as fairly uncharted. According to Angela Rosak, product marketing manager, "Current studies show that graphics will be in greater use and that mainframe functions are quickly migrating to the PC. Consequently, it's important to have the proper mix of hardware and software to meet this new market." Moreover, AST sees the emerging CAD and business-graphics market demanding more from hardware. To meet those perceived demands, the AST board offers a bit-mapped video with 720-dot-by-348-dot resolution and adds a serial and parallel port along with a clock calendar.

Even with added board functions, AST sees the battle as one of cost versus market. Thus, for $495, the MonoGraphicPlus provides high-resolution monochrome graphics without requiring extra CRTs. The company feels that the ideal situation is to have one CRT and one display adapter. The system must function in both text and graphics modes without either unit being degraded by poor performance. "Color isn't the issue. Rather, clarity of display for the lowest possible price is," says senior design engineer Ciro Cornejo.

Doubling scan lines enhances display

Another way to increase IBM PC display power at low cost is Princeton Graphic Systems' Scan Doubler. This $249 add-on card runs Princeton's ST12, or other 81.5 kHz/30 MHz color monitors, from a standard IBM color card. When attached to an IBM color card, the board effectively doubles each horizontal scan line to produce a 640-dot-by-400-dot non-interlaced display. Although the software addresses only 200 lines, the lines are repeated, deepening the color display and improving the text clarity.

Another approach, Tecmar Inc.'s Graphic Master, brings high dot resolution (720 by 700) to the monochrome or color IBM display. The $695 board's 128K bytes of display memory is usable as additional system RAM when the graphics functions are unused. And like the other boards mentioned, it can display graphics or text on any IBM monochrome monitor, NTSC (National Television System Committee) standard composite monitor or RGB (red, green, blue) color monitor that permits a 720-dot-by-480-dot, four-color display or a 640-dot-by-400-dot, 16-color output. The NTSC standard was the first monochrome-compatible, simultaneous color system used for public broadcasting.

Although the Tecmar board does offer a set of formidable features, including a light-pen connection and output to a video recorder, no existing package takes full advantage of the extra display characteristics.

Cards match IBM

For system implementations that must closely match IBM, the $495 Graphix Plus from STB Systems Inc.'s (Richardson, Tex.) is like many previous cards: it offers
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The Quadcolor II supports as many as 136 simultaneous colors with a resolution of 320 dots by 200 dots.

both composite monochrome and RGB color outputs. In addition, it has moderate output resolutions of 640 dots by 200 dots and 320 dots by 200 dots. "Our approach is simple," says company president Bill Ogle. "Offer the most workable and cost-effective product and be as compatible to the software world as we can. We don’t want to provide more than is legitimately useful."

For system integrators wanting a monochrome adapter board to match the IBM card, and able to accept custom character sets, there is the $295 Persyst monochrome display adapter. And for color-graphics capability, $244 buys the color graphics adapter that provides a full set of characters and implements custom character sets as on the monochrome board. Like STB, Persyst plans a conservative approach to ensure software and system compatibility.

Quadram Corp. offers Quadcolor I and II boards. Quadcolor I with 32K bytes of onboard memory sells for $275. Another $295 converts it into the II model and adds another 32K bytes of memory, a game port and BASICQ, which modifies IBM’s BASICA language with special graphics commands providing access to the board’s enhanced features. With the Quadram boards, two colors in addition to black and white are available, and to enhance character sets, scan lines are increased from eight to 16. In addition, two character sets in ROM are software-selectable and user-definable for special applications. Besides supporting the more expensive monochrome and color displays, Quadram adapters have an RF modulator for television use. Screen mode provides 136 colors. Colors can be displayed simultaneously in various combinations with a resolution of 320 by 200 dots.

Interest Quotient (Circle One)
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Database management software accents flexibility

Word-oriented database package accepts varied data formats and simplifies data retrieval methods

Steve Magidson and Tom Sherrard, DayFlo Inc.

System integrators who use software in adding value to IBM Corp. PC/XT and PC/AT computer systems or their look-alikes can now offer a broad range of applications with a new concept in database management software. Called DayFlo, the software adds flexibility to database management in the personal computer environment.

Database design architectures were typically transplanted from mainframes and minicomputers and were not designed to maximize the capabilities of microcomputers in the personal and business environments. One had to choose between easy-to-use software with limited capabilities, or powerful-but-complex products that require detailed programming. In addition, because database systems available for microcomputers have been built around structured data, they employ rigid record formats that may make them efficient, but relatively inflexible. They do not support the way people work. Rigid record formats plague even the newer user-friendly packages.

Departs from past database technology

This database software represents a marked improvement in information management. By supporting any data format, it permits users to enter information spontaneously, without first translating it into rigid record formats. Similarly, users can retrieve information from the database via a range of criteria or "clues," without having to remember exactly how or where the information is stored, as required by traditional database systems. Initiating tasks involves interactive menus that make task selection easy for the user, just like reaching for a file folder.

When DayFlo is employed in an "electronic desktop" environment, organized work resides in electronic stacks (the current stack and 19 side stacks), provides electronic files and offers a "trash" feature for purging no-longer-needed information. Switching between tasks takes four keystrokes. In traditional database environments, such switching is impossible or cumbersome, involving swapping diskettes and typing long sets of sign-on/sign-off control sequences. Speedy switching also does not interrupt the user's train of thought.

This approach to handling a database integrates word-processing with database-management functions to enhance flexibility, extending the capabilities of both functions. DayFlo's integral word-processing lets users perform powerful word-processing functions, such as search and replace or cut and paste, editing and modifying data records while staying within the database environment.

Adds value on two levels

The extended capabilities and flexibility of this database system mean system integrators can offer cost-effective applications at two functional levels. At the first level, integrators can create applications using standard DayFlo features. For example, they can create records that contain blank forms and templates,
such as for personnel records, expense reports, prospect files and stock portfolios. Blank forms and templates can be established for lists of public relations and editorial contacts.

A user preparing questionnaires for mailing lists may employ cross-referencing. Forms for sales prospects and listings would include such items as company, contact, title and potential sales amount. A daily calendar might include key tasks and deadlines. Expense report templates might include purpose, car mileage, tolls, meals, tips and the like. Personnel templates might include “last date changed,” pay rate, shift, vacation time, remarks and notes.

Integrators can also use the standard features to provide enhancements, such as specific application-oriented databases. For example, to build systems for medical professionals, the system integrator could create a computer-based medical reference encyclopedia and make it a part of the software. The computerized database is superior to the same material in book form. The database can grow and change dynamically as medical knowledge advances. Furthermore, unlike a book, users can cross-reference information extensively, and group references together for easy access.

What’s more, they can easily synthesize diverse information collected in the database and insert it in reports and papers by using cut-and-paste commands.

The command-log facility is another “built-in” feature with diverse possibilities. Command logs are database records; they contain command sequences required to execute certain specific functions. Command logs are created to perform such applications as automatically generating sales summaries for sales managers, creating investment summary reports for financial consultants or preparing tickler files for office workers.

Software applications are straightforward

At the second functional level, users can develop application software and interface it to the basic system. Here, also, the system has advantages for the integrator. DayFlo, developed under UNIX and written in C, benefits from that environment’s inherent system-level portability.

Application implementations are developed in a straightforward manner. They also do not appear alien to the software’s basic system of operation and menus. Instead, they are fully integrated and virtually transparent to users. Because of clearly-defined system-

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COMMAND AND RESPONSE PROCESSOR
(USER INTERFACE)

DAYFLO SYSTEM PROCESSOR

FUNCTIONAL EXTENSIONS

STANDARD FUNCTIONS
- DATA SEARCHING
- DATA EDITING
- DATA SYNTHESIZING
- DATA SORTING
- DATA ORGANIZATION
- DATA MANAGEMENT

STANDARD DATATYPES
- TEXT
- NUMBERS
- DATES
- YES/NO

REPORTFLO

REPORTFLO TEMPLATES

DATABASE

HOST INTERFACE

Systems architecture contains three levels. The host interface is at the bottom, the user interface at the top. The user gets into the system through the command and response processor; the system processor performs data manipulation.

level interfaces, all developed applications look and operate like DayFlo. Application software will use the same interfaces and services. These include: a standardized database interface providing full record, field and index manipulation facilities; comprehensive command and response functions for parameter input and display of dynamic help screens; and executive services for screen, keyboard and peripheral input/output, virtual memory management and data translation and validation.

Flexibility unavailable in other database packages is possible because those packages' underlying architecture is fundamentally different from traditional database system architectures. In the traditional rigid record structure, each record type must be handled differently because each uses a different format. DayFlo provides an environment that manages both structured and unstructured records. Thus, it accommodates as many different types of records in its information base as the user wishes to create.

This approach to handling database information affects both the creation and manipulation of records. For example, records need not look alike. They may be of different lengths, contain different numbers of items and be changed dynamically. Because operating environment records are effectively equivalent, virtually the entire command set can operate on all types of records.

The key to handling records in such a unique manner lies in the system's structure. Flexibility is important for people working in a personal-computer environment. For example, the retrieval software is relatively insensitive to grammar and punctuation. This insensitivity lets users recall records without remembering exactly how they were input.

Another key to flexibility in record handling is the way records are defined. Traditional systems separate the data structure from the data itself. Here each individual record carries with it all the information required to define its structure, using techniques that minimize both database storage and processing overhead. This freedom from global-structure constraints permits users to move—or even dynamically combine—individual data records to set up entirely new types of information from existing information.

Further input flexibility lets the user enter data into the system in virtually any convenient format. And because the software accepts any record format, integrators can pick whichever format they find convenient to work with in creating applications. This reduces time and overhead costs in developing new applications and getting them to market.

Retrieval method eases task-switching

Associative retrieval makes switching between tasks easy. Operators get information out of the database easily using many options. Unlike traditional databases that require data-retrieval queries constructed with Boolean algebra, these retrieval queries are in English. Finding data is more direct. The system's "contains"
These English-language menus are direct, and data-retrieval queries are self-explanatory. Other database systems' retrieval queries function illustrates how powerful data retrieval can be. Take, for example, a user who must retrieve a record for a prospective customer who had last called months previously. The user doesn't remember the prospect's whole name—only that it was "Mr. Richards", or maybe "Richard", or "Dick"—something. Constructing a satisfactory retrieval query for this situation with traditional database Boolean language is difficult at best. But the "contains" function does it with dispatch.

Certain functions that do not exist in traditional database systems are possible and meaningful. One is the ability to retrieve information from a record on the basis of a certain field. For example, a user could easily retrieve only those customer records that include a home-address field despite the fact that the system allows for customer records with or without a home-address field. It would be impossible to use this command in a traditional database system where all customer records must be the same. Either all the records would contain a home-address field or they would not. Another data-retrieval function gives users the ability to gather many different types of records with a single query such as the one previously described.

Integrating word processing with the database system extends the power of both functions. Word processing works directly with database records and keeps both functions simultaneously available to the user. Word processing capabilities are enhanced through managing, sorting and manipulating text files with database power. A record change is performed as a word-processing function. For example, adding a home-address field to a customer record is as simple as addressing the record: you insert the number of blank lines required and type in the address.

Other word-processing functions allow other powerful operations on database records. For example, the search function can move through whole sets of records, finding all records (regardless of type) that contain a particular character string in any field. And the search and replace command can be used to dynamically update large numbers of diverse records.

Command logs add value. They permit predefining complex functions by putting commands together in a record and giving that record a meaningful name and optional description. Then it is only necessary to access and execute the appropriate command log. Command logs reduce the time and effort users normally need to create powerful functions and utilities. System integrators can provide these functions in application-specific command logs. The procedure for translating data from a popular database program into DayFlo records can be built into a command log that the user can access with just a few keystrokes. The command log contains the instructions necessary to perform an associative retrieval of data from the information base.

Thomas H. Sherrard, principal member of the technical staff at DayFlo, has worked in software, hardware and systems design on mainframes, minicomputers and microcomputers for 21 years. He has worked for the University of Chicago, Bunker-Ramo Information Systems, General Automation Inc. and others, in positions ranging from system programmer to vice president of marketing.

Steven R. Magidson, also principal member of DayFlo's technical staff, has 14 years experience in software design, implementation, quality assurance and human interface subsystems. He has worked for General Automation, Inc., Downey Savings & Loan and the European American Bank. Magidson has a B.A. degree from Rutgers University and a masters degree in computer science from West Coast University.
A DEFENSE THAT HANGS TOUGH
PLAY AFTER PLAY AFTER PLAY.

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The company that produces a family of database software designed to take on the future.

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INFORMIX is a true relational database system designed to take full advantage of the power of UNIX. It includes the most widely used report writer on the market.

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INFORMIX and File-it are fully integrated. Users can upgrade from File-it to INFORMIX or access data from one program or the other without re-entering data, retraining employees or reprogramming.

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**Simplify program development.**

RDS offers C-ISAM™ the de facto standard ISAM for UNIX. It's a library of C subroutines with a B+-Tree based access method that stores, retrieves and modifies data from indexed files. It's embedded in INFORMIX and File-it! Or is available as a standalone product.

**Software good enough for AT&T.**

AT&T, inventor of UNIX, has co-labeled INFORMIX, File-it and C-ISAM to run on their full AT&T 3B Computer line (from micros to minis).

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In fact, INFORMIX has an installed base of over 6,000 copies. And RDS has sold over 35,000 licenses for all their products to date.

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There's only one database software family that's UNIX-, PC-DOS-, MS-DOS- and PC/IX-based. It runs on more than 60 systems. And it's ideal for both novice and expert.

Now it doesn't matter where the future's headed. You're already there.

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- Bunker Ramo Aladdin 20
- Charles River Data Systems
- Universe 68
- Convergent Technologies MINIF and Megaflex
- Corvus Systems Uniplex
- Cromenco System 1
- Dual Systems System 83
- Fortune 32:16
- Forward Technology 320
- General Automation Zebra
- [all models]

Demos of INFORMIX and File-it are available. Demonstration software and complete manuals included.

**Further reading:**

See us at UNIX Expo, Oct. 16-18, New York, Booth #123

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Everyone knows that Silicon Systems dominates the market with read/write IC's for 14", 8", 5-1/4", and smaller Winchester disk drives. What they may not know is that we're not satisfied to stop there. Although our present line of rotating memory circuits includes much more than read/write IC's, we won't be satisfied until we completely integrate Winchester disk drive electronics. And we are continuing to expand the industry's most complete line of "Applications Specific" IC's for Winchesters, Floppies, and Tape Drives.

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In addition to our broad line of standard circuits, we have developed a host of innovative custom IC's for use with a variety of mass storage systems. We have produced custom IC's for read/write electronics, spindle motor control, analog data processing, digital bus interface, and servo control functions.

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Microcomputer COBOL aids mainframe links

A full COBOL compiler, a debugging package and source-code generators let interactive microcomputers serve as cost-effective, mainframe application development and maintenance stations

Dan Fineberg, Micro Focus Inc.

The use of microcomputers to develop COBOL (common business-oriented language) applications for mainframes has come of age. Programmers and system integrators can no longer regard microcomputers as machines incapable of effective interactions with mainframes. COBOL has outgrown its reputation as a batch-oriented, slow, verbose and memory-intensive language—a reputation that may have discouraged microcomputer-application vendors from taking advantage of COBOL's benefits. Today's interactive COBOL running on powerful multiuser 16- and 32-bit microcomputers with large storage capacities, allows them to effectively develop and maintain a host of mainframe-level business applications.

Microcomputers no longer function as mere stand-alone systems. They can serve as both mainframe program development stations and as delivery vehicles for distributed processing. Software shared between microcomputers and mainframes allows uploading and downloading of application programs between the two types of computers. Powerful microcomputers in large organizations linked to central mainframe computers provide two important benefits. They remove a significant programming workload from corporate mainframe computers, freeing valuable CPU time for execution of...
data-processing applications. And they permit end-users to more easily access information and information-processing resources.

**Increases programmer productivity**

Optimizing computer resources in this manner also increases programmers' productivity. With their own microcomputers readily available, programmers can download from the mainframe to standalone systems for application testing and maintenance. They can also develop new mainframe applications on the standalone system without the interruptions that often occur when they use the central mainframe resource during peak hours: 1 p.m. to 5 p.m. During this period, response time often degrades to as long as two minutes from the normal 3 to 5 seconds.

Running standard COBOL on both a mainframe and microcomputers enables end users to collect and process central data on the microcomputer and store locally processed information on the mainframe. This capability allows end users to be more productive by freeing them from data-processing department schedules and constraints. However, it does not interfere with the DP manager's efforts to control the security of sensitive information.

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**A LOOK AT TWO WAYS TO PROGRAM FOR MAINFRAMES**

**Mainframe program development from mainframe terminal**

**Decision process**
- Cost justification
- Priority justification
- Allocate resources
- Predict downtime
- Predict interruptions
- Predict time to complete

**Disadvantages**
- No dedicated CPU
- Slow response time
- Downtime
- Interruptions
- No debug capabilities
- No "what-if" capabilities
- Long turnaround

**Mainframe program development from interactive microcomputers with Level-II COBOL**

**Decision process**
- Priority justification
- Allocate resources

**Advantages**
- Interactive development environment
- Fast response time from CPU
- Powerful debug capabilities
- "What-if" analysis capabilities
- Virtually zero downtime
- Permits efficient use of programmer's time
- Built-in maintenance environment

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The maintenance of application software takes up a disproportionate amount of program-development time. Microcomputer-based programming tools can decrease the time and effort required to debug mainframe application programs.

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**How program developers spend their time**

- Define requirements: 9%
- Module test: 8%
- Code: 7%
- Design: 5%
- Integration test: 7%
- Maintenance (in-field debugging, post-facto enhancements): 67%

Source: ACM Computing Surveys

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Mainframe program development from microcomputers using interactive COBOL offers advantages not found in the mainframe environment, speeding the decision and software-development processes.
The new Canon TX-50 desktop computer.
It fits any customer’s business as well as his desk.

No matter how specialized your customers’ business needs, Canon's new compact desktop computer is uniquely designed to accommodate them.

Because the TX-50 is a self-contained computer that can be customized for a wide range of specific business applications.

Its all-in-one design includes:
- A high-performance 16-bit microprocessor with MS-DOS® operating system. Standard 128KB memory is expandable to 256KB.
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- Fifty-function LED keyboard plus separate ten-key calculator pad and cursor control keys.
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With such impressive, self-contained flexibility, the TX-50 is ideal in areas such as customer operations and counter service. Especially since the TX-50 provides such a huge range of varied functions, yet takes up so little space.

Businesses such as gasoline stations, banks, mail rooms, real estate brokers and numerous others will find the TX-50 particularly useful for sales, credit, loan or general customer calculations.

So if you’re dealing with business, whether large or small, and you feel they need a rather special computer, consider the new Canon® TX-50 desktop computer.

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CIRCLE NO. 107 ON INQUIRY CARD
The increasing availability of 32-bit compilers on microcomputers will overcome several drawbacks of today's machines: First, 16-bit addressing often prevents the downloading of mainframe applications. Second, 16-bit compilers with data spaces of less than 64K sometimes cannot handle the large, unmodified mainframe applications. Having 32-bit addressing on a microcomputer also permits end users to read in multiple files and build up large databases.

**Packages implement debugging, screen creation**

Four packages from Micro Focus Inc. provide an effective bridge between microcomputer and mainframe business software-development environments. LEVEL II COBOL combines features of mainframe COBOL with interactive extensions to take full advantage of 8-bit to 32-bit microprocessor-based development workstations. The ANIMATOR debugging and maintenance package allows programmers to interact and control executing programs, check data values and

**In the first stage of the application-development process, the high-performance LEVEL II COBOL compiler produces intermediate code that conforms to an abstract COBOL machine. In the second stage, the intermediate code is interpreted by the Run-Time Support Package for UNIX-, CP/M- and MS-DOS-based microcomputers. Alternatively, native code generators can compile intermediate object code to the target machine's native code.**

**On-going standardization efforts keep COBOL up to date**

COBOL has evolved along standardized lines to keep pace with the development of computer hardware. In the late 1950s, when business and government first began using computers, software programs could be developed only by software engineers, and software applications were not readily transportable across different machines. To overcome these problems, a group of computer manufacturers, compiler writers, end-users and government officials met in Washington, D.C., in May of 1959 at the Pentagon to design a common business-oriented language (COBOL), "independent of any make or model of computer, open-ended and stated both in English and narrative form."

Led by a U.S. Navy Commodore, Grace Hopper, known as the "mother" of COBOL, the group grew into the COBOL Committee of the Committee on Data Systems Languages (CODASYL), the governing body that guides the language's evolution. The committee produced an initial version of COBOL in January, 1960. Since then, more than $100 billion has been invested in COBOL applications worldwide. The COBOL Committee has continued its work, proposing standards for adoption by the American National Standards Institute (ANSI) and enforced by the government's General Services Administration (GSA) at the Federal Compiler Testing Center. As a result, COBOL is the most strictly standardized business programming language in the world. Standardization offers many benefits, including the ability to maintain an investment in existing software as new hardware is implemented.

The 23-member COBOL Committee meets six times a year to discuss specifications of the language. It produces the COBOL Journal of Development (JOD), a regularly updated publication that defines proposed changes to the language.

ANSI, through its COBOL committee (X3J4), periodically generates a new industry COBOL standard. First published in 1968, the standard is based solely on the current CODASYL version published in the JOD.

Based upon ANSI COBOL, Federal Standard COBOL meets U.S. government requirements with four levels of implementation: Low, Low-Intermediate, High-Intermediate and High. The GSA's Federal Compiler Testing Center tests each COBOL compiler for compliance with the Federal COBOL standard, using a suite of programs comprising 225,000 lines and 5,500 individual tests. A compiler is tested at the implementor's claimed level, then placed on the Certified Compiler List either "with errors" or "with zero errors." For example, Micro Focus Inc.'s LEVEL-II COBOL compilers are GSA certified at the High Level with "zero errors." Certification is valid for one year, after which each compiler must be retested. As a result of these standards, COBOL source code is portable across different machines, operating systems and various implementations of a standard COBOL compiler.
How does a new, letter-quality, thermal transfer printer made by Canon sound? Very quiet.

Canon's advanced non-impact printing technology heralds yet another achievement—The F-60: a flexible, high-quality thermal transfer printer with Graphic Image capability. Its letter-quality printing is good enough to use with a word processor; yet quiet enough to be seen and not heard. The F-60 operates at a dramatically low 45db, so it's perfect for even the most noise-conscious office.

Extreme flexibility gives access to three attractive printing modes. Printing speeds range from Graphic Image at a rapid 80cps, through Draft and Near-Letter-Quality to Letter-Quality at a smooth 20cps and an impressive high-resolution 36X24 dot matrix.

But its flexibility doesn't stop there. A simple system of interchangeable typestyle cartridges gives an incredible choice of eight different fonts.

The F-60 is also highly versatile. It handles not only thermal paper and overhead projection film, but also plain paper in single sheets, rolls or fan folded. Its self loading mechanism automatically inserts and advances the paper. It's even compatible with most leading personal computers.

Plus it prints in a choice of four bold colors.

And it does it very quietly, and at a very competitive price.

For upgraded performance, optional accessories include pin feed, tractors, roll paper holders and a serial interface card.

The new F-60 thermal transfer printer from Canon. You have to admit it sounds very good.

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set up "what-if" situations—capabilities generally not available on mainframes. The FORMS-2 and SOURCE-WRITER source-code generators speed the development of COBOL applications by automatically producing error-free source code.

Using these packages on a microcomputer reduces the time required to develop and debug a mainframe program. Working directly on a mainframe, a highly productive programmer might require 10 working days to write, debug and test 600 lines of code (one module). With LEVEL II COBOL on a microcomputer, the programmer could complete the task at least one-third faster. For example, if it takes nine months to develop a purchase-order system on a mainframe, the same task requires less than six months to complete on the microcomputer.

Nearly 70 percent of all investment in applications software goes toward maintenance. The ANIMATOR tool solves COBOL maintenance debugging problems in a flexible manner, permitting a programmer to watch the program's source code execute on the screen and automatically trace the effects of an error through a COBOL program's logic and data structure. ANIMATOR also lets programmers select parts of a program, choose the data to demonstrate the code being checked and control the speed at which the code runs.

The FORMS-2 source code generator automates the laborious task of creating interactive screen displays for COBOL programs. Menu-driven and easy to use, this tool allows programmers to directly "paint" displays on the screen using a keyboard. It also automatically generates the COBOL source code required to make the interactive screen functional.

After the package generates a COBOL source file, software developers can use the COBOL copy verb to incorporate the program into an application program. Simple editing commands manipulate text on the screen. Using FORMS-2 can save an estimated eight to 10 man hours for each interactive form generated. The SOURCEWRITER package, a system-building, data dictionary-based generator, can similarly cut the time required to produce source code for complex applications requiring interlinked files and thousands of lines of code.

To meet the burgeoning needs of the personal computer market, Micro Focus developed PERSONAL COBOL, a fully integrated program development system for IBM Corp.'s PC, PC/XT and 3270 PC. The package provides a powerful full-screen text editor, source code generator for forms, index program generator, syntax checker, automatic file handler and an interactive source-code-level debugging facility. PERSONAL COBOL supports all IBM PC color/monochrome display attributes and graphics characters, and Eratosthenes" benchmark program. As the program executes on the bottom half of the screen, the cursor moves from statement to statement. Interactive debugging and analysis commands (B) implement modification of data values, alteration of the control flow, "what-if" analysis and other capabilities.
What's more incredible about Canon's color ink-jet printer?
The quality... or the price?

Take a look at the beautiful clarity of the Canon PJ-1080A's color ink-jet printing. Then discover that Canon's color printer actually costs well under a thousand dollars. You'll be hard-pressed to decide which is more amazing.

What makes the quality so incredible? Features like:

• The advanced drop-on-demand printing system. Canon's patented ink-jet technology gives a sharp 540 dot-per-line scan mode, for dazzling high-resolution color and exceptionally clean, crisp printouts.
• Whisper-quiet operation of less than 50dB and an impressive speed of 37 c.p.s.
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• Compatibility with most computers you can buy.

And how much does all this cost? Far less than a thousand dollars. So what's more incredible about the PJ-1080A color ink-jet printer? There's only one way you'll really be able to find out.

And that's to buy one and decide for yourself.

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CIRCLE NO. 109 ON INQUIRY CARD

Canon Printer Division
SOFTWARE

'PAINTING' A FORM FOR END USERS

CLIENT PROFILE

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Speeding the creation of interactive screen-handling programs, the FORMS-2 VISUAL PROGRAMMING tool enables a COBOL program developer to "paint" a form directly on the screen exactly as it will appear to the end user. After the variable data in the screen shown left is defined (represented, for example, by Xs, Zs or numbers within the brackets), the package automatically generates the source code necessary to implement the final screen display.

COBOL offers strengths in these areas. Approximately half the language is dedicated to file-handling capabilities, and a sort module permits the reorganization of data files according to complex user-defined parameters. Other languages require programmers to write additional lines of code to accomplish similar tasks.

COBOL versus the alternatives

New software alternatives, such as fourth-generation languages, are not compatible with the $100 billion, worldwide established base of COBOL applications and lack the flexibility of high-level programming languages. COBOL has maintained standardization and compatibility with its installed base.

In comparing COBOL with C, PL/I, and other popular languages, system integrators and programmers should consider the extent of standardization along with software investment and optimal design for business-application development.

C, for example, is a system implementation language useful for writing operating systems, other languages, database-management systems and word-processing packages. It provides powerful assembly code-like capabilities and offers portability among many architectures.

COBOL and C are complementary languages. LEVEL II COBOL, for instance, contains a run-time support package written in C that allows it to operate on UNIX-based systems. As an application program-

LEVEL II COBOL combines features of mainframe COBOL with interactive extensions to take full advantage of microprocessor-based development workstations.

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LEVEL II COBOL combines features of mainframe COBOL with interactive extensions to take full advantage of microprocessor-based development workstations.
Now you don't have to sacrifice print quality for speed.

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High speed and high quality in one functional, compact unit. That's what Canon's Impact Matrix Printers offer you.

They print hard copy at a rapid 160 characters per second. While in the double pass mode you get an impressive, high-density 23 X18 dot matrix that gives near letter quality printing suitable for word processing.

Canon's unique technology has also dramatically reduced bothersome clatter down to a muted noise level of less than 60dB.

Even at high speed.

And that, unlike many other impact matrix printers, makes them a pleasure to work with.

Plus there's limitless flexibility with the optional down-loading function that lets you print whatever character fonts your host computer can create. As well as a choice of four different character styles (all printable on the same line) that you can enlarge or condense.

The Impact Matrix Series Printers give you a convenient choice of special paper widths—the PW-1080A for 80-character column printout and the PW-1156A for 156-character column.

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similar applications. But it was developed to help college students learn how to use computers, and lacks COBOL's facilities for manipulating data and handling files in an elegant manner. In addition, Pascal does not represent as large a mainframe-based application software investment as COBOL.

BASIC was developed at Dartmouth College as a beginner's instructional language. It was not designed specifically as a data-processing tool, although it is a useful language for personal computers. Furthermore, BASIC's lack of standardization and sophistication generally prevent its consideration as a serious business-application development language for large organizations.

**Implement decisions directly on microcomputers**

In short, running COBOL on microcomputers to develop and maintain mainframe applications speeds application development, reduces costs and increases the capabilities of connected microcomputers with added capabilities. As software products evolve that allow non-programmers to create applications easily on microcomputers, they may also allow business professionals and managers to make corporate decisions without interfacing directly with the corporate mainframe.

Today, when a manager in a large company decides to implement a complex procedure, usually more than two years pass before the DP department can complete the application. Using COBOL on both microcomputers and mainframes allows non-programmers to design an application based on collected data using standard COBOL procedures. Users can then transmit the program to the DP department for integration into the corporate management information system, freeing DP professionals to perform other tasks.

Dan Fineberg, business unit manager at Micro Focus Inc., Palo Alto, Calif., controls the company's joint marketing and development efforts with Digital Research Inc., Pacific Grove, Calif. Previously, he headed Micro Focus's marketing communication operation and was an account manager at Franson & Associates. He holds a master of management degree from the George Atkinson Graduate School of Management, Willamette University.

**Interest Quotient (Circle One)**

High 828 Medium 829 Low 830
The new Canon Handy Terminal makes any computer system go farther.

The new Canon Handy Terminal 5000 is the portable unit that lets you gather and process information out of the office.

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It can be programmed to perform almost any task, adopting BASIC and Assembler languages.

And can even relay information to your computer via phone hookup.

Portability is also the key word of the 5000, because Canon's Handy Terminal was especially designed for traveling light.

At a weight of less than 2 lbs., it can operate on a rechargeable battery and can be carried by neck strap or in an attache case. Yet it's highly durable, water resistant and shock resistant. Which means it can take its fair share of hard knocks.

Also available is the 5000P (shown above) which has a built-in thermal dot printer that can print one original and a copy.

And both terminals can incorporate an optional bar code reader.

So why not widen your computer horizons with Canon's new Handy Terminal. It lets you go as far as you like.

For more information:
Call 1-800-323-1717, Ext. 302.
(In Illinois call 1-800-942-8881, Ext. 302.)
Or Write Canon U.S.A., Inc., Systems Division/Handy Terminal, P.O. Box CN 11250, Trenton, N.J. 08638.

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CIRCLE NO. 113 ON INQUIRY CARD
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INTRODUCING

DOUBLE DRIVE™

If you've been pondering whether you need a streaming tape drive to back up your Winchester, or a start/stop tape drive, or maybe both, we have good news. You no longer have to decide. Because now there's a drive with the capabilities of both. Rosscomp's Double Drive. It saves you the agony of decision. And an incredible amount of money at the same time.

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When our engineers set out to design the Double Drive, they too had a decision to make. Quarter-inch tape? Or half-inch tape? But then they found that, even by pushing quarter-inch technology to its absolute limit, they wouldn't be able to give us the capabilities we wanted.

So half-inch became the only choice. That also meant they could assure us of something else we demanded. Reliability. For instance, they could design-in the industry's highest quality read/write half-inch heads. Meanwhile, they could make the system stream at unbeatable speeds.

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Spring loaded and ball bearing tape guides.

Simple, dependable automatic tape threading.

Single capstan motor.

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Available formatters include QIC-02, SCSI and 9-track.

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Versatile OEM module combines laser printing, image scanning and copying functions

Easily integrated into office automation systems, the M3071 uses a semiconductor diode laser, a CCD scanning system and halogen-lamp electrophotography to perform a host of office applications

Mark R. Bond, Fujitsu America Inc.

Today's automated offices contain a variety of one-function business machines lined up side by side. Such machines—printers, plotters, facsimile machines, optical character recognition readers and copiers—perform their functions well enough, but unifunctional office machines cannot match the efficiency of an integrated automated environment. Furthermore, they are expensive and take up valuable office space. Each unifunctional office system has its own set of host-computer interfacing rules, drivers, software-control codes, repair subassemblies and replacement parts.

Fujitsu America's M3071 integrated-printer module addresses these problems by combining printing, copying, image scanning and optical image overlay functions in one multifunctional machine that can serve a wide variety of automated-office applications.

The M3071 module performs high-resolution laser printing, halogen-lamp copying, digitized image scanning using a charge-coupled device (CCD) and optical image overlay combining printing and copying. Because system integrators add external controllers, the machine easily interfaces with end users' systems or machines to accommodate a variety of specialized applications, including optical character recognition (OCR) and the intelligent facsimile transfer of text and graphics. The M3071 prints 20 pages per minute (ppm) with a resolution of 240 dots per inch (dpi), and 16 ppm with 300 dpi resolution for business, scientific or word-processing printing applications.

Three technologies are combined in the M3071: a low-cost semiconductor laser, a compact electrophotographic copier and the CCD scanning system.

Semiconductor lasers reduce cost of laser printers

Semiconductor diode lasers form the heart of the new generation of inexpensive laser printer modules. Compact and reliable, they are less expensive and have lower power and voltage requirements than gas lasers. A drive current that can be changed very rapidly to pulse on and off produces the semiconductor laser's light beam. In contrast, gas lasers use expensive and space-consuming external modulators rapidly blocking or deflecting the light beam.
Laser printing, (laser electrophotography), is performed by scanning a charged, revolving photoconductive drum with a narrowly focused light beam, modulated by video signals, that disperses the charge. The areas not exposed to the beam are left charged and attract oppositely charged toner that is transferred to the copy paper. Because laser printing uses some of the same components as photocopying, the M3071 module can combine printing and copying functions. Merging of these functions is cost-effective and efficient and permits additional office applications such as overlaying photocopied images with laser-printed data.

When comparing and evaluating different print technologies, OEMs and system integrators should consider several factors including print speed, resolution, diversitity of applications and versatility. The use of semiconductor or gas laser systems, band, dot-matrix and ink-jet printers entails tradeoffs for certain applications.

Three principal factors, for example, determine laser printing speed: how fast the light beam turns on and off, print resolution measured in dpi and the drum's photoconductive sensitivity to laser wavelengths. The M3071's 4-mW laser pulses at 280 nsec for 240 dpi resolution. For 300-dpi resolution, it pulses at 219 nsec.

The printing speed compares favorably with other competitively priced systems, which operate at eight to 20 ppm.

Higher printing resolutions are available—some desktop laser printers produce 480 dpi—but these machines operate at slower speeds, (requiring twice as many scan lines per inch), and their higher resolution is difficult to perceive when compared with 300-dpi printing. In any case, 480 dpi appears to be the upper limit for laser-printing resolution. Higher resolution systems obey the law of diminishing returns; they do not result in observably better quality, only slower printing speeds.

The scanning mirror and drive-motor assembly provide critical support functions for fast laser printing. The laser beam scans the drum by reflecting off a multi-faceted, circular mirror assembly rotating at a high rpm level. Because each mirror face provides one drum scan, the number of scans per minute equals the number of mirror faces (facets) multiplied by the rpm. Fujitsu's mirror assembly has 10 mirrors and spins at 6,810 rpm.

Drum sensitivity is an extremely important factor affecting laser-printing resolution and speed. The faster the laser is able to switch power on and off, the more

---

**How Fujitsu combines three document reproduction functions**

Laser printing and electrophotography functions use the same photoconductor drum.

In laser printing, the laser beam, modulated by video signals from the external controller, generates an image on the drum, which is transferred to paper and fixed by pressure. The copying process uses a halogen lamp illuminating a document on the document board to produce the image.

For optical image scanning, the charge-coupled device (CCD) generates a digitized video signal from the original document that is sent to the host computer through the CCD and external controllers for further processing.
CalComp introduces the only plotter with .001" resolution, eight pens and 36" wide plots for under $8,500.

The numbers on CalComp's new 1040 Series add up to one great buy. Even better, there are no hidden costs or extras because each 1040 plotter includes a built-in controller interface and host software.

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The 1040 Series has advanced features that make it impressive at any price. For instance, there's a new interchangeable carriage-mounted 8-pen turret that eliminates tedious pen change delays. By using special sensors, it determines pen type, and sets optimal pen force and speed.

User-friendly features such as automatic media loading and sizing allow the user to get started quickly, producing A to E size plots. An intelligent control panel has local data manipulation capability and built-in self-diagnostics which further enhance overall productivity.

The 1040 Series family includes both cut-sheet operation for more immediate jobs and continuous roll capability for unattended operation. These flexible products are compatible with any CAD system, including those based on IBM® PC and Apple® computers.

Go by the numbers when you select plotters. For details, contact: CalComp, 2411 W. La Palma Ave., P.O. Box 3250, Anaheim, California 92803. Or call toll-free 1-800-CALCOMP, ext. 156.
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dpi it can produce in a given time period. Unfortunately, a semiconductor laser's low infrared-light wavelength discharges a drum more slowly than high-wavelength blue or red in gas lasers. Using higher-wattage lasers to produce a stronger light output is one method by which manufacturers obtain faster printing speeds—but at accompanying higher costs. Fujitsu's and other semiconductor lasers, however, rely upon a new generation of photoconductive selenium drum coatings highly sensitive to infrared light to overcome the low-wavelength-light sensitivity problem.

Laser printing versus the competition

Operating at 300 to 2,000 lines per minute (lpm), band and drum printers offer the closest competition in price/performance ratios to laser printers. Low-cost laser units provide 500- to 1,300-lpm operation. Line printers perform certain jobs extremely well, such as continuous, unattended printing; printing on multi-part carbon-copy statements, and heavy-duty printing workloads of 200,000 or more sheets. These data-processing office workhorses have their limitations, though. For example, their print-band/fabric-ribbon combination and single font style cannot match the quality and multi-font flexibility of laser printing.

Ink jet printers operate at speeds to 150 characters per second (cps), providing stiff competition for high-end laser systems that operate at 10 ppm or less. Furnishing multi-font printing, long-life components, optional color output and whisper-quiet operations, these units have print quality resembling that of dot-matrix printers. High-quality, expensive smooth bond paper however, is typically required because resolutions of higher than 80 dpi invite ink bleed and print smearing.

Multi-mode dot-matrix printers are among the most versatile devices for office-printing applications. Models with high-resolution graphics, multiple fonts, variable pitch selection and letter-quality or draft-quality printing are available. Dot-matrix systems are less expensive, require less maintenance and are smaller in size than laser systems. They can also print carbon-copy packs—unlike non-contact laser printers—and can handle envelopes and other odd-sized stationery.

Laser technology, however, surpasses dot-matrix technology in general-performance speed and resolution specs. Some of the faster-performing dot-matrix models print at 600 cps (approximately 270 lpm), and several multi-head machines print at a rate of 150 lpm, for data-processing resolution of approximately 72 dpi. Laser printers, though, offer four times the resolution and three to five times the print speed of most dot-matrix units.

Plotting and graphics are also performed extremely well by laser technology. Because the laser is already set for high resolution, quality business graphics, bit-mapped graphics and plots do not reduce printing speed. In contrast, pen plotters can spec very fine resolutions of 500 steps per inch and up to infinite resolutions for straight lines and defined geometric shapes, but for specialized plotting applications laser printers have the edge in speed.

Image scanning produces video output

In addition to laser printing, the M3071 module performs image scanning of any hard-copy document placed on its sliding-glass document board. The document is exposed to a halogen lamp, and the reflected light is focused by a lens onto the CCD. The CCD converts the light image into digital form and then into video signal outputs that can be sent through the CCD controller and external controller for further processing. The CCD can detect 16 shades of gray to provide accurate reproductions of the original document.

Two CCD packages are available: 240-dpi resolution (2,048 dots per line) or 300 dpi-resolution (4,096 dots
The ATTACH system from ABLE Computer helps the data processing manager avoid a mutiny among users by enhancing processor efficiency. A multi-host terminal network system, ATTACH supports DEC UNIBUS VAX and PDP computers...and with its Softswitch feature that supports port selection, makes for smooth sailing through your network.

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With ATTACH, users select their network destination. The data processing manager assigns user class definitions for various host computers. Then users can initiate switching between any VAX and PDP-II UNIBUS computer ports in the system. Access to specific data files and applications in the appropriate host computer is readily available.

Navigate The Network Efficiently
With port selection, users match themselves to the application port required — no more wasted user time, or wasted support resources. And no host computer is sitting idle while others are overloaded.

Secure A Safe Passage
The ATTACH system assures the data processing manager of security in the network. With user class definition the supervisor restricts access to any specified host computer, set of computers or subset — this safeguards critical data files. Plus, with ATTACH, the supervisor is free to allocate a particular host computer to high priority users who demand instant access and processing time.

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per line). The higher resolution module can actually produce 480-dpi output, but output bits are masked off to conform to the laser printer's 300-dpi resolution. The CCD system takes six seconds to scan documents up to 8⅛ by 14 inches. System integrators can loop a CCD-scanned image into the M3071 laser from the external controller's RAM memory, overlaying logos, signatures and photographs on data sent from the host computer. Overlaying a negative image-scanned master form in this manner, with print data sent from the host system, means that computer end users no longer have to store pre-printed forms.

Communications facilities can turn the printer module into an intelligent facsimile machine. System integrators can buffer the scanned image on-board (1M byte of RAM memory is required for full-page storage) or send the image to the host computer for buffering. With pattern-recognition logic, the M3071 can perform optical character reading or image reading for many different applications.

Optical overlay merges copied, computer images

Optical image overlay can also combine images generated by M3071's laser system with those produced by halogen lamp copying. Like image scanning, this process reduces the cost of business forms by merging a copied master form with data transferred from the host computer system. Other applications include merging drawings, business graphs and logos with word-processed text.

Although halogen lamp electrophotography is a well-known technology, the M3071 incorporates several unique features into its photocopier module to improve the quality of a copied or printed image and to provide longer maintenance-free performance.

Like other photocopier systems, Fujitsu’s uses a 5-step process that charges a photoconductive drum, images it with a light source (a halogen lamp or laser), develops the image with toner, transfers the developed image to a charged sheet of paper, cleans the drum and bonds the toner to the paper. The copier's cleaning and bonding stations, however, are different from most other low-cost copier modules. Cleaning is performed in three stages to remove any toner on the drum not transferred to the paper. First, a fluorescent lamp discharges the drum's surface so that the toner is no longer attracted to it. Next, a magnetic roller brush attracts the loose toner particles, dropping them into a throw-away receptacle. Finally, a soft sponge roller wipes the drum surface clean of any remaining particles.

Most copiers use hot roll fusing to bond toner with paper. In this process, toner is melted under high temperature (375°F) and fused under light pressure. A newer technique, and one used by the M3071, employs cold press rolling that bonds the toner to the paper under relatively high pressure. Critics of cold pressing charge that it cannot achieve the quality of hot fusing. Fujitsu has overcome the quality problem through the development of a proprietary toner.

Cold pressing, in addition, offers certain distinct advantages over hot fusing. Because copiers using this technique are not subject to the accelerated wear and tear caused by high levels of heat, they will probably have fewer repair bills and maintenance problems. Cold press rolling also has faster initial start-up time. Copying is performed at the rate of 12 ppm with the first copy available in less than 17 seconds.

The M3071 module is available as a laser printer engine without copier and image-scanning components or as a desktop printer—the M3072—with controller and power supply. It operates at 16 ppm with 300 dpi

Spec summary

- **Manufacturer:** Fujitsu America Inc., 3055 Orchid Drive, San Jose Calif. 95134.
- **Product:** M3071 integrated printer module
- **Dimensions:** 17.6 by 48.6 by 22.1 inches with paper stacker and cassettes

**Laser printing**

- **Technology:** laser diode and electrophotography
- **Resolution:** 240 dots per inch (dpi), vertical and horizontal, with 280 nsec per dot video-signal input, or 300 dpi
- **Print speed:** faster than 20 pages per minute (ppm), with 240-dpi resolution and letter-size paper
- **Paper size:** letter and legal plus B4, A4, B5, A5

**Copying**

- **Technology:** halogen-lamp optics system and electrophotography
- **Copy speed:** faster than 12 ppm with letter-size paper

**Image scanning**

- **Technology:** flat-bed scanning by charge-coupled device
- **Scanning density:** 240 dpi, vertical and horizontal, or 300 dpi
- **Scanning speed:** less than 6 seconds per sheet
- **Interfaces:** printer, TTL 3.6M-bps serial video; image scanner, TTL serial video
- **Noise:** less than 60 dB
- **Price:** $7,760 (OEM quantity) for M3071 module with copier and scanner options; $8,285 (OEM quantity) for M3072 desktop printer with controller and power supply
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resolution. Four plug-in cartridge slots accept ROM cartridges for font selection and/or RAM cartridges for downloadable character sets, data buffers, large-scale graphics and electronic forms image-overlay applications. A 256K-byte cartridge provides nearly 4 inches by 4 inches of large-scale graphics. An electronic forms feature overlays format data held in a forms overlay buffer with print data sent from the host computer.

Mark R. Bond, is senior product engineer, peripheral products group, at Fujitsu America Inc., San Jose, Calif. He came to Fujitsu after 13½ years at Mannesmann-Tally Corp., Kent, Wash., where he was supervisor of field services, Western region.

Interest Quotient (Circle One)
High 831 Medium 832 Low 833

NEXT MONTH IN MMS

The November issue of Mini-Micro Systems focuses on terminals. MMS will present an overview on alphanumeric terminals, the key products and expected market trends.

In a comprehensive software profile, MMS studies terminal emulation and control software. Through the use of this type of software, display terminals can emulate the features and performance of other, often superior terminals at a much lower cost. MMS will examine networking opportunities and software compatibility advantages of various product offerings.

The Integrator section of Mini-Micro Systems will profile a computer-aided publishing system that allows professional quality typesetting, graphic arts and paste-up to be achieved in house. The system integrates a 32-bit microcomputer with high-resolution graphics, multiple-font text-processing and business-graphics software.

Be sure to watch for your issue of Mini-Micro Systems' next Fall Peripherals Digest, coming November 15. This comprehensive reference guide will cover the following topics:

- disk drives (up to 5¼-inch)
- disk subsystems
- cartridge tape drives (up to ¾-inch)
- alphanumeric terminals
- serial printers

A directory of manufacturers will also be included.
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**INTRODUCING VAULT.**

Emulex rises above the competition with the Vault™. This 70-MByte tape subsystem is built around the CDC Sentinel ¼" cartridge tape streamer and uses Emulex's own TC05 (QBus) or TC15 (Unibus) tape coupler to interface with your system. The Vault is totally software transparent to standard TS11 software. So this compact tape unit looks just like a big ½" TS11 subsystem to your operating system and diagnostics.

Vault comes complete with power supply in a single compact cabinet. It's the perfect backup unit for smaller QBus systems such as the MICRO/PDP-11 and MICRO/VAX.

**PRESENTING SABRE.**

SABRE™ is a sharp solution for LSI users who need more storage and backup. It packs 31.2 MBytes of main storage onto a 5¼" Winchester and 10.4 MBytes of backup onto a removable 8" cartridge disk.

And since SABRE is an exact RL02 emulation, all existing operating and diagnostic software can be used as is.

SABRE is 5¼" high and slips into any 19" RETMA enclosure. A desktop version is also available. Both come complete with power supply, host adapter and connecting cables.

SABRE needs only one-eighth the space and one-quarter the power of four RL02s. And it eliminates the need for a separate system bootstrap, bus terminator and clock control board.
ANNOUNCING MEDLEY™

Emulex has another winning combination with the Medley™ Winchester cartridge tape subsystem. It gives you either 35 or 110 MBytes of formatted storage and up to 70 MBytes of streaming tape backup. The Medley is fully software transparent to the operating system and diagnostic software of QBus and Unibus CPUs. And it uses the powerful and versatile Small Computer System Interface (SCSI) which keeps your options open for peripheral expansion.

Medley is interfaced to the system with a TC05/TC15 tape coupler and a UC02 (QBus) or UC12 (Unibus) host adapter. By using the Mass Storage Control Protocol (MSCP), the UC02 and UC12 allow the operating system to utilize the precise characteristics of the Winchester disk drive without patches or modifications to the operating system.

For convenience, Medley's disk drive, tape drive and power supply all fit into an attractive cabinet that easily mounts in a standard 19" rack. The Medley is also available in an attractive desktop version.

Find out how Emulex subsystems can keep you ahead of the game. Call toll-free (800) 854-7112. In California (714) 662-5600. Or write Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626.

The genuine alternative.

CIRCLE NO. 120 ON INQUIRY CARD
Portable computer converts to desktop workstation

The Otrona 2001 portable computer features an adjustable CRT and a detached, low-profile keyboard. All interfaces for peripheral devices are accessed and located on the unit's right side.

The Otrona 2001 portable computer weighs 19 pounds, measures 7 by 15 by 14 inches, and is said to be 100 percent IBM PC compatible. IBM PC software such as Lotus 1-2-3, Word, Multiplan and Flight Simulator can be used right off the shelf. Its expansion chassis accepts as many as three IBM PC-compatible expansion boards. The system recognizes both IBM PC and 16-bit diskette formats. Its screen has the same resolution (640 by 200) as the IBM PC's, an IBM-style character set and an 80-column-by-25-line mode.

Priced at $2,495, the standard configuration includes an 8088 microprocessor; 128K bytes of RAM; a 7-inch, adjustable amber display screen; one 5¼-inch, 360K-byte floppy disk drive; one RS232 port; one parallel port and a composite/RGB external monitor interface. The computer can be expanded with options such as a 10M-byte internal, rigid-disk drive, additional memory (up to 640K bytes), a Z80B microprocessor with CP/M operating system, an 8087 math coprocessor, a real-time clock, an internal 300- to 1,200-baud auto-dial modem, a high-resolution graphics board (640 by 400), additional I/O ports and internal DC power. With the additions of a printer or a plotter and a 13-color or 12-inch monochrome display, the product converts from a portable computer to a desktop workstation. Otrona Advanced Systems Corp., 4725 Walnut St., Boulder, Colo. 80301, (303) 444-8100. Circle No 300

68000-based computer uses FORTH

Offering a CPU alternative for use in Q-bus systems, Quest series computers employ the SBP-68Q single-board 68000 processor. The computers support the polyFORTH II operating system and the FORTH programming language. The series includes rack-mounted and tabletop configurations, 128K bytes of main memory, a 10M-byte fixed Winchester disk drive and four serial I/O ports. Each computer provides a removable-media storage device for program loading, software transfers and Winchester backup. The rack-mounted version comes with an RLO1/02-compatible 5M-byte Iomega removable cartridge disk drive and sells for $10,900 (10 units). The table-top version comes with an RX02-compatible floppy disk drive and sells for $10,530 (10 units). Ranyan Computer Enhancement Systems, 15239 Springdale St., Huntington Beach, Calif. 92649, (714) 896-5504. Circle No 302

Microcomputer uses dual 8-bit coprocessors

The MTX 512 microcomputer employs Z80A and 8028 8-bit coprocessors. The standard model features 80K bytes of user RAM, expandable to 512K bytes under program control and includes 16K bytes of dedicated video RAM. The unit offers 16 colors, 40-column text, 256-by-192-dot resolution graphics and 32 user-defined graphics characters. Standard outputs include a Centronics-type printer port, TV and composite video monitor ports, an uncommitted I/O port and a 2,400-baud cassette port. Other features include a real-time clock and a 79-key keyboard with eight function keys and a numeric pad. The machine's 24K-byte ROM contains MTX BASIC, assembler/disassembler and MTX graphics language. Eight independent virtual screens (windows) enable users to define screen sections. Prices start at $995. Memotech Corp., 99 Cabot St., Needham, Mass. 02194, (303) 449-6614. Circle No 303

Computer features 8-inch Winchester

The Universe 68/137 computer system incorporates 8-inch Winchester disk drives with 120M bytes of formatted capacity. The system is available with 512K bytes of parity-checking memory for $29,900 or with 1M byte of error-checking and -correcting memory for $29,650. Both systems include a 45M-byte cartridge-tape drive, four DMA-controlled serial ports and a 12.5-MHz 68000 microprocessor. The proprietary real-time operating system, UNOS, or UNIX/System V, supports the Universe systems. Charles River Data Systems Inc., 983 Concord St., Framingham, Mass. 01701, (617) 626-1000. Circle No 301
Desktop microcomputer implements XENIX

The X-286 desktop microcomputer implements the XENIX operating system on the 80286 processor. The basic configuration supports five users, expandable to 16. XENIX-286 includes the Bourne and Berkeley shells and enhancements for semaphores and file and record locks. The unit incorporates the iAPX 286 processor, an 80-bit 80287 numeric coprocessor and 512K bytes of error-detecting and -correcting RAM. The disk system includes a pipelined controller, 127M bytes (formatted) of Winchester disk storage, one 5¼-inch, 320K-byte floppy disk drive and a QIC-02 interface. $17,900. BDS Inc., 1400 Shepard Drive, Sterling, Va. 22170, (703) 430-0800. Circle No 304

Portable computers feature 25-line LCD screens

This three-product family of 16-bit portable and transportable personal business computers runs software written for the IBM PC. Features include 25-line LCD screens and a battery-powered, detachable intelligent keyboard with word-processing firmware. The trio uses an 80186 microprocessor with 128K bytes of RAM, and IBM-compatible, 5¼-inch floppy disk drives. All computers have two RS232C ports and a Centronics-type parallel interface. Model 9240, a lap-size, portable unit, weighs less than 15 pounds, incorporates the 25-line LCD screen and includes one 360K-byte floppy disk drive. Model 9230, a completely transportable system, furnishes the 25-line LCD screen, two 360K-byte floppy disk drives, a built-in 80-column dot-matrix printer and an intelligent keyboard. Model 9231 is a conventional unit with CRT display and two 360K-byte floppy disk drives. It can be equipped with the intelligent keyboard. Contact the company for prices. Mr. Jack Carroll, International Quartz Ltd., 25505 Crenshaw Blvd., Torrance, Calif. 90505, (213) 539-8944. Circle No 305

TEST DRIVES.

Put Applied Data's PT-350 portable floppy drive tester through its paces and you'll find that it's the most thorough and economical drive tester on the market today. Small, but powerful, the PT-350 offers capabilities comparable to larger systems at a higher sticker price. With a single command, up to 30 successive tests can be initiated and as many as 10 user-defined test strings can be stored in the 2K-bytes of CMOS static RAM with a battery back up.

You'll enjoy the easy handling and high performance of the PT-350, which is capable of testing all drives from 3" to 8" and utilizes Dayton's Digital Diagnostics (DDD) for verifying drive alignment. The PT-350 comes complete with a 40 character/2 line display, carrying handle, storage area for 5 cables with options available for built-in printer and 2 serial ports. No other drive tester offers all these features.

Other products available from ADC: Winchester disk drive tester, diskette duplication equipment, Trac/Media conversion system and media certifier. Prompt delivery of your new PT-350 if you order today.

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CIRCLE NO. 121 ON INQUIRY CARD 233
Computer employs iAPX 286 processor
The SuperMicro computer system employs an iAPX 286 applications processor and an iAPX 287 numeric coprocessor. Both processors are interfaced to a multi-channel DMA controller, prioritized interrupt system, real-time clock and as much as 2M bytes of memory. The computer incorporates an internal 500K-byte-per-second peripheral bus that conforms to the Small Computer System Interface (SCSI) standard. Permanent storage consists of one or two 50M-byte 5¼-inch Winchester disk drives backed up by a 46M-byte, ¼-inch streaming-cartridge tape drive. An industry-standard, 5¼-inch floppy disk drive provides program loading capabilities. A wide range of terminals, peripheral devices and communications equipment can be connected to the computer via as many as 16 RS232C ports and an IEEE-488 bus. The system runs Concurrent DOS and UNIX System V.

System runs concurrent OSs
The Series 9 multiuser, multiprocessor computer system allows the simultaneous operation of 8- and 16-bit processors and compatibility with five operating systems. The base model accommodates as many as nine application processors and includes 20M bytes of rigid disk storage, 320K bytes of floppy disk storage and a file processor card. Application processors include the model AP/186, an 80186-based card with 256K bytes of RAM, and 80286-based cards. The eight-port Terminal Concentrator Processor connects as many as eight terminals to the computer. Prices start at $7,995. Molecular Computer, 251 River Oaks Parkway, San Jose, Calif. 95114, (408) 212-2122.

Personal computer runs MS-DOS and UNIX
The Advanced Personal III runs MS-DOS 2.11 and UNIX. It comes with single or dual floppy disk drives (320K bytes each) or with one floppy disk drive and an internal 10M-byte Winchester disk drive. All models include an 8-MHz NEC 58065 16-bit microprocessor; 128K bytes of RAM expandable to 640K bytes; 32K bytes of ROM for bootstrapping, diagnostics and ROM BIOS; and 8K bytes of CMOS non-volatile memory. Standard input/output facilities include a Centronics parallel interface and RS232 port providing asynchronous and synchronous communications at speeds as high as 9,600 bps. Monochrome and color (RGB) monitor interfaces are standard. Both monochrome (white/black) and color systems use 14-inch, reduced glare monitors that display 25 lines by 80 columns. Character cells are 8 by 16 pixels. Graphics resolution is 640 by 400 pixels. The unit's IBM Selectric-style keyboard has 12 user-definable function keys that can be used in five modes for a total of 60 definitions. Prices start at $1,995 for the single floppy drive version and at $2,595 for the hard disk version. NEC Information Systems Inc., 1414 Massachusetts Ave., Boxborough, Mass. 01719, (617) 264-8000.

MS-DOS portable mixes calculator, modem
Called Pivot, this portable 16-bit computer offers personal computing, a built-in modem, clock, calculator and 5¼-inch floppy disk storage in a nine-pound package. The system comes in three versions, with prices starting at approximately $2,500. Based on the CMOS 80C86 microprocessor, the computer runs business applications software written under MS-DOS 2.X. Systems contain a parallel port that mimics IBM PC I/O; an RS232C port with programmable baud rates from 300 to 19.2K baud, synchronous or asynchronous; and an RJ11C port to connect the modem to telephone lines. The built-in modem operates at 300 baud under the Bell 102 protocol. Other features include 128K bytes of RAM, 16K bytes of ROM and a full-featured keyboard with 63 programmable keys, 10 membrane function keys and a 22-key calculator overlay. Morrow Inc., 600 McCormick St., San Leandro, Calif. 94577, (415) 430-1970.

Minicomputer targets multiple uses
Targeted at engineering, scientific and office-automation applications, the H60 minicomputer operates at 0.85 MIPS in single-precision whetstones and 0.81 MIPS in double-precision whetstones. Packaged in a 30-inch-high cabinet, the system consists of a two-board CPU, a communications controller (expandable to 16 lines), an 8-inch, 80M-byte Winchester disk drive, a 23M-byte, ¾-inch cartridge tape drive, a communications terminal as a systems console and the VOS operating system. Main memory size ranges from 768K to 12M bytes. The VOS event-driven, demand-paged, multiprogramming operating system supports multi-stream batch processing, interactive timesharing, database management, remote-job entry, real-time operations and transaction processing. Prices start at $65,000. Harris Corp., Computer Systems Division, 2101 W. Cypress Creek Road, Fort Lauderdale, Fla. 33309, (305) 974-1700.

Circle No 306
Circle No 307
Circle No 308
Circle No 309
Circle No 310
Computer emulates IBM PC

The STM Personal Computer uses Intel's 80186 microprocessor and MS-DOS 2.0. Priced at $3,449, the portable version weighs less than 17 pounds and includes 256K bytes of dynamic RAM (expandable to 512K bytes); an auto-dial, auto-answer, 300-/1,200-baud, direct-connect modem; speaker phone; a 25-line-by-80-column LCD display with electroluminescent backlit panel; dual 800K-byte each (formatted), 5¼-inch floppy disk drives; an integral 40-column thermal printer and a detachable, low-profile, 88-key keyboard with numeric keypad and 10 function keys. I/O ports include one Centronics-compatible parallel printer port, two synchronous/asynchronous RS232C ports, an SCSI-compatible hard disk interface and an IBM I/O bus expansion connector. A word processor, GW BASIC and the operating system software come standard. The computer runs all software that operates on an IBM PC. STM Electronics Corp, 535 Middlefield Road, Suite 250, Menlo Park, Calif. 94025, (415) 326-6226. Circle No 311

Single-user workstation executes 8 MIPS

The Ridge 32S single-user, 32-bit workstation executes 8 MIPS and performs 1.5 million Whetstone operations per sec. It features virtual memory, four-stage pipelined architecture and an operating system designed to support scientific, engineering and graphics applications. The ROS 3.1 operating system is derived from UNIX System V and BSD 4.2. Software includes FORTRAN 77, C, Pascal and MAINSAIL languages. The product's virtual memory system offers 4G bytes of addressable code and data, 1M to 4M bytes of memory, demand-paged virtual memory with 4K-byte pages and a 375-nsec. memory cycle time. A monochrome display with 1,024- by 768-pixel resolution or a 19-inch color display with 1,024- by 800-pixel resolution are available. Priced at $36,400, the basic configuration includes the CPU, 1M byte of main memory, a 78M-byte Winchester disk drive, a 1M-byte floppy disk drive and universal interfaces (two RS232, one printer/plotter and one lineprinter port). Delivery is 90 days ARO. Ridge Computers, 2451 Mission College Blvd., Santa Clara, Calif. 95054, (408) 986-8500. Circle No 313

NEW

ONE SIZE FITS ALL

Heurikon presents Minibox - a multiuser UNIX workstation based on its powerful HK68™ single board microcomputer and Uniplus™ UNIX System III or System V operating system with Berkeley enhancements.

Designed with the OEM in mind, one size fits all. Both compact and flexible, the Minibox includes within its 10.5"w x 13.9"h x 20.5" frame a 200 or 400 watt power supply, six slot Multibus™ card cage, (4-5 available for user use!), single double density floppy disk drive, streamer tape drive, and 31 or 65 Mbyte Winchester drive (expandable to 280 Mbytes). All this within the same cabinet! System status LEDs on the front panel inform the user of CPU and disk drive activity.

With Uniplus™, Minibox becomes a flexible and affordable tool for program development, text preparation, and general office tasks. Included is a full "C" compiler, associated assembler and linker/loader. Optional languages are:

- Macro assembler, ISO Pascal compiler
- FORTRAN-77 compiler, RM-COBOL™
- SVS BASIC (DEC BASIC compatible interpreter)
- SMC BASIC (Basic-Four BB3 compatible interpreter), and Ada™. Other utilities include UltraCalc™ multiuser spread sheet, Unix™ DBM, Ethernet™ and floating point processor. Alternate operating systems available are PolyForth™, Regulus™, CP/M 88K™, and others.

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What do you like better about the VISUAL 2000... its power or its versatility?

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Never has a UNIX-based multi-user system given so much to so many for so little.

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The VISUAL 2000 is the full-featured system with the power and flexibility to support multiple users in real business applications at a surprisingly low cost per station. It can be used with inexpensive video terminals. Or as a database manager or file server for a cluster of intelligent workstations or PCs, including both the IBM® PC and VISUAL's own lightweight, portable, totally IBM PC compatible COMMUTER. In all applications it offers greater performance, more flexibility, and lower cost than any other system in its class.

Powerful Intel 286 processor
The Intel 286 is today's chip of choice for UNIX®-based systems. Only the Intel 286 has on-chip memory management, an instruction set optimized for multi-tasking, and the optional 287 numeric co-processor to speed up floating point by a factor of 10.

What do these features mean to the VISUAL 2000 end user? Faster response time, more users supported, and lower system cost!

Cost-effective one-board design
A basic advantage of the VISUAL 2000 is its one-board base-level design. A single high-density board includes the 286 CPU, 512KB-2MB of RAM, controllers for Winchester, floppy, and streaming tape, an intelligent communications processor, six RS-232 ports, and a parallel printer port. Even a real-time clock with battery backup. One-board design means higher performance, lower cost, and greater reliability than comparable multi-board implementations.
Configurability and Expandability: VISUAL gives you more
The VISUAL 2000 spans a much wider range of configurability and expandability than other systems in its price class. Up to 16 independent users. 6 megabytes of RAM. 4 Winchesterers. Floppy. And streaming tape for simple, reliable disk backup. All in a small stand-up enclosure which looks right at home next to a desk.
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Extensive system software simplifies system integration
The VISUAL 2000 runs XENIX, Microsoft's popular, enhanced version of UNIX, derived from UNIX under license from AT&T, and designed to be faster, more secure, and easier to use in business applications.

And VISUAL has worked hard to simplify the system integrator's job, by providing all the tools needed to deliver end-user applications with a minimum of effort.
Languages such as C, SMC BASIC, RM/COBOL, TOM BASIC, SOFTBOL, and MicroFocus Level II COBOL, to provide instant compatibility with hundreds of proven business application programs.
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And productivity software, such as the 20/20 integrated spreadsheet and XED office-grade word processor.

The Bottom Line
High performance. Superior flexibility. Extensive software. And low cost...VISUAL 2000 systems start at under $10,000, suggested list. No one gives you more in a UNIX-based multi-user system.
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Sponsored by California regional units of IEEE and the Electronic Representatives Association.
Digital minicassette operates at two voltages

The dual-voltage model MTL-II RS232-type drive operates on 117V or 230V AC, 50/60 Hz. By recording data on four tracks at a density of 800 bpi, the system offers 0.5M bytes of storage on an 80-foot minicassette tape. The device moves the tape at 3 ips in start/stop mode. Communications speeds are user-selectable from 150 to 9,600 baud. $550 (OEM quantities). Braemar Computer Corp., 11950 12th Ave. S., Burnsville, Minn. 55337, (612) 890-5125. Circle No 314

Tape subsystem enlarges DEC micro storage

Suites for use with DEC Micro/PDP-11 and PDP-11/23+ microcomputers, the TK25 ¼-inch, streaming cartridge tape subsystem has a 60M-byte capacity. It uses a standard DC600A cartridge and comes in a standalone, tabletop enclosure. Three operating systems—RT-11, RSX-11 and RSTS/E—support the unit. $4,600. Digital Equipment Corp., Maynard, Mass. 01754. Circle No 316

Streaming tape drive stores 60M bytes

Suited for Winchester backup and data storage, the nine-track series 6500 streaming tape transport has a formatted capacity of 60M bytes with a 600-foot cartridge and 45M bytes with a 450-foot cartridge. Time to backup 60M bytes takes 12 minutes. The transport ramps up to and down from its 90-ips operating speed in 150 msec. It employs self-clocking group-code recording (GCR) with an 8K-bpi recording density and a 10K-flux-reversals-per-inch flux density. Burst data transfer is 2M bytes per second; sustained data transfer is 720K bps. The product is available in a full-height configuration with formatter card installed that measures 5.75 by 3.25 by 8 inches and in a half-height configuration without formatter that measures 5.75 by 1.625 by 8 inches. The formatter adopts the QIC-02 drive interface standard and is compatible with the QIC-11 and QIC-24 tape formats. $1,275 with formatter, $875 without formatter. Kennedy Co., 1600 Shamrock Ave., Monrovia, Calif. 91016, (818) 357-8831. Circle No 315

IBM-compatible streamer backs up 138M bytes

The PCT-1000, an IBM-format-compatible, nine-track streaming-tape drive, provides as much as 138M bytes of backup storage capacity for Winchester disk drives, read/write access to archival data banks and intercomputer data interchange. Two microprocessors and a real-time operating system control tape motion. The unit handles a variety of formats including 800 characters-per-inch (cpi) NRZI, IBM and ANSI; 1,600-cpi PE, IBM and ANSI; and dual-density 2,300/1,600 cpi. The product is compatible with the Cipher/Pertec interface. Available in vertical mount and horizontal drawer-mount configurations, the device handles standard 7-, 8½- and 10½-inch tape reels. $2,256 (100 units) for a 1,600-cpi, drawer-mount model. Ibex Computer Corp., 20741 Marilla St., Chatsworth, Calif. 91311, (818) 709-8100. Circle No 317

Memory system reads, writes on four surfaces

The MVP 212 8-inch Winchester disk drive contains a total of 212M bytes of unformatted storage through eight data surfaces split into two sets of four parallel read/write channels. At any time, this unit allows any read/write combination on four surfaces. The device consists of a mechanical module and an electronics module. The mechanical module is a sealed head-disk assembly that contains five disks, eight heads and a rotary voice coil positioner. Average access time is 38 msec. The electronics module includes power amplifier, servo tachometer, microprocessor control, input/output and four sets of read/write PCBs. Equipped with an SMD interface and a transfer rate of 9.67 MHz per channel, the data rate using four channels is 38.6 MHz. $7,500 in OEM quantities. Delivery time is 45 days. MegaVault, 6431 Independence Ave., Woodland Hills, Calif. 91367, (818) 884-7300. Circle No 318

SCSI-based subsystem handles varied CPUs

The Javelin, an SCSI-based, mass-storage subsystem, connects through an independent host adapter to a variety of CPUs, including the DEC Q-bus and Unibus, the Intel Multibus and the IBM PC, PC/XT and compatible microcomputers. The basic chassis incorporates...
New Products

DISK/TAPE

100M-byte Winchester uses thin-film heads
Using thin-film recording heads, a closed-loop servo system, plated media and the ESDI interface, the models 96202 and 96203 half-height, 5¼-inch Winchester disk drives store 61.8M and 103M bytes (unformatted), respectively. They employ a voice-coil-driven linear head positioner and average 30-msec. access times. Data transfer rate is 100M bps. Model 96202, $1,150 (1,000 units); model 96203, $1,475 (1,000 units). Advanced Storage Technology Inc., 6580 Via Del Oro, San Jose, Calif. 95119, (408) 224-8010.

Half-height Winchester stores 25M bytes
The MR522, a half-height, 5¼-inch Winchester disk drive, has 25.5M bytes of unformatted capacity, 6.37M bytes per surface and 10,416 bytes per track. The drive furnishes an industry-standard transfer rate, recording format and controller interface requirements and draws 18W. It incorporates two platters, four data surfaces and four magnetic data heads. Key features include an embedded servo positioning system, a rotary arm, stepper assembly, plated media and MnZn monolithic heads. $875 in OEM quantities. Production units will be available in the fall. Mitsubishi Electronics America Inc. 991 Knox St., Torrance, Calif. 90502, (213) 515-3993.

Half-height minifloppy drive packs 3.2M bytes
The model 1865 half-height, 5¼-inch floppy disk drive provides 3.2M bytes of unformatted data capacity by recording at 10,250 bpi and 170 tpi. One hundred fifty-four tracks are placed on each side of an industry standard UHR-II high coercivity (600 Oersted) minifloppy diskette. Track-to-track access time is less than 2 msec. The drive reads data recorded on 48- and 96-tpi diskettes. Data can be written in FM or MFM coding with any soft-sectored format. The drive normally spins a 170-tpi diskette at 360 rpm to achieve its data-transfer rate of 500K bps. When a non-Amlyn diskette is inserted into the drive, the unit's microprocessor increases the spindle speed to 600 rpm. $330 (1,000 units). Amlyn Corp., 2450 Autumnvale Drive, San Jose, Calif. 95131, (408) 946-8616.
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New Products

TERMINALS

Editing terminal emulates 14 models

The Ampex 210 editing terminal emulates TeleVideo's 925, 910 + and 910 models; Qume's QVT 102; Lear Siegler's ADM 5, ADM 3A +, ADM 3A and ADM 3; ADDS' Viewpoint, Regent's 25 and 20; and Hazeltine's 1500, 1410 and 1400 models. The 14 resident emulations are keyboard selectable. Video attributes include blinking, reverse video, underline, blank and half intensity. The terminal features a 14-inch diagonal, non-glare screen available in amber or green phosphors and a 24-line-by-80-character format with a 25th status line. It displays 96 ASCII characters, 32 control characters and 15 line graphic characters. Seven character sets are resident and user-selectable, including U.S., U.K., French, German, Norwegian, Swedish and Danish. $549. Ampex Corp., 2201 Lively Blvd., Elk Grove Village, Ill. 60007, (312) 595-6890. Circle No 324

Multi-purpose terminal performs text editing

The Model 8363 Delta Demon, together with its text-processing software, performs editing tasks such as cursor movement, insert, delete, search-and-replace functions and word wrap. The 16-bit microprocessor intelligent terminal furnishes a tilt-and-swivel monitor and a 127-key detachable keyboard. A 14-inch, high-resolution screen formats into 28 lines by 80 characters. The multi-task windowing capability is defined by eight available screen segments which operate independently. Additional features include document control with 40K of scrolling memory and a setup menu which configures the terminal for any operating environment. Settings are retained in a non-volatile EAROM for later use. $2,295. Delta Data Systems Corp., 2595 Metropolitan Drive, Trevose, Pa. 19047, (215) 322-5400. Circle No 326

Terminal serves industrial applications

The Rack Mount Touch Information Display, measuring 19 inches wide by 12¾ inches high, is an integrated touch-active terminal best suited for industrial control applications. It functions as a standard ASCII terminal and includes a standard ASCII keyboard port, emulates Lear Siegler ADM-3A cursor-addressing functions and communicates via a configurable RS232C interface at a rate of 19.2K baud. The 12-inch diagonal text switch. The Color 710 has an etched-glass CRT to reduce glare and a long-persistence phosphor for vertical resolution of 480. Color 700, $749; Color 710, $799. Amdek Corp., 2201 Lively Blvd., Elk Grove Village, Ill. 60007, (312) 595-6890. Circle No 324

Video display terminals provide emulation

The Visual 60 and Visual 65 video display terminals are code-for-code compatible with the Esprit I, ADDS Viewpoint, Lear Siegler ADM-3A and DEC VT52. Ergonomic features include smooth scroll, 7-dot-by-9-dot matrix characters, non-glare screen and detachable, low-profile keyboard. Both terminals offer Full 5 Attribute Selection, line-drawing character set, block mode, editing, bidirectional auxiliary port, 128-character set, 80-column-by-24-link screen format, 25th status line, columnar tabbing and independent receive and transmit rates. The Visual 65 includes 12 user-programmable function keys, extended editing features, selectable scrolling region and emulations of Hazeltine 1500 and 1510 and Visual 200 and 210. Model 60, $595; Model 65, $695. Visual Technology Inc., 540 Main St., Tewksbury, Mass. 01876, (617) 851-5000. Circle No 327

RGB monitors compatible with IBM, Apple

The Color 700 and 710 high-resolution video monitors interface with RGB-TTL output computers and work with the IBM PC and compatibles and Apple II and compatible computers. Its .31mm black dot-matrix picture tubes combined with high-resolution, 720 dots by 240 lines (non-interlaced) provide color displays for graphics applications. The series furnishes 96-column-by-25-line text display and features an on/off power switch with light-emitting-diode (LED) display, brightness, contrast and amber (P134) phosphor CRT displays a 24-line-by-80-character format. Up to 648 active touch points can be defined; touch areas can be any size or shape. The unit employs an 8085 microprocessor and is housed in black anodized aluminum. $1,500. Electro Mechanical Systems Inc., 801 W. Bradley, Champaign, Ill. 61820, (217) 359-7125. Circle No 325

MINI-MICRO SYSTEMS/October 1984
**New Products**

**TERMINALS**

**Emulating terminals feature CP/M-80, MS-DOS**

The 8200 VIS series combines universal terminal emulation with personal computing capabilities. Employing an MC68000 microprocessor with 128K bytes of RAM, the series emulates the IBM 3271, 3275 and 3277; the DEC VT100 and 200; ADDS' Regent 40; and Univac's UTS 30 and 40 terminals for communication with IBM host systems, DEC PDP-11 and VAX minicomputers and Univac 1100 series computers. The standard configuration displays 10-dot-by-12-dot matrix characters in a 24-line-by-80-column screen format. Includes 128K bytes of memory; protocols for Univac's 200 and 400, IBM's 3270 and DEC's VT100 and 200 emulation; two 5 1/4-inch floppy disk drives and CP/M-80 personal computing option. $4,340. Megadata Corp., 35 Orville Drive, Bohemia, N.Y. 11716, (516) 589-6800.

Circle No 328

**Terminal compatible with Tektronix 4010 series**

The 2048-by-2048 addressable points on the Radiance 2000 terminal enable the user to create accurate drawings on a 20-inch diagonal screen with a 68-Hz refresh rate, using eight colors. A keyboard integrated-pad digitizer offers flexibility and speed in selecting a pixel. A bi-processor architecture employs both a 6809 and a 68000 as well as a high-speed graphic bus. Graphics include circles, histograms, pie charts and polygon filling. Two separately addressable memory planes display two sets of graphic information. One can be used as background, the other as a work plane. Horizontal or vertical scroll of one plane with respect to the other facilitates superposition application. Compatible with the Tektronix 4010 series, the terminal offers five types of programmed line textures, five character sizes and the ASCII and APL character sets. Raster-scan technology provides functions such as selective erase, color inversion and vector rectangle. Additional features include two asynchronous ports, from 110 baud to 38,400 baud rates, one Centronics parallel port and ergonomic design. $24,000. Gixi Inc., 7808 Glenroy Road, Suite 100, Bloomington, Minn. 55434, (612) 893-1350.

Circle No 329

**Color graphics terminal provides high resolution**

The Sibyl color graphics terminal features a resolution of 2,730 by 1,024 pixels, a 60-Hz non-interlaced refresh and a video bandwidth greater than 100 MHz. The unit can display more than 2.5 million colors simultaneously from a palette of more than 16.7 million colors. It provides pan and zoom over a 4K by 4K global memory within a 64K by 64K virtual workspace. A 68000 microprocessor handles display list management. Area fills occur at speeds as high as 1G pixels per second. The tabletop system consists of a 19-inch monitor, a VT100-style keyboard and a system controller in a RETMA rack-mountable case. $24,500. Delivery in 120 days, ARO. PsiTech, 16902 Von Karman Ave., Irvine, Calif. 92714, (714) 863-0981.

Circle No 330

**TOUGH LOCAL NETWORK PROBLEM:**

"How can our department get our six computers and three printers to work together efficiently? We also want to be able to access outside data services and our future company LAN."

**SIMPLE NETWORK SOLUTION:** NetCommander

NetCommander is a smart, small Local Area Network manager. It lets you link from four to 40 computers and peripherals — in any mix of models and makes. A 50K buffer (expandable to 250K) makes sure that productivity is high — keeping fewer printers humming — while computer and PC users do their thing, without waiting for a printer, modem, or shared disk. Those devices can be specified with names defined by users — and allocated on the basis of availability and capability. And NetCommander handles multiple protocols and different baud rates simultaneously — without modifications to hardware or software. It will also tie into your company's LAN. The latest in a family of products in use since 1979, NetCommander is a smart, small, efficient network manager.

For more information, call or write:

NetCommander
Digital Products Inc. • The Simple Network Solution Company
600 Pleasant Street • Watertown, MA 02172
(617) 924-1660 • Outside Mass., call 1-800-243-2333
And check out our 30-day trial evaluation.
Terminal offers telephony features

The Freedom 212 remote information station combines terminal functions and data-communications and telephony capabilities. The unit features a full-sized, tilt-and-swivel display, a 106-key keyboard with 47 programmable non-volatile function keys, an integral Bell 212A-compatible modem, a built-in 25-line phone directory and an automatic dialer. In a standalone terminal mode with the modem bypassed, it operates as a video display terminal and modem, as a standalone modem or as a display telephone. $1,295. Liberty Electronics, 625 Third St., San Francisco, Calif. 94107, (415) 543-7000. Circle No 332

Display station replaces IBM 3278 units

A plug-compatible replacement for the IBM 3278 display station, the Memorex 2178 display station connects to Memorex 2076 or 2074 cluster controllers or to IBM 3276 or 3274 cluster controllers. The product consists of three detachable and interchangeable modules—the display module, the logic module and the keyboard. Three keyboard styles in a choice of 10 languages are offered including typewriter, data entry and typewriter with numeric keypad. Data is displayed in 24 lines of 80 characters each on a 12-inch diagonal, non-glare green screen. Other features include automatic screen dimming after 20 minutes of inactivity, audible alarm, cursor position indicator and automatic diagnostics at power on. $1,485. Memorex Corp., San Tomas at Central Expressway, Santa Clara, Calif. 95052 (408) 987-3072. Circle No 333

The IBEX Mainstreamer ™

At $1850* the price is the least of the breakthroughs!

This IBM format-compatible 9-track tape drive weighs 60% less than any equivalent system available. And occupies 25% less space. (Save up to $200 on freight costs alone!) It's simple and reliable. Fewer moving parts. No automatic threading failures. No noisy blower. And look at all you get:

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- Transfer rates of 20K to 160K bytes / second
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- Cipher/ Pertec interface
- Internal diagnostics
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**Network is user-installable**

The FastLAN network, user-installable cable system, consists of FastLAN-A, a broadband radio-frequency amplifier unit; FastLAN-B, a network branch with two coupler boxes that connects to the amplifier unit; and FastLAN-C, a drop cable with a four-port WangNet multiplier outlet that connects to a coupler box. The three components can be combined in configurations ranging from four to 640 ports and covering a radius of as much as 800 feet. The network employs a dual-cable broadband medium and CATV components for the concurrent exchange of data, text, image and video information. FastLAN offers five communications services: Wang Band for communications between Wang systems at speeds as high as 10M bps, a peripheral-attachment service for connecting Wang workstations and peripherals and IBM Type A 3270 devices to their host systems, an interconnect band for transmission pathways for industry-standard communications interfaces and protocols, a utility band for video applications and professional computer service for connecting Wang Professional computers to the network. With Teflon cabling, FastLAN-A sells for $1,300; FastLAN-B, $800; FastLAN-C, $180. Wang Laboratories Inc., 1 Industrial Ave., Lowell, Mass. 01851, (617) 459-5000. Circle No 334

**Full-duplex modem uses five microprocessors**

The WD212-X synchronous/asynchronous full-duplex modem operates at 1,200 bps. By using a five-microprocessor design, the modem features Bell 212A, Bell 103 and CCITT X.25 LAPB compatibility for error-free data transmission via dial-up telephone lines. Self-adaptive program logic in each microprocessor chip enables the modem to adjust automatically to the operating conditions of each telephone line. The modem's direct connect, auto-dial/auto answer features equip it for computer-to-computer, remote data access and local-area network communications. In synchronous mode the product is compatible with CCITT X.25 LAPB. In asynchronous mode it is compatible with most communications software packages developed for use with the IBM PC. The device is available as a printed circuit board for use within the IBM PC or as a standalone peripheral modem that connects through an RS232C port to any personal computer or data terminal. $345 (1,000 units). Wolfdata Inc., 187 Billerica Road, Chelmsford, Mass. 01824, (617) 250-1500. Circle No 335

**Soft switch links eight RS232-compatible devices**

The model 9108 soft switch transfers data between eight RS232 ports via a common 8-bit data bus. This method allows port-to-port communication with as many as four pairs of ports at the same time. The device operates at asynchronous speeds to 9,600 bps. Features include a queue facility that provides auto-connect; an activity timer to prevent system tie-ups, DTE/DCE selection, port status report, user-selectable log off and port naming. $895. International Data Sciences Inc., 7 Wellington Road, Lincoln, R.I. 02865, (401) 333-6200. Circle No 336

**LAN uses Diplomat, locks records and files**

The L-Net MS-DOS-based LAN extends the company's Diplomat natural language to multiple users with record-and-file-locking capability. This linearpush network supports as many as 64 workstations connected with a twisted-pair cable as long as 10,000 feet. The LAN uses an Ethernet-like CSMA/CD protocol with a 2.5M-bps data-transmission rate. Workstations can be any combination of IBM PC-compatible machines that are configured with the appropriate Logical network workstation conversion kit. Installations can designate any hard-disk workstation as one of several file servers. The Diplomat application language uses nouns and verbs to create data files, entry screens and reports. When running on L-Net, Diplomat ensures that only one user can update a single record at a given time. File-server kits for converting hard-disk computers cost $1,980. Kits for converting a standalone microcomputer into a workstation cost between $775 and $1,200. Network repeaters for each 600-foot extension of the data bus are priced at $615 each. Logical Business Machines, 1294 Hammerwood Ave., Sunnyvale, Calif. 94086, (408) 744-1290. Circle No 337

**Packages enable micro-to-mainframe communications**

Consisting of a printed-circuit board, user's choice of emulation software and documentation, the IRMAcom package allows IBM PC and IBM PC-compatible personal computers to attach to networks using synchronous protocols across leased or switched lines. IRMAcom software provides SNA 3274 controller emulation, BSC 3274 controller emulation, SNA SNA 3770 RJE station emulation, BSC 3770 RJE station emulation or BSC 2780/3780 RJE station emulation. The printed circuit board and one emulation program cost $895. Additional emulation programs cost $95 each. Digital Communications Associates Inc., 303 Technology Park, Norcross, Ga. 30092, (404) 448-1400. Circle No 338
Data link controller serves Multibus systems

When attached to the company's NT10 transceiver, the N13210 Multibus Ethernet/IEEE-802.3 communications controller provides a link-level connection to Ethernet for Multibus systems. The controller board performs the specified data link and physical channel functions, permitting 10M-bps data communications between stations separated by as much as 2,500 meters. The product employs 8K bytes of dual ported RAM, linked list buffer management, an onboard DMA controller and a programmable byte swap facility. It includes two sets of diagnostic tools. One set indicates network faults by furnishing tools such as internal and external loopback modes. Another group generates data for characterizing the network's quality of service. Optional NS4244 XNS Internet Transport Protocols for UNIX System V offer network software support. $760 (100 units). Interlan Inc., 3 Lyberty Way, Westwood, Mass. 01886, (617) 692-3900. Circle No 339

Modems feature 68000 microprocessing power

The 2600 series modems use the Motorola 68000 microprocessor as a controller. The modems feature implementation of trellis-coded modulation (TCM), data transmission at speeds as high as 16,800 bps, automatic speed adjustment to changing line conditions, down-line loading of new options or customized features and built-in network control. The series consists of model 2640 for 9,600-bps transmission, model 2620 for 4,800-bps transmission and model 2660, which uses trellis-coded modulation for data transmission of 9,600 to 16,800 bps and features an adaptive rate system that continuously senses varying line conditions and automatically adapts the main channel data rate for the highest possible throughput. Diagnostic procedures include power-up self-test, audio, digital and terminal loop-back, modem check, test-tone generation, poll test and bit error rate tests. Prices range from $4,175 for the model 2620 to $13,000 for the model 2660. Codex, 20 Cabot Blvd., Mansfield, Mass. 02048, (617) 364-2000. Circle No 340

Interface transmits data and control signals

The TR2000 fiber-optic RS232C modem interchanges data and control signals between electronic equipment and a fiber-optic cable. Two TR2000 modems and a duplex fiber-optic cable furnish a full-duplex transmission link as long as 3,600 feet at data rates as high as 150K bps. The modem plugs into the RS232 port on the equipment and can be powered from the equipment itself or an external 120V AC source using a 12V DC power pack. It operates in the DTE or DCE mode and can monitor the transmitted data. $99. American Photonics Inc., 71 Commerce Drive, P.O. Box 289, Brookfield Center, Conn. 06805, (203) 775-8950. Circle No 341

Output device interface features printer emulation

IRMAprint allows asynchronous ASCII output devices such as an IBM PC printer to operate as output peripherals within IBM 3270 networks. It is compatible with all IBM 3274, 3276 and
SWITCHING TERMINALS A PROBLEM?

48XX integral terminal controllers with type “A” adapters, whether in SNA/SDLC or BSC environments. The product services the IBM coax protocol and emulates an IBM 3287 printer through a standard coaxial cable connection to a 3270 controller. Data transmitted from the 3270 controller is converted to the asynchronous ASCII format and sent to the ASCII output device through an RS232C or Centronics interface. Tested transmission rates run from 45 to 38,400 bps. $1,295. Digital Communications Associates Inc., 751 Design, 751 S. Kellog Ave., Goleta, Calif. 93117, (714) 979-0363 or (800) 368-0092.

Circle No 342

Modem transmits at 300 and 1,200 bps

The TM-1200, a Bell 212A-compatible modem, operates full-duplex asynchronous at 300 bps or full-duplex synchronous/asynchronous at 1,200 bps, over a two-wire dial-up circuit. Front-panel controls allow users to exercise analog, digital and remote digital loop-back tests and self-test diagnostics at either of two operating speeds. The unit also features automatic answer capability. A built-in abort timer disconnects the modem from the line when the absence of a carrier is detected. $750. Com-Design, 751 S. Kellog Ave., Goleta, Calif. 93117, (800) 235-635 or (800) 368-0092.

Circle No 343

Baseband network links Kaypro microcomputers

The Web networking system addresses as many as 100 Kaypro microcomputers at distances of up to 2,000 feet. The system consists of a circuit board that plugs into the computer, software and connecting cable. The network operates on a bus topology at 500K baud and supports CP/M programs. It features a direct communication mode, electronic mail, remote read/write and security provisions. $350 per workstation. Adveco Inc., P.O. Box 606, Camp Hill, Pa. 17011, (717) 765-1799.

Circle No 344

THE ANY-PORT-TO-ANY-PORT SMART SWITCH

- Allow more users to share the computer.
- Connect to multiple computer systems and equipment.
- Here’s an affordable way to switch up to eight RS232 ports in any interconnection. Any port can select any other port, with up to four pairs communicating at the same time. “User friendly” commands aid in port selection, port status and sign-off. The unit even signals you when the port you wanted is no longer busy. Push buttons define each port as either DTE or DCE, for quick and easy installation.

Model SS-8 = $895.

4 PORT PUSH BUTTON SWITCHING

Fed up with the hassle of plugging and unplugging data cables or running around flipping switches on a mechanical box? The TM-41 electronic switch is capable of switching common RS232 signals between 4 input ports and 1 output port to select a printer, modem or computer.

Model TM-41 = $295.

PRINTER SHARING UNIT

The PSU-41 allows up to 4 computers or CRTs to share one printer. It scans each port until the data has been sent to the printer, then resumes scanning.

Model PSU-41 = $395.

2 TERMINALS SIMULTANEOUSLY SHARE ONE MODEM!

The MSU-21 allows 2 ASCII terminals to simultaneously share one modem or data line. MSU-21 = $295.

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CIRCLE NO. 132 ON INQUIRY CARD
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Interface switch provides peripherals sharing

The model 8652-D (desktop) and the model 9106 (rack-mount) EIA RS232 A, B, C, D, E, and F switches allow six terminals to use one I/O port or share one modem, or six minicomputers or microcomputers to share one printer. All connections are made via seven female 25-pin EIA connectors on the rear panel. Setting the front-panel switch routes signals from the common connector to the A, B, C, D, E or F connector. The products are speed- and code-transparent and require no power. 8652-D: $395, 9106: $495. Electro Standards Laboratory Inc., P.O. Box 9144, Providence, R.I. 02940, (401) 943-1164. Circle No 345

Front-end processors work with Ethernet

The EXOS 200 series of front-end processors are compatible with the Ethernet V1.0, V2.0 and IEEE 802.3 standards. EXOS 201 is a single standard Multibus board that supports 20- and 24-bit host memory addressing. EXOS 202 is a single, double-width VME board that supports 24 bits of host memory addressing and provides a 6-bit address modifier. EXOS 203 is a single quad Q-bus board that provides 18- and 22-bit memory addressing. EXOS 204 is a single quad Unibus board that supports 18-bit memory addressing. The boards employ an 8-MHz 80186 microprocessor and 128K bytes of RAM. All RAM is dual-ported between the EXOS CPU and the network. The NX 200 operating system, provided in 16K bytes of EPROM-based firmware with each EXOS 200 series product, manages the Ethernet hardware, gathers network statistics and furnishes on-board diagnostics. All EXOS 200 series products include an SBX bus with a connector that supports additional concurrent links such as RS232, RS422 or IEEE 488. Prices range from $1,125 to $2,225 (500 units). Excelan Inc., 2180 Fortune Drive, San Jose, Calif. 95131, (408) 945-9826. Circle No 346
New Products

SOFTWARE

Cross assembler runs on IBM PCs

The 68000 cross assembler development system, which is written in C and runs on the IBM PC under MS-DOS, consists of a macroassembler, a linker, an object-module librarian and a cross-reference utility. The assembler features EXORmacs compatibility, conditional assembly, relocatable and absolute modes (16 sections), an include file facility, multiple input and command files, as many as 30 character symbol names, full macro capability with argument substitution and a virtual symbol table. $500. Oasys Inc., 60 Aberdeen Ave., Cambridge, Mass. 02138, (617) 491-4180. Circle No 347

BASIC language supports external subroutines

Applications BASIC, a business-oriented BASIC language for MS-DOS or 8-bit CP/M systems, offers external subroutines that provide procedure- and function-like features found in Pascal and C. The language supports ISAM, random and serial file handling for 65,535 records per file, one to 32,767 characters per record and one to 32,767 fields per record with optional automatic field separation. As many as 63 files can be opened simultaneously. Data-handling capabilities include automatic variable passing to other program segments, automatic decimal rounding and numeric-to-string conversion with masking. $395. Soft Gold Inc., P.O. Box 2718, Newport Beach, Calif. 92663, (714) 476-3004. Circle No 348

File-transfer package is dictionary-driven

With the iLink dictionary-driven software-transfer program, users can download, upload or cross-load data files from IBM PC database and spreadsheet applications that use DIF or CSV file formats to IBM mainframe information-center products. The program downloads data by transforming mainframe data files into DIF or CSV formats that can be read by the IBM PC. The iLink package uploads data by transforming DIF or CSV files into mainframe exchange files that can be accessed by products, packages or languages running under VM/CMS, including SAS, RAMIS, FOCUS, ADRS, APLDI and FPS. Other features include an electronic note pad, partial source-file extraction, record ID creation, field name and width modification, row/column transposition for each transfer procedure and automatic default options. $12,500 including magnetic tapes for two database links, 10 IBM PC diskettes, documentation and tutorials. InfoCenter Software, 171 Main St., New Paltz, N.Y. 12561, (914) 255-8925. Circle No 349

Software links VAX minis, IBM mainframes

The jnet networking software product allows VAX-11 computers running the VAX/VMS operating system to exchange files, electronic mail and real-time messages with IBM 370, 4300 and 308X computers running VM/SP and CMS. With jnet, VAX-11 computers can communicate over binary synchronous communication lines using the remote spooling communications subsystem (RSCS) networking program product protocol. To IBM computers, an attached VAX-11 using jnet appears to be another IBM computer running VM/SP. VAX/VMS digital command language commands are provided for sending files, network commands and messages over an RSCS network. Price for a 20-year license ranges from $2,500 to $5,000, depending on the size of the VAX processor. Joiner Associates Inc., 1124 Edgehill Drive, P.O. Box 5445, Madison, Wis. 53705, (608) 298-8134. Circle No 350

Package develops interactive software

The NaturalLink technology package supports software development for the TI Professional and Portable Professional computers. Applications developed using NaturalLink present users with on-screen English descriptions of command choices in an application. The NaturalLink interface guides users by controlling the selection of on-screen items. The package furnishes a screen builder for specifying the appearance and behavior of the screen in an application; a message builder for specifying help and error messages; and an interface builder for debugging grammar, specifying a lexicon and building and testing the interface file that drives NaturalLink. The package also includes linkable object code for the NaturalLink software and high-level language interface routines that allow users to call this software from MS-FORTAN, MS-Pascal or Lattice C. $8,000. Texas Instruments Inc., Data Systems Group, P.O. Box 1444, H-702, M/S 7929, Houston, Texas 77521, (713) 895-4600. Circle No 351

FORTH implemented on 68000-based computers

FourByteForth, a 32-bit implementation of the FORTH language for 68000-based computers, runs under CP/M-68K. This development system incorporates an interpreter, compiler, editor, decompiler and debugging tools. It executes the Byte Sieve in 18 seconds (10 iterations) and compiles screens at 125 per minute. The multifunction screen editor inserts, deletes and moves text around the screen or to different screens. Users can single-step through the execution of a definition from the editor, viewing the stack before and after each word is executed. $250. Software Architects, 1912 Grant, Berkeley, Calif. 94703, (415) 549-3185. Circle No 352

ROM BIOS software makes micros IBM-compatible

Developed under strict controls to avoid copyright infringement and insured against infringement suits, this ROM BIOS software makes a microcomputer fully compatible with the IBM PC. The package also includes PC-DOS-compatible utilities, a version of MS-DOS 2.11 that uses the company's ROM BIOS software and the GWBASIC language configured to resemble BASICA. Phoenix Software Associates Ltd., 1420 Providence Highway, Suite 260, Norwood, Mass. 02062, (617) 769-7020. Circle No 353
New Products

SOFTWARE

Electronic-mail packages utilize multiuser micros

The ComNet-8 and -16 electronic-mail software packages for 8- and 16-bit microcomputers, respectively, operate with multiuser microcomputers, in which four to 32 microcomputer users share a host computer, or within a local-area network, in which each user runs a separate computer. ComNet-8 supports the CP/M-86 operating system, and ComNet-16 supports CP/M-86 and MS-DOS. The packages provide a keyboard-labeling system for identification of messages, distribution lists and name aliases as well as codes to identify a message's status—unread, answered, unanswered, deleted, copied or filed. ComNet-16's function-key feature enables users to invoke mail commands with one keystroke. ComNet-8N and -16N are inter-network communications packages that pick up and deliver mail and files and allow telecommunications interfaces for access to other networks via hard-wire, telephone/modem links or standard gateways. ComNet-8 and -16: $395 each, ComNet-8N and -16N: $495 each. Action Technologies Inc., 1804 Broadway, San Francisco, Calif. 94109, (415) 775-9396. Circle No 354

System runs four PC-DOS, CP/M applications

Concurrent PC-DOS, for IBM PC or IBM PC-compatible computers with 256K bytes of memory and two floppy disk drives, runs as many as four PC-DOS or CP/M application programs simultaneously. The product supports most popular PC-DOS applications, including Lotus 1-2-3, dBASE II, Wordstar, Multimate and SuperCalc 3. Users monitor applications through windows that can be positioned anywhere on the screen and scrolled or sized to display parts of each application. A communications capability allows users to work on one application while the system receives information from a database. Productivity tools include a print spooler and a Rolodex. $295. Digital Research Inc., 160 Central Ave., Pacific Grove, Calif. 93950, (408) 649-8896. Circle No 355

Package converts FORTRAN to C

FORTRIX-C converts FORTRAN programs and files to C code. The package includes integer-character string converters, space allocators and string parsers. In operation, FORTRIX-C converts FORTRAN flow control statements (DO, GOTO, IF ELSE, ELSE IF, CONTINUE, RETURN, END, CALL) to functionally equivalent sets of C instructions; DO loops reconstructed in C as FOR loops; CONTINUE statements are reduced to null statements; I/O statements are expanded into fully parallel sets of I/O instructions; read and write field widths are retained and the C code spacing requirements equal those of the parent FORTRAN program. The product executes at a typical conversion rate of 600 lines of code per minute. $2,500. Rapitech Systems Inc., 565 Fifth Ave., New York, N.Y. 10017, (212) 687-6225. Circle No 356
Compiler reproduces dBASE II programs

The dBASE III Programmer translates a dBASE II application program into low-level, directly executable modules that are generally smaller than the original application and do not require dBASE II to operate. Depending upon the characteristics of the command and data files involved, some applications execute faster when compiled. The product can legally reproduce dBASE II programs for different operating environments, including CP/M-80, CP/M-86 and MS-DOS. $750 with the ability to produce code for one environment. Cross-linkers to produce code for additional environments cost $350 each. WordTech Systems Inc., P.O. Box 1747, Orinda, Calif. 94563, (415) 254-0900.

Circle No 357

DBL furnishes software virtual memory

Written in C, the Data Business Language (DBL) runs under MS-DOS on the HP 150, IBM PC, DG model 10, Wang PC and DEC Rainbow microcomputers. DBL, a superset of DEC's DIBOL-11, is upwardly compatible with all versions including DIBOL-88. Language enhancements include software virtual memory, full-screen programing functions and a symbolic debugger. DBL also features multikey ISAM files with a find statement for rapid lookup of random records, multidimensional arrays to support table structures and integrated sort and merge facilities for sorting sequential files. Scan and replace statements facilitate string search and replacement and fixed-point decimal data simplifies the handling of monetary data. The product also supports compile-time constants. Prices start at $449. Digital Information Systems Corp., 3336 Bradshaw Road, Suite 340, Sacramento, Calif. 95827, (916) 383-7355.

Circle No 358

C utilities provide screen-control functions

This C utilities package for IBM PCs provides functions for controlling the screen and peripherals and for performing graphics, animation and math tasks. Screen-control utilities include functions for menu selection, function-key selection, full-screen input, window scrolling, multiple-screen pages, inverse video, blinking characters, multiple color strings and various cursor sizes. Peripheral-control utilities furnish a random-number generator, date/time function, RS232 serial port control, parallel printer port control, input and output port control, background music and sound generator and a terminal emulator. Users can draw dots, lines, circles or ellipses with the graphics utilities and perform multiple pattern fills and animate and store pictures with the animation utilities. The math utilities calculate sine, cosine, tangent, arctangent, arcsine, arccosine, ln, log, exponent, power, root and square root. $119. Software Labs, 1221 Matisse St., Sunnyvale, Calif. 94087, (408) 730-8108. Circle No 359
If you think all port expanders are equal...  
HERE'S THE SWITCH!

No more scraps to see who gets to use the printer first. No more tangles with cables every time you want to connect to peripherals. No more jostling heavy equipment around the office.

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Portal allows you to quickly and easily introduce a comprehensive switching system that will handle terminals, printers, modems, CPUs and other RS232 compatible devices. Up to 32 ports can handle 16 simultaneous connections.

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Portal gives you network capabilities at a fraction of the cost. With features such as hunt group (acts much like a multi-line telephone that will ensure the user gets through to an open mode) and wait queues that will automatically notify user once the requested peripheral is available.

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CIRCLE NO. 136 ON INQUIRY CARD

SONEX
Printer Covers

Here's a quiet solution to noisy computer printers from the SONEX sound-proofing experts. SONEX acoustical foam, with a unique anechoic wedge design, has controlled industrial, computer and pro audio sound for years. Now available in a printer cover, SONEX can be ordered directly from our factory. To learn more about our printer covers and the sound control technology behind them, call us at 612/521-3555, or write for our free color brochure: 3800 Washington Ave. North, Minneapolis, MN 55412.

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Word-processing package is object-oriented

The CrystalWriter word-processing package is object-oriented: users specify the type of document, such as a business letter, a personal letter, a memo, a report or an envelope, to be created, and the system automatically adjusts the margins, vertical spacing, justification, tabbing, document length and printing style. Within any type of document, users can invoke a variety of appropriate formats. Once users create a text file, they can reformat it by changing document types. The package uses 20 English commands and terminal function keys with on-screen soft-key labels. Users can work with as many as 12 files at once and move back and forth among them without saving them on disk each time. The product runs on UNIX 68000-based microcomputer systems. $1,000. Syntactics Corp., 3333 Bowers Ave., Suite 145, Santa Clara, Calif. 95051, (408) 727-8400.

Circle No 361
Laser printer works with personal computers

The LaserJet printer produces eight pages per minute and registers a noise level of less than 55 decibels. The printer is targeted for the small business and office and works with personal computers such as the HP 150, IBM PC and IBM PC compatibles. An RS232 interface comes as standard equipment. The product can print horizontally for business correspondence or vertically to create spreadsheets, using a compressed character font. It is compatible with software packages such as Lotus 1-2-3, Multimate, Wordstar, PFS Write and BPI Accounting.

Featuring 300-by-300 dpi resolution, the unit mixes text and graphics. Users can mix four typefaces on one page. Courier 10 is standard. Other fonts are available in three-font, plug-in font cartridges.

The printer uses standard cut-sheet paper plus legal-size paper and European sizes A4 and B5. It handles bond paper with preprinted letterhead, envelopes, labels and transparencies designed for copiers. A built-in sheet feeder accommodates 100 sheets of paper.

The printer employs replaceable electro-photographic cartridges that contain key imaging components including the drum. Each disposable print cartridge yields 3,000 pages. $3,495. Hewlett-Packard Co., 1820 Embarcadero Road, Palo Alto, Calif. 94303.

Circle No 362

Ink transient suppressor adorns color ink-jet copier

Compatible with the Tektronix 4107, 4109, 4113B (option 9) and 4115B (option 9) color display terminals, the model 4692 color graphics copier uses air-assisted, drop-on-demand ink-jet technology and features an ink transient suppressor that increases copier reliability. The copier supports two printing modes. The fixed-resolution mode prints at the copier's 154-dpi addressability, producing as many as 1536 by 1152 dots in an A-size (8½ by 11 inch) image during a two-minute printing period. The variable resolution mode selectable under software control produces copies in less than one minute, depending on the image format and signal source. The product produces images on clay-coated paper or transparency film. Its interface protocol and electrical characteristics are of the Centronics type, modified to accommodate color data, four-channel copier multiplexing and the higher data rates required by color copiers. $5,995. Tektronix Inc., Marketing Communications Department, Mailing Station 63-635, P.O. Box 500, Beaverton, Ore. 97077, (503) 644-0161.

Circle No 363

Printers feature bit-mapped graphics

This line of IBM PC-compatible dot-matrix printers features an IBM extended character set and screen dump graphics. Models 12CQ1 and 32CQ1 correspondence-quality printers offer 80 or 132 columns, respectively. They print at 150 cps in draft mode using a 9-by-11 dot matrix and at 60 cps in correspondence-quality mode using a 16-by-36 dot matrix. Model 101, an entry-level, 80-column, 80-cps printer, furnishes draft-quality printing. All three models have block, line and bit-map graphics capabilities. They handle cut sheets and fanfold paper and three-part (model 101) or five-part (models 12CQI and 32CQI) forms. A centronics interface comes standard. $499 to $995. Diablo Systems Inc., 901 Page Ave., P.O. Box 5000, Fremont, Calif. 94537, (415) 499-7000.

Circle No 364

Dot-matrix printer touts long print head life

The Legend 1000 dot-matrix printer features a print head life rated at more than 100 million characters and an MTBF of more than five million lines. The printer offers a nine-wire print head, 9-by-11 dot matrix, logic-seeking bidirectional printing and incremental printing. User-selectable character sets include standard ASCII, UK ASCII, French, German and JIS. Pica, elite, condensed, double-width and double-width condensed modes are available in fixed or proportional spacing. The unit supports bit image graphics modes with a dot-pitch ratio of one-to-one and a density of 576 dots per line. Graphics and a variety of text styles can be mixed in one document. Interfacing is via a Centronics-type parallel (standard) or RS232C (optional). Friction and tractor paper feeds come standard. $359. CALABCO, 14722 Oxnard St., Van Nuys, Calif. 91401, (818) 994-0909.

Circle No 365
Printer has removable interface cartridges

The DEC LA100-compatible CL-3500/model 10 printer provides task-dedicated printing speeds of 87.5 cps for letter-quality/word-pressing applications, and 350 cps for data and list processing. The product plots 2c0 by 144 dpi in the bit-image graphics mode. Character matrices are 17 by 16 in letter-quality mode and 9 by 9 in draft mode. Key highlights include removable interface and font cartridges. Standard features include bold face, slanting, superscripts, subscripts, variable print densities and remote setup and forms control. An RS232C interface comes standard. Friction and tractor paper feed are provided for cut sheet or continuous forms printing. $1,995. CIE Terminals Inc., 2505 McCabe Way, Irvine, Calif. 92714, (714) 660-1421.

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Strobe Inc., 897 Independence Ave., Building 5A, Mountain View, Calif. 94043, (415) 969-5130. Circle No 368

New Products

Printer achieves letter quality at 30 cps

Made up of four models, the Paper Tiger/Series 8000 dot-matrix printers produce letter-quality output using a dual-pass technique and a staggered 18-wire print head. The high-end model achieves letter-quality printing with only one pass. The 80-column model 8010 ($649) and 132-column model 8020 ($849) are black-and-white units that print draft correspondence at 180 cps, text at 90 cps and letter quality at 30 cps. Models 8050 ($1,895) and 8070 ($2,395) are 132-column color devices. Model 8050 prints at 200, 110 and 35 cps; model 8070 prints at 400, 200 and 75 cps. All printers support multiple-part forms, cut sheets and fanfold paper. Paper can be fed from the front, rear and bottom, manually or automatically. The printers support eight international and three scientific character sets and can print in superscripting, subscripting, bold, expanded, underscore, auto justification and emphasized styles.

Dataproducts Corp., 6200 Canoga Ave., Woodland Hills, Calif. 91365, (213) 887-8451. Circle No 367

Eight-pen plotter fits on a desktop

The M260 drum platen plotter with x and y stepper motors fits on a desktop. The eight-pen plotter produces multicolor bar graphs, pie charts, line graphs and character graphics with 500-step-per-inch resolution. Total plotting area is 7½ by 11 inches on 3½-by-11-inch transparent film or non-porous paper. The plotter's repeatability is 0.002 inches without pen changes and 0.008 inches with pen changes. The unit's graphics language is a subset of HP-GL. $995. TeleVideo Systems Inc., 1170 Morse Ave., Sunnyvale, Calif. 94086, (408) 745-7760. Circle No 369
Card set turns IBM PC into graphics workstation

Featuring 672-by-480-dot resolution graphics with 612 colors per pixel, the Midas two-card set replaces the IBM color card in an IBM PC or PC/XT microcomputer. It provides 4,096 standard colors with an optional palette of 16.8 million colors. The card set also furnishes 384K bytes of graphics RAM, nine bit planes, hardware zoom with roam, DMA from its 80188 microprocessor to frame buffer, light-pen support and an MS-DOS 2.0 software driver. $2,295. Vectrix Corp., 2606 Branchwood Drive, Greensboro, N.C. 27408, (919) 288-0520.

System merges images and text for display, printing

The model 800 Word Image Processing System operates with the IBM PC XT computer as a front-end peripheral. It consists of the model 680 graphic scanner, the model 110 image-processing interface, WIPS software and necessary cables. The graphics scanner contains an electronic digitizing mechanism and an illumination source. Its 8-bit, 1728-by-2846 picture-element resolution provides as many as 256 shades of gray. Scan times, scan area windows and scan modes are programmable. The scanner has a parallel interface that includes an 8-bit bidirectional data bus, plus control lines. The software enables users to create documents that integrate words and images. It interfaces with word-processing and database packages such as Wordwriter Deluxe, Visiword, Microsoft Word, Lotus 1-2-3 and Condor 3.$9,945. Datacopy Corp., 1215 Terra Bella Ave., Mountain View, Calif. 94043, (415) 965-7900.

Controller mates SMD disks, Q-bus computers

The model DQ215 Winchester disk controller interfaces two 8- or 14-inch SMD-compatible disk drives with DEC LSI-11 series and Micro/PDP-11 computers. The self-contained quad module plugs into one Q-bus slot and connects to drives by flat cables. Features include 56-bit ECC for error detection and correction, 22-bit addressing for 4M-byte data access, and compatibility with RT-11, RSX-11 and RSTS operating systems. $1,150. Distributed Logic Corp., 12900 Garden Grove Blvd., Garden Grove, Calif. 92643, (714) 534-8950.

Multibus video controller supports four displays

The MSBC-QV3 Multibus-compatible display controller supports four independent displays. Display formats (characters per line and lines per page) are user definable to 2,000 characters per display maximum. On-board color manipulation capabilities allow independent selection of background color and foreground and underline components of each displayed character. Each component can be programmed to blink to a different color. A hardware character generator contains a 128 ASCII character set. The controller generates RS-330 video signals that drive most standard RGB video display monitors. Four built-in DTMF keyboard interfaces permit interaction with each of the four displays. $1,620. Matrox Electronic Systems Ltd., 5800 Andover Ave., Montreal H4T 1H4, Canada (514) 735-1182.
Brochure lists graphics software for plotters

This guide to personal computer plotters and graphics describes six graphics software packages that enable users of the HP 150 touch-screen personal computer to produce charts and graphics on the HP 7470A and 7475A graphics plotters. The guide details the features of each software package; includes sample plots to illustrate graphics capability; and lists hardware requirements, ordering information and prices. Hewlett-Packard Co., 1820 Embarcadero Road, Palo Alto, Calif. 94303. Circle No 376

Pocket guide covers enhanced UNIX

The 103-page "Quick Reference Guide to Zilog's Enhanced UNIX System" summarizes all operating-system commands and formats, serving as an easy-to-use guide for System 8000 users. The guide covers user and administrator commands, the C shell, library routines, system calls and text-processing tools. Zilog Inc., Corporate Publications, 1315 Dell Ave., Campbell, Calif. 95008, (408) 370-8000. Circle No 377

Catalog lists UNIX-based applications software

The Software Products Catalog lists more than 50 horizontal and vertical UNIX-based applications packages that run on CIE Systems computers. The publication covers business applications software such as general accounting and legal time billing, office automation software such as word processing and electronic spreadsheet, and support software such as language processors, utilities and program generators. Each entry is indexed by Standard Industrial Classification Code and by the source language in which the software is written. CIE Systems, 2515 McCabe Way, Irvine, Calif. 92715, (714) 660-1800. Circle No 378

Color brochure describes vision-system applications

A four-page color brochure describes a variety of industrial vision-system applications and the use of the KR-95 image-recognition and -inspection systems. The brochure illustrates how the equipment reads alphanumeric characters on packages, tags and labels; monitors bulk material for defects; views cartons for correct filling; and inspects bottle and jars. Key Image Systems Inc., 20100 Plummer St., Chatsworth, Calif. 91311, (818) 993-1911. Circle No 379

Catalog covers datacomm products

A 14-page, illustrated short form catalog and price list covers Micom Systems Inc.'s range of data-communications and local-networking equipment. The booklet describes data concentrators, protocol converters, data PABXs, modems, voice/data multiplexers and mini datasets. It includes U.S. pricing for currently available products. Micom Systems Inc., 20151 Nordhoff St., Chatsworth, Calif. 91311, (213) 998-8844. Circle No 382

UNIX catalog contains 150 packages

A new Plexus computers' software referral catalog lists more than 150 UNIX application software packages available on its supermicrocomputer systems. Suited for UNIX resellers and users, the catalog serves as a reference for integrating the Plexus systems for vertical applications and for improving performance through networking and language development. Typical packages offered are for high-level language-compilation, database management, word processing, spreadsheet displaying, text editing, communications and business graphics. Plexus Computers Inc., 2230 Martin Ave., Santa Clara, Calif. 95050, (408) 988-1755. Circle No 383

Publication details datacomm products

The 32-page, color catalog covers Racal-Milgo's network components, communications networks and office network products as well as customer support services. Included in the network components section are modems, multiplexers, data service units and data encryption products. The communications network section describes large-scale network management systems as well as test sets and accessory products. The office networks section details local-area networks, protocol and code translators, terminals, printers and communications controllers. Racal-Milgo, Corporate Communications Department, MS 1302, 8600 N.W. 41st St., Miami, Fla. 33166, (305) 592-9600. Circle No 384

New Products

LITERATURE
New Products

LITERATURE

Newsletter targets engineering applications
Dedicated to showing engineers and scientists how to use their personal computers as data-acquisition systems, computer-aided design workstations, logic analyzers or microcomputer development systems, Personal Engineering and Instrumentation News presents industry news and application stories. This monthly newsletter permits readers to exchange tips and comments on products and design techniques. The $25-per-year subscription fee includes membership in the Personal Engineering Computer Users' Society. Personal Engineering Communications, Box 983 Back Bay Annex, Boston, Mass. 02117, (617) 536-8124.

Handbook clarifies graphics standards
Conflicting standards for business, engineering, scientific, educational, entertainment and publication graphics systems are compared and evaluated in the Graphics Standards Handbook. Edited by Edmund Van Deusen, the 500-page publication covers the Core System, Graphics Kernel System, Virtual Device Metafile, Initial Graphics Exchange Standard, Virtual Device Interface and North American Presentation-Level Protocol Syntax. It describes the functions, commands, elements, entities and control codes specified by each standard. It also includes a cross-referenced glossary of graphics standards terms. $145. CC Exchange, P.O. Box 1251, Laguna Beach, Calif. 92652, (714) 494-4910.

Study analyzes optical data storage
A market analysis published by Freeman Reports predicts that the market for computer optical data storage will grow to $7.3 billion by 1990. The study attributes the growth to graphics and image-storage applications and to large databases. Titled Optical Disk Storage Outlook, the 296-page report analyzes market characteristics and technology status, forecasts worldwide shipment volumes and revenues for three product classes from 1984 through 1990 and assesses the likely impact of optical techniques on magnetic storage. Profiles of 28 manufacturers developing optical products are included. $1,650. Freeman Associates, 311 East Carrillo St., Santa Barbara, Calif. 93101, (805) 963-3853.

Report assesses IBM marketplace
IBM Microcomputer Strategies: Hardware and Software analyzes microcomputer markets through 1988 with particular focus on IBM's activities, products and strategies. The report predicts that IBM will claim 50 percent of the market by 1986. While noting that market barriers are on the rise, the report also delineates the competitive strategies essential for survival with IBM in the market, and for maintaining a strong market position. $1,600. Competitive Strategies International, 4340 Stevens Creek Blvd., Suite 275, San Jose, Calif. 95129, (408) 249-7550.

Directory describes software package
The International Engineering Software Directory, organized by application, furnishes a technical description of engineering software packages for minicomputers, microcomputers or mainframes. The standardized directory includes information regarding minimum memory requirement, required hardware and software environments, list price, documentation, availability of updates and source code, technical support, warranty policy, delivery time and company description. $35. Technical Database Corp., P.O. Box 720, Conroe, Texas 77305, (409) 539-9688.

Software directory lists 34,000 packages
The eighth edition of the PC Telemart Software Directory, edited by E.J. McFaul, contains more than 34,000 listings and descriptions of software packages. The 1,400-page, softbound book describes software products for more than 180 types of microcomputers, with listings referenced by application category and operating system, and includes a directory of software publishers. Software packages are listed for business software, programming tools, educational software, programs for home and personal use and specialized vertical market software. $39.95. PC Telemart, 11781 Lee-Jackson Highway, Fairfax, Va. 22033, (703) 352-0721.

Book explains EMI compliance
Compliance Engineering, 1984, co-edited by Glen Dash and Isidor Straus, conveys the latest information and engineering solutions for computer product EMI compliance with FCC Part 15. Articles cover site design, test, redesign and retrofit-to-comply procedures. The 175-page handbook also explains the FCC's own test procedures and site design. $49.50. Compliance Engineering, 593 Massachusetts Ave., Boxborough, Mass. 01719, (617) 264-4479.

Graphics software survey covers 60 products
A survey of 60 graphics software packages for microcomputers, released by Data Decisions, explains which environments are suited for graphics presentation. The survey, titled Microcomputer Graphics Software, highlights product features via a dot chart. Each product description, arranged alphabetically by vendor, comprises applications, date of product's introduction, hardware operating system requirements, display and output capabilities, text chart features, business graphic features and retail price. $29. Data Decisions, 20 Brace Rd., Cherry Hill, N.J. 08034, (609) 429-7100.
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16 - 18  West Coast Electronic Office Expo & Conference (EOE '84), San Jose Convention Center, San Jose, Calif., sponsored by Cartlidge & Associates Inc. Contact: Show Management, Cartlidge & Associates Inc., Suite 205, 4030 Moorpark Ave., San Jose, Calif. 95117, (408) 554-6644.


25 - 26  "Effective Utilization of Microcomputers" Course, Atlanta, Ga., sponsored by the Institute of Industrial Engineers. Contact: Lane Gardner Camp or Phil Harrison, IIE, 25 Technology Park/Atlanta, Norcross, Ga. 30092, (404) 449-0460. Also held on Oct. 27-28 in Atlanta.
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**25-28 Twin Cities Computer Show & Software Exposition, Minneapolis, sponsored by CompuShows, Inc.**  
Contact: Ann Katchef, CompuShows, P.O. Box 3815, Annapolis, Md. 21403, (301) 263-8044 or (800) 368-2066. Also held at Civic Center, Atlanta, December 13-16.

**29-31 ONLINE ’84 San Francisco Hilton and Tower, San Francisco, sponsored by Online Inc. Contact: Online Inc., 11 Tannery Lane, Weston, Conn. 06883, (203) 227-8466 or (800) 824-7888.**

**30-31 Seventh Annual Newport Conference on Fiber-Optic Markets, Newport, R.I., sponsored by Kessler Marketing Intelligence. Contact: Conference coordinator, Kessler Marketing Intelligence, 22 Farewell St., Newport, R.I. 02840, (401) 849-6771.**

**29-(1) COMDEX/EUROPE ’84, RAI Congress and Exhibition Centre, Amsterdam, The Netherlands, presented by The Interface Group. Contact: Peter B. Young or Linda M. Yogel, The Interface Group Inc., 300 First Ave., Needham, Mass. 02194, (617) 449-6600 or (800) 325-3330. In Europe, Rivierstraete, Amsteldijk 166, P.O. Box 7000, 1007 MA, Amsterdam, The Netherlands, Telex: 12358NL.**

**30-(2) Mini/Micro West ’84 Computer Conference and Exhibition, Anaheim, Calif., produced by Electronic Conventions Inc. Contact: Nancy Hogan or Kent Keller, Electronic Conventions Inc., 8110 Airport Blvd., Los Angeles, Calif. 90045, (213) 772-2965.**

**30-(2) Wescon ’84 High-Technology Electronics Exhibition and Convention, Anaheim, Calif., produced by Electronic Conventions Inc. Contact: Nancy Hogan and Kent Keller, Electronic Conventions Inc., 8110 Airport Blvd., Los Angeles, Calif. 90045, (213) 772-2965.**

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**31-(2) Edmonton Computer & Office Automation Show, Edmonton Convention Centre, Edmonton, New Brunswick, Canada, sponsored by Canadian Information Processing Society, Edmonton. Contact: James K. Mahon, Group Show Manager, Industrial Trade Shows, 20 Butterfield Road, Toronto, M5W 3Z8, Canada, (416) 252-7791.**

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**NOVEMBER**


**13-15 INTERFACE I, Conrad Hilton Hotel, Chicago, sponsored by Society of Manufacturing Engineers, its Computer and Automated Systems Association (CAS/A) and the American Production and Inventory Control Society (APICS). Contact: Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, Mich. 48121, (313) 271-1500, or American Production & Inventory Control Society, 500 West Annadale Road., Falls Church, Va. 22046, (703) 237-8944.**
Rates

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**MINI-MICRO SYSTEMS**

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Stamford, CT 06904

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**1.**

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**Home Address (Street, City, State, Zip)**

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<th>Other (Area Code)</th>
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**2.** **EDUCATION INFORMATION:** Schools Attended

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**3.** **EMPLOYMENT INFORMATION:**

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<th>Name &amp; Address of Present Employer (Will not be contacted)</th>
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<th>Position (Please give brief description of your title and current job assignment)</th>
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<th>Length of time with current employer</th>
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**4.** Are you willing to relocate? ______

What are your geographical preferences? ______

**5.** Please Check One:

- U.S. Citizen ______
- Permanent Resident ______
- Student Visa ______

**6.** Foreign Language

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<th>Read</th>
<th>Write</th>
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**7.** Please indicate current salary ______

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*Please Sign Here*

Date ______

*Your signature will authorize us to forward the above information on to the company of your choice, in the strictest confidence. Your current employer will not be contacted.*
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