

FIRST MAGAZINE OF GLOBAL ELECTRONICS MANAGEMENT

# CAN IBM GO HOME AGAIN?

The home computer market, where even IBM flopped in the early 1980s, has once again become a target for personal computer manufacturers.

PAGE 63



■ HDTV: Progress in Europe **48** ■ Delay in Japan **51** ■ Politics in the U.S. **57**

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CIRCLE 177

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CIRCLE 7

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408-441-0551

September 1990 Volume 63, Number 9

Electronics (ISSN 0883-4989) is published monthly by Penton Publishing, Inc., 1100 Superior Ave., Cleveland, OH 44114. Second class postage paid at Cleveland, OH, and additional mailing offices.

Editorial and advertising addresses: Electronics, 611 Route #46 West, Hasbrouck Heights, NJ 07604. Telephone (201) 393-6060; Facsimile (201) 393-0204; San Jose, Calif.: Telephone (408) 441-0550. Circulation (1100 Superior Ave., Cleveland, OH 44114): (216) 696-7000.

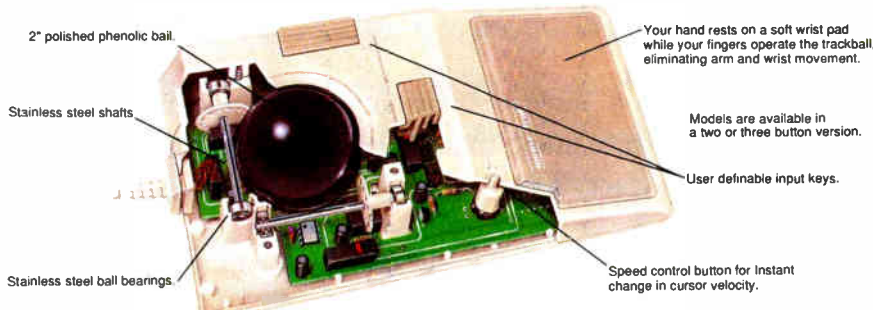
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Subscriptions free to qualified managers. All others: \$60 for one year in the U.S.; \$70 in Canada; \$125 in all other countries. For subscriber change of address and subscription inquiries, call 216-696-7000.

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CIRCLE 178

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CIRCLE 172

# HOW TO BUILD CANNONS

In every major confrontation with Asian semiconductor giants, U.S. companies seem to surrender rather than do battle. Admittedly, the Americans have been going into battle with what amounts to rifles to face the Asian companies' heavy artillery, and the big guns will prevail every time. The need for the U.S. companies to beef up their firepower became increasingly obvious in the last weeks of August when two manufacturers decided to quit the increasingly competitive static-RAM business. Both National Semiconductor Corp. in Santa Clara, Calif., and VLSI Technology Inc. of San Jose, Calif., decided to devote resources to higher-value products.

They pulled out of the market because Japanese manufacturers, with their hundred-million-dollar fabs, had turned their big guns on SRAMs, causing prices to plummet on the world market. With more than 30 manufacturers flooding the market with lower-priced units, the result will be a drop in dollar volume, from \$497.6 million in 1989 to \$450 million in 1990.

Until now, the prevailing view was that U.S. companies could compete because the SRAM business was small and atomized with a diversity of product. SRAM makers sold into a niche market that served high-end workstation and computer applications. Sales in the U.S. weren't high enough to attract competition from the large Asian companies looking to feed those big fabs.

That all changed last year when the high-end personal computers based on the 33-MHz 80386 and 80486 appeared. At the higher clock rates, dynamic RAMs were too slow to keep up; a cache was needed between CPU and DRAM to avoid wait states that robbed performance.

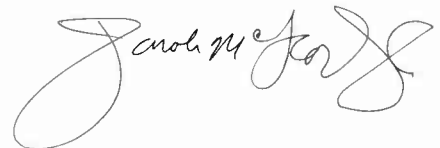
That means that instead of annual shipments of a few hundred thousand mainframe, mini, and workstation computers requiring SRAMs, the prospect is for millions of 386- and 486-based PCs. So the number of SRAMs likely to ship will increase by an order of magnitude.

Meanwhile, capital-rich Asian companies have built giant fabs, turning out many devices that sell at low prices. This enables them to bombard high-volume markets, like that for DRAMs, with lots of low-cost chips. On the other hand, capital-starved U.S. companies construct smaller, less expensive fabs that can easily be configured for a variety of product, "boutique" parts—like SRAMs—that sell for higher margins. The trick is to continually find new specialty parts as existing products go commodity.

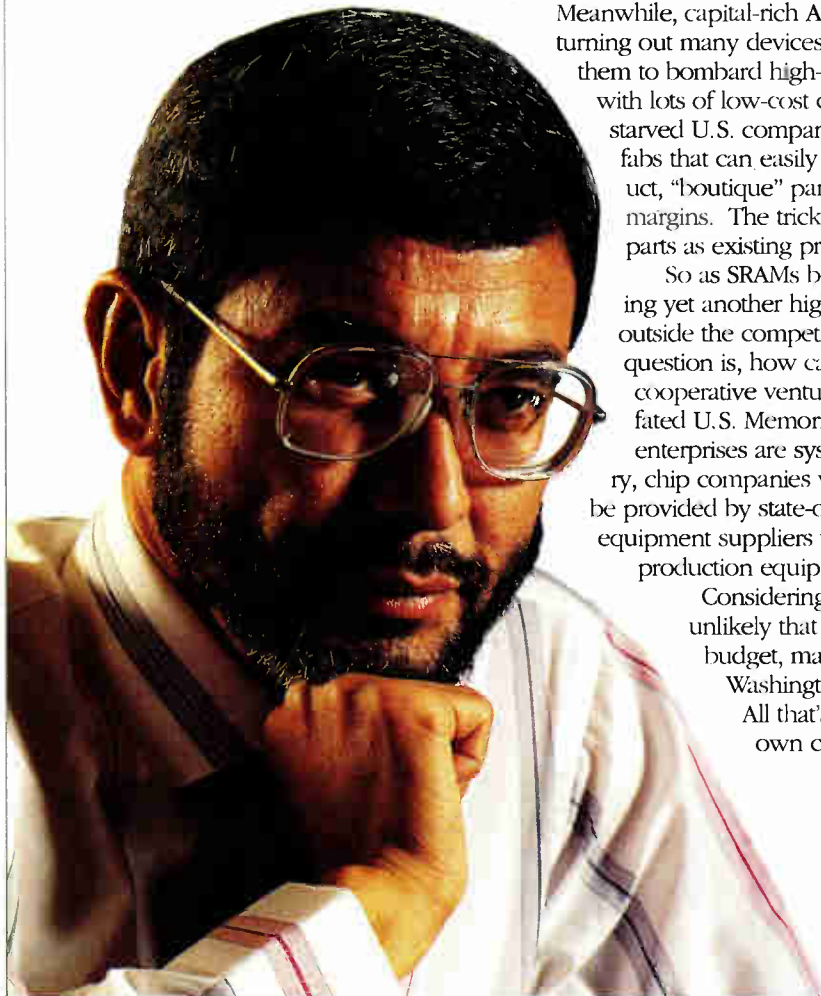
So as SRAMs become commodities we are witnessing yet another high-volume memory business moving outside the competitive orbit of U.S. companies. The question is, how can this be prevented? The answer: cooperative ventures of the sort embodied in the ill-fated U.S. Memories. Having a mutual interest in such enterprises are system companies that consume memory, chip companies wanting access to technology that can be provided by state-of-the-art production facilities, and equipment suppliers wanting to develop next-generation production equipment.

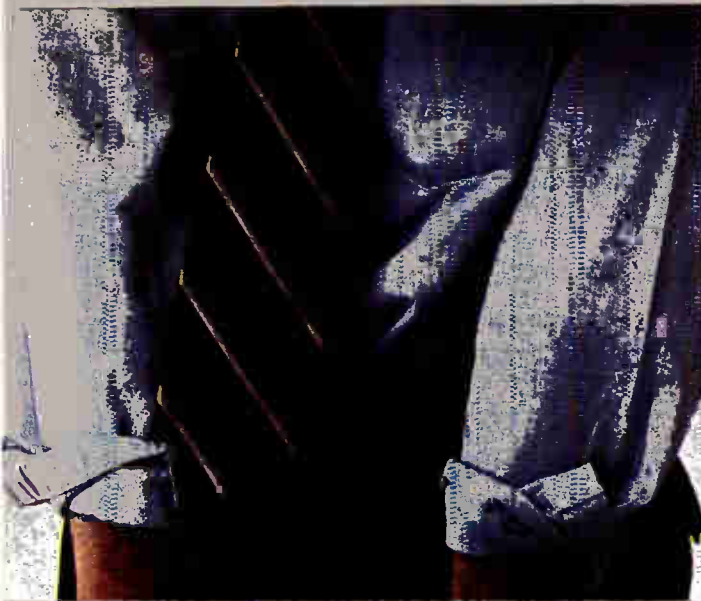
Considering the options, what else is there? It's unlikely that the Administration will balance the budget, making capital less expensive, or that Washington will provide direct financial aid.

All that's left is to cooperate and build your own cannons. **E**



JONAH McLEOD  
EDITOR





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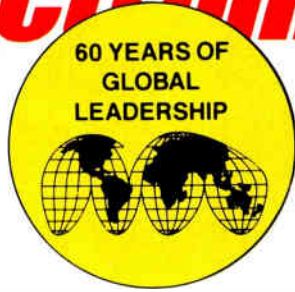
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# Electronics



COVER STORY PAGE 63

## FEATURES

63

### Can IBM go home again?

Big Blue mounts a marketing blitz for its PS/1 as Tandy and Commodore also move in the home-computer market

79

### Embedded computers are going mini

Ampro's downsized, low-priced family could open new markets for embedded systems

69

### Chip set vendors rally around the 386SX

They're also pushing standard-cell solutions and greater integration in 286 products

73

### Workstation graphics at PC prices

RISC-based chip supporting 8514/A and VGA brings a significant drop in graphics-board costs



PAGE 69

77

### 'Motherboard on a chip' becomes a reality

AMD is first with a processor/logic IC, a class of chip that may be the ultimate laptop solution

82

### Can CD-ROM tailor a new image?

As prices drop and multimedia grows up, computer vendors mull their choices

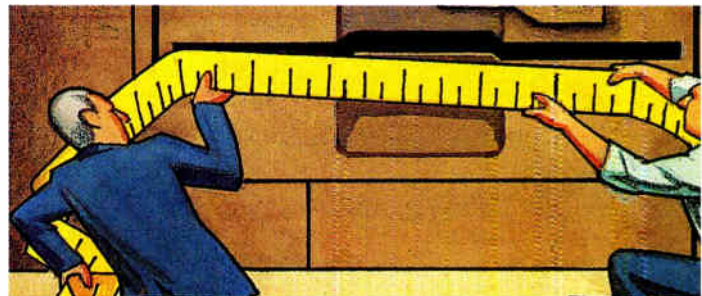
87

### Skystation puts new spin on a Sun

Accelerator gives supercomputer-like zip to Sparcstations without code alteration



PAGE 48



PAGE 82



## DEPARTMENTS

4 Up Front

13 Letter from Berlin

26 Face-Off

80 Information Center

95 Electronics Index

96 Advertisers' Index

## NEWS ROUNDUP

21

### News Front

- How to attract capital
- It's disk vs. flash in PCs
- GaAs climbs to million-transistor level
- Now, "Tiny" Mosis chips

28

### Products to Watch

- Texas Instruments breaks out a parallel DSP
- AMD has a 1-Mbit flash
- A solution to the problem of PC-data Babel
- Stardent targets graphics

46

### European Observer

- Telecom-switch makers score in the East
- Devalued dollar? No problem in Germany
- Philips develops chip for neural networks

## WORLDWIDE NEWS

31

### Networking

Ethernet meets FDDI

34

### Lithography

Sharper edges, denser ICs

38

### Manufacturing

Ban near on CFCs

40

### Consumer Electronics

A perfect timepiece

42

### Medical Electronics

Doctors ready to implant the first FES unit

## EXECUTIVE BRIEFING

48

### HDTV

As Europe's Eureka project enters Phase 2, HDTV moves out of the labs

51

### HDTV

Japan's NHK encounters a broadcasting delay, but products are arriving fast

57

### HDTV

In the U. S., HDTV is a focal point for the competitiveness issue

## NEWSMAKERS

88

### Minc Inc.

Quality assurance in software? Minc says yes

89

### RFT SEL

A new capitalist at an East-West combine

## SUPPLEMENT

48A

### Executives on the Go

Businessman and best-selling author Harvey Mackay shows executives how to succeed—at play as well as at work.

## Companies covered in this issue, indexed to the first page of the article in which each is mentioned.

Advanced Micro Devices Inc. ....	28, 69, 77	National Semiconductor Corp. ....	4, 69
Advanced Television Test Center .....	57	NEC Corp. ....	51
Alcatel NV .....	46	Next Computer Inc. ....	82
Ampro Computers Inc. ....	79	NHK .....	51
Apple Computer Inc. ....	63, 82	Nokia Corp. ....	48
AT&T Microelectronics .....	57	Nokia OY .....	13
BIS Mackintosh Ltd. ....	46, 48	Opti Inc. ....	69
British Satellite Broadcasting Ltd. ....	48	Orbit Semiconductor Inc. ....	21
Chips & Technologies Inc. ....	69, 73, 77	Panasonic Advanced TV-Video Laboratory .....	51
Chorus Systems Inc. ....	21	Philips International NV .....	13, 26, 48, 82
Cirrus Logic Inc. ....	69	Poquet Computers .....	69
Cisco Systems Inc. ....	31	Promula Development Corp. ....	87
Commodore Business Machines Inc. ....	27, 63, 82	RFT SEL Nachrichten-elektronik GmbH .....	13, 88
Compaq Computer Corp. ....	82	Robert Bosch GmbH .....	48
Dataquest Inc. ....	63	Sanyo Electric Co. Ltd. ....	51
Digital Equipment Corp. ....	38	Sharp Corp. ....	51
Frost & Sullivan Inc. ....	79	Siemens AG .....	13, 34, 46
Go-Video Inc. ....	57	Sigma-C GmbH .....	34
GS Technology Inc. ....	69	Sky Computers Inc. ....	87
Headland Technology Inc. ....	69	Software Publishing Corp. ....	28
Hewlett-Packard Co. ....	82, 88	Sony Corp. ....	48, 51
Hitachi Ltd. ....	51	Sony Corp. of America .....	82
IBM Corp. ....	13, 63, 69, 73, 77, 79, 82	Standard Elektrik Lorenz AG .....	13, 46
In-Stat Inc. ....	69	Stardent Computer Inc. ....	28
Independent Broadcasting Authority .....	48	StoreBoard .....	69
Integrated Information Technologies .....	73	Sun Microsystems Inc. ....	82, 87
Intel Corp. ....	13, 63, 69, 77, 82, 87	Synergetics Inc. ....	31
Intermetall GmbH .....	13	Tandy Corp. ....	63
International Data Corp. ....	87	Telecom Zwut .....	46
ITT Semiconductors Group ..	13	Texas Instruments Inc. ....	28, 63, 69, 73
Junghans GmbH .....	40	Thomson SA .....	48
KnowledgeSet Corp. ....	82	Toshiba Corp. ....	13, 51
Laboratoires d'Electronique Philips .....	46	Toshiba Disk Product Division .....	82
Lotus Development Corp. ....	82	Unisys Corp. ....	21
LSI Logic Corp. ....	13	Vanguard Semiconductor Corp. ....	57
Matsushita Electric Industrial Co. ....	51	VLSI Technology Inc. ....	4, 69
Mentor Graphics Corp. ....	82	Weitek Corp. ....	73
Meridian Data Inc. ....	82	Wellfleet Communications Inc. ....	31
Merrill Pickard Anderson & Eyre .....	31	Western Digital Corp. ....	69, 73
MetaWare Inc. ....	87	Xymos Corp. ....	69
Microsoft Corp. ....	63, 82	Zenith Electronics Corp. ....	57
Minc Inc. ....	88	Zytec Inc. ....	38

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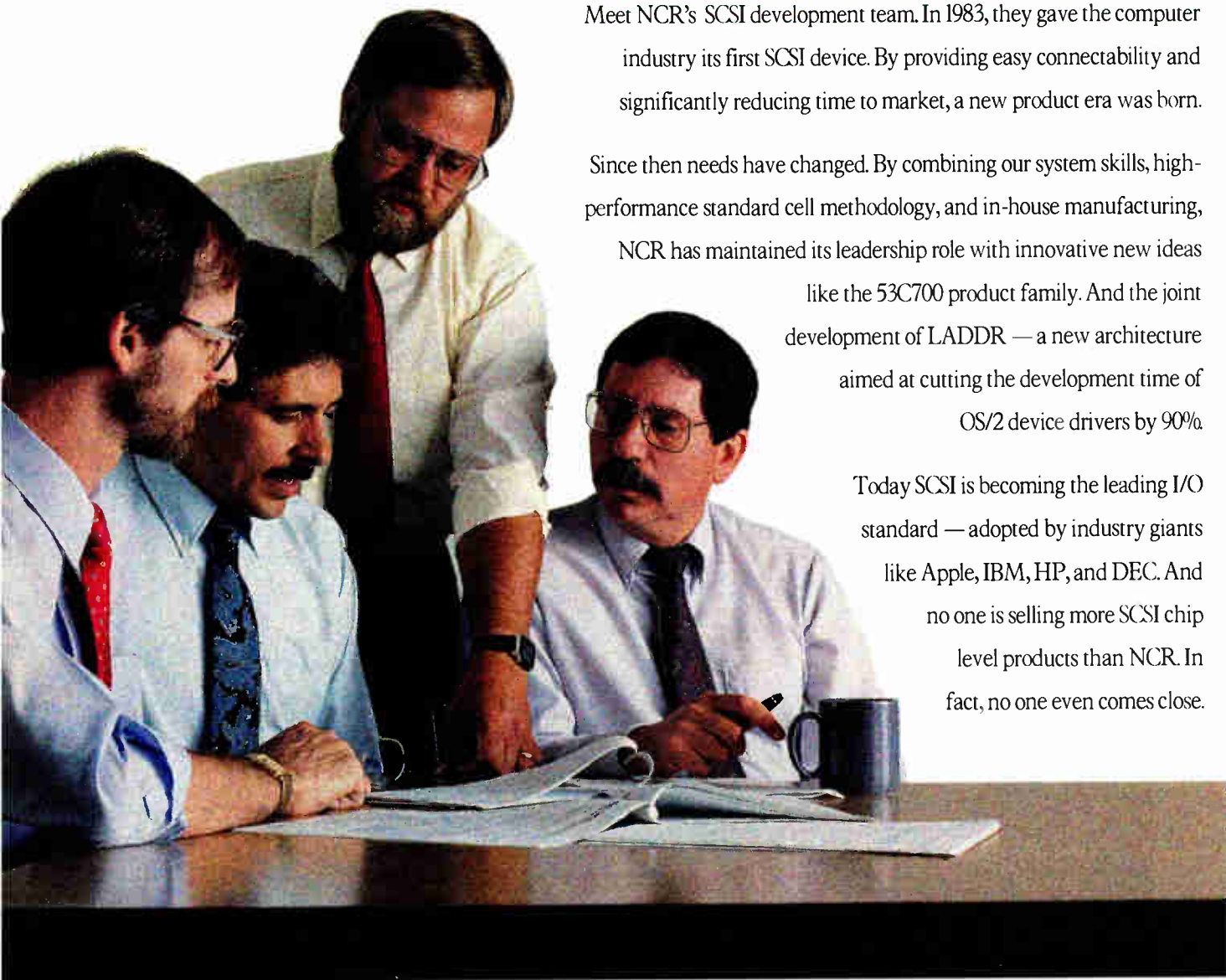
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**Part of the NCR SCSI Development Team:** (left to right) **Jerry Armstrong**, Sr. Software Engineer; **Harry Mason**, Strategic Marketing Manager; **John Lohmeyer**, NCR Sr. Consulting Engineer and Chairman of the ANSI X3T9.2 Committee and **Dave Skinner**, SCSI Product Manager.

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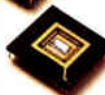
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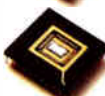
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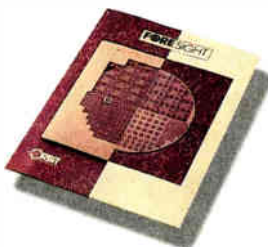
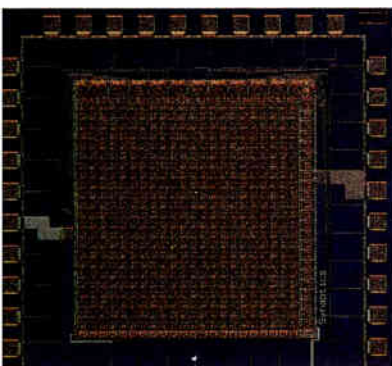


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World Radio History

CIRCLE 218

# BERLIN

## MORE LAND, MORE PEOPLE—AND A MONUMENTAL REBUILDING TASK WHAT WILL A NEW GERMANY BRING?

BY JOHN GOSCH

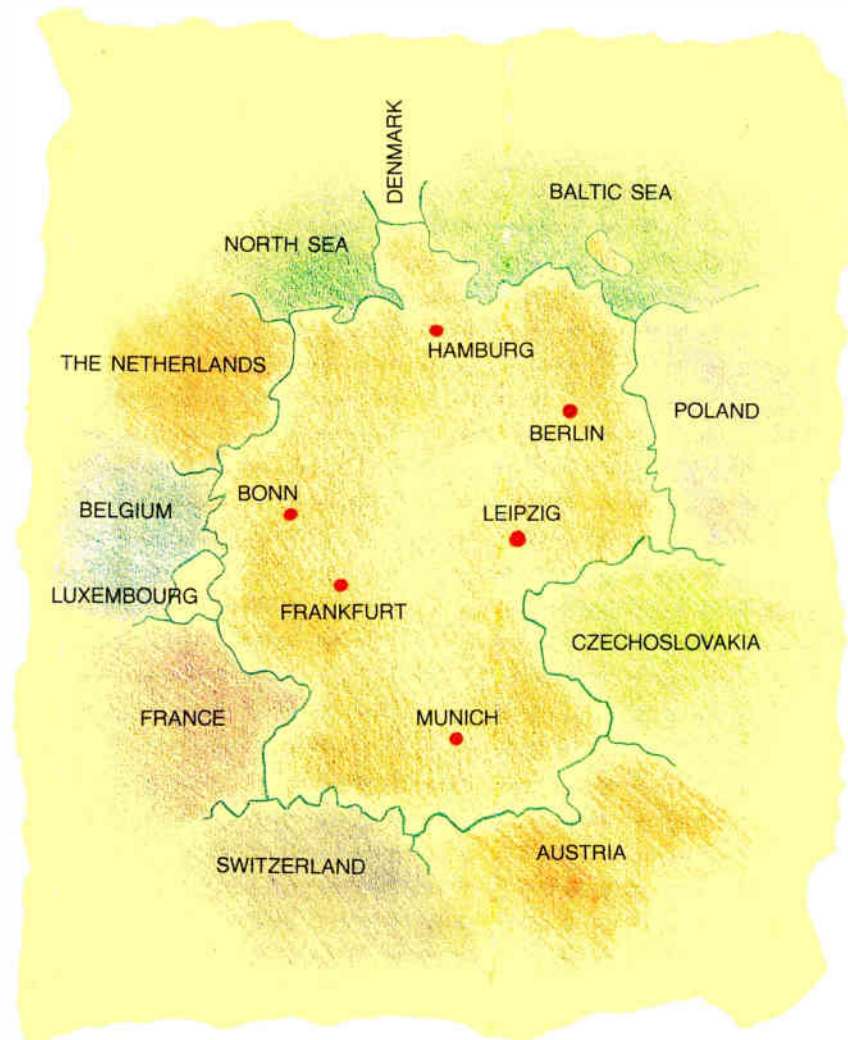
**O**NCE AGAIN IN THEIR long and tortuous history the Germans have redrawn the map of their country. This time, what was split in the aftermath of World War II has been rejoined: the two Germanys, East and West, became a single political entity on Oct. 3. Thus there's a "new" country at the heart of Europe, one almost the size of California and with nearly 80 million people.

What will the united Germany bring? Will it upset Europe's balance of power or try to dominate the continent economically, as some of its neighbors fear? No doubt the dramatic changes in Germany—like those in Eastern Europe and the Soviet Union—will affect Western economies. But German politicians go to great lengths to assure the neighbors that their country will stay locked in the embrace of the European Community and, in a spirit of partnership, help advance the cause of European integration.

What should also allay anxieties about a new economic muscle man in Europe are a few facts and figures. Although East Germany added about 20% more people and 30% more area to the united country, the economy that was joined to West Germany's is only 10% of the combined total.

And a sorry economy it is. More than 40 years of Communist rule left East Germany a shambles, a country with an inefficient communications infrastructure, dilapidated factories, and a heavily polluted environment. The East Germans' standard of living is far below that of their affluent relatives in the West. All told, analysts figure that it will take some \$800 billion to bring the region's overall infrastructure to the level of West Germany's and make its industry competitive on world markets.

But it's not just a question of money; there is also economic philosophy. Now that last November's euphoria over the crumbling Berlin Wall and the unification fever are subsiding, many Germans realize they are facing a tough challenge: merging two funda-



mentally different economic systems. This task entails blending East Germany's state-owned and subsidized economy into West Germany's free and market-driven system. "That's something that has never been tried before in economic history," remarks Horst Jenisch, director of technology transfer at Intermetall GmbH, the IIT company in Freiburg. "It's going to be a painful process."

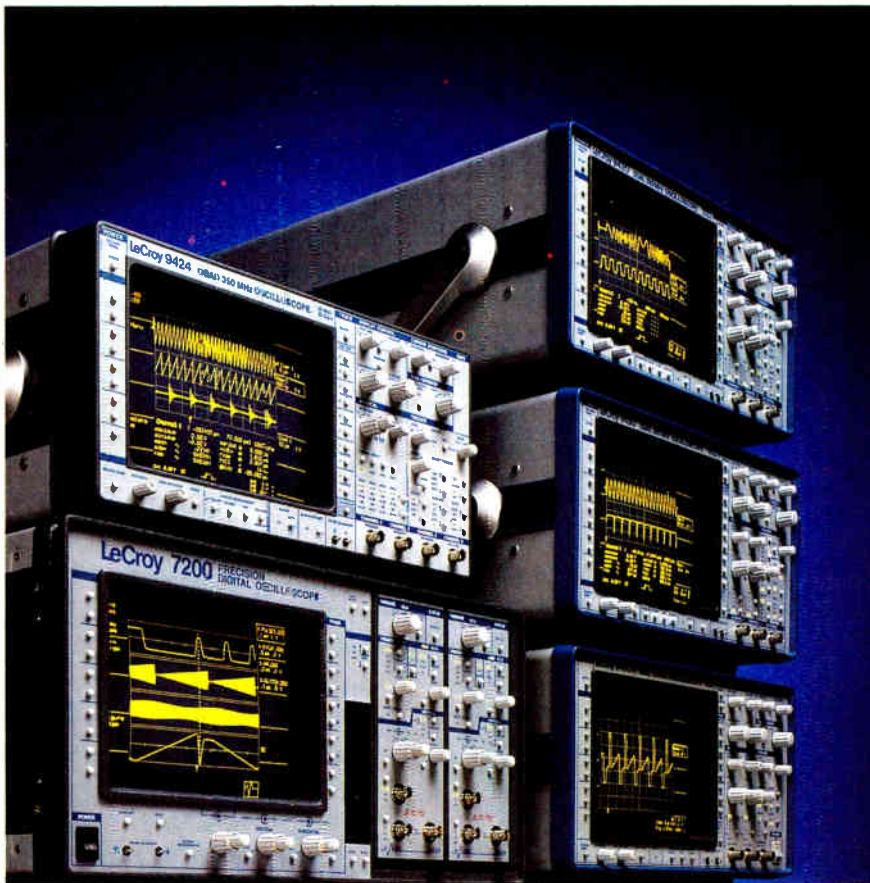
Also hurting is that, except for pump-priming money from the West, subsidies are gone. The upshot: more than a million people, or 10% of East Germany's work force, have lost their jobs in recent months or are on shorter

work weeks. That number could swell to 3 million by mid-1991.

In view of all this, what can East Germany add to the united country's electronics industry? The fact is that at least in technology, the eastern region cannot contribute much, even though in comparison to other East European countries, East Germany excelled: it has produced samples of 1-Mbit dynamic random-access memories and 32-bit microprocessors.

However, East Germany can make some contributions. It can chip in with production capacity, well-trained engineers and scientists, and a good knowledge of East European markets. That's

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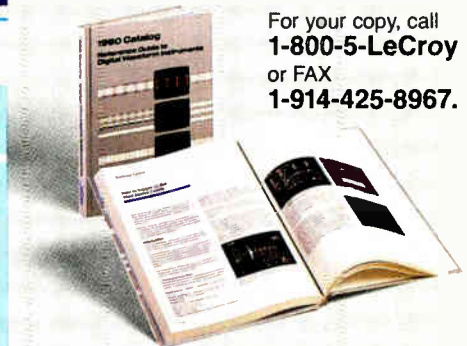
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Innovators in Instrumentation



the view of Jürgen Apitz, chairman of the management board of East Berlin-based RFT SEL Nachrichtenelektronik GmbH, an East-West joint venture employing 6,000 people (see p. 89).

Indeed, since the economic union between the two Germanys became effective July 1, Western firms, eager to tap the available production capacity, have stepped up their efforts "to enter cooperative deals, especially in information and communications technology," says Rudolf Scheid, head of the Frankfurt-based Electrical and Electronics Industry Association.

Scheid thinks that such cooperation could make one quarter of East Germany's electrical and electronics industry more competitive by the end of this year. Analysts figure that in the longer term, the structure of East Germany's industry will match that of West Germany and, with 300,000 people, contribute about \$30 billion (roughly half of that accounted for by electronics)—or 20%—to the united country's total sales of electrical and electronic goods.

For its part, Munich-based Siemens AG has set up or is negotiating joint ventures with a number of other firms that once belonged to East Germany's communications equipment combine. "The aim is cooperation in public and private switches, transmission equipment, and text terminals," says Eberhard Posner, Siemens's chief spokesman for economic affairs.

As is typical for the company, Siemens is taking a long-range view of business development and has started to invest in Germany's five new states in the East. It is now negotiating some 30 cooperative projects in virtually all electronic fields, from communications to traffic control, factory automation, and medical electronics. Posner figures that in a few years his company will provide between 25,000 and 30,000 jobs in East Germany and eventually derive more than \$3.2 billion worth of business a year from the new Eastern regions. For starters, the firm has earmarked \$650 million for investments.

Cooperation of sorts will also take place in components, although the device technology of the possible partners in the East is three to eight years behind that of the West (up to 12 years in applications), according to an East German electronics magazine. So cooperation will be limited to low-tech devices, and these will be made mainly with production equipment supplied

by the Western partner.

The list of possible Western partners in device production reads like a Who's Who in components. Besides such European heavyweights as Siemens and Philips NV of the Netherlands, there are Japan's Toshiba as well as America's Intel, LSI Logic, and IBM. The last is believed eager to cooperate in production equipment.

East Germany's large pool of good engineers from some of Europe's top engineering schools, such as the universities of Dresden and Chemnitz, are also valued by the West. If taught to put their knowledge to practical use in a competitive society, these engineers are a valuable resource in a country in need of qualified personnel.

Among the companies tapping this human resource is, again, Intermetall. It will help a group of East German engineers set up a company of their own to do designs on a contract basis for Intermetall. The East Germans will be familiarized with the latest workstations and other development tools.

Finally, will the former East Germany significantly increase the united country's electronic markets? That depends on the products involved. What East Germany needs in the way of sophisticated semiconductor devices "we can satisfy with the output of a Friday afternoon," says Jürgen Knorr, president of Siemens's Semiconductor Division. He points to East Germany's big need for equipment to improve its rail system, agriculture, highways, housing, and environment—in short, equipment that does not gobble up huge numbers of semiconductor devices.

If sizable electronics markets do exist in the East, it's for consumer products and communications gear. "Long deprived of features-laden TV sets, video recorders, and other advanced consumer goods, the East Germans want the latest the West can offer," says Reinhard Preuss, spokesman for the ITT Semiconductors Group.

The biggest market is likely to be in communications equipment. Postal authorities in the West figure that to bring East Germany's communications infrastructure to the level of West Germany's, investments of around \$35 billion are needed between 1991 and 1997. The demand is particularly strong for digital switches, telefax systems, mobile radio equipment, packet-switching lines, cable-TV connections, and coin phones. **E**

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# CAE Technology Report

October 1990

Vol. 2 No. 8

## A Major Boost for PC-Based CAE Tools

Many designers judge CAE tools based on their operating hardware. Even more important is the power of the underlying operating system. For this reason, the joint announcement by AT&T,<sup>™</sup> Intel Corp.<sup>™</sup> and Santa Cruz Operation to define a common Unix operating system for 386- and 486-based personal computers, will have a huge impact on CAE tools. A new generation of low-cost, powerful and easy-to-use CAE tools should appear within a year and will provide open-end portability to workstation platforms.

## Siemens<sup>™</sup> Joins EDA

Not discouraged by dismal financial results of leading CAE vendors, Siemens AG, Germany, has plunged into the CAE business by buying Calay Systems Inc. of Irvine, California. Calay is known for its excellent Prisma<sup>™</sup> package that includes PC-based schematic capture and back-end layout and routing tools. Some experts claim that since Calay is missing a good simulator it will not be able to compete against Mentor Graphics<sup>™</sup> and others. That perception is erroneous because Calay can quickly standardize on the SUSIE<sup>™</sup> simulator from ALDEC, Inc. (Newbury Park, CA). This VHDL platform is based on incremental compilation and is an order of magnitude faster than products from other CAE vendors. By adopting this standard, Siemens can quickly become an important CAE player. **Circle 102**



## FPGAs Lead IC Growth in the 90's

To lower design costs and shorten development time, logic designers are turning to field programmable gate arrays (FPGAs). With FPGA's ever-increasing speed, density and I/O capability, designers have a sure path for future growth. FPGA design tools have also improved dramatically. Simulators like SUSIE/PGA and SUSIE/ACT allow concurrent design correction and simulation. All errors are automatically tracked

and displayed instantaneously. These fully automated tools make FPGAs even more attractive because they can now be debugged in minimum time. **Circle 105**

## Actel<sup>™</sup> FPGAs Hit 8,000 Gates

Actel Corporation has recently announced enhancements to its "antifuse" interconnect technology. The new ACT2 family of devices will be twice as fast and have twice the I/O than the family. In the upcoming Xilinx<sup>™</sup>, the leader

present ACT1 fourth quarter, in FPGA applications, will bring out its 4000 series. With these new products, the race for FPGA leadership is heating up again. ALDEC

provides the SUSIE 6.0 real-time interactive simulator for both Xilinx and Actel parts, and will most likely gain from the growing popularity of both parts, primarily because SUSIE simulates the operation of single and multiple FPGA parts, both at chip and system level.

**Circle 104**

## Windows 3.0--A Big Boost to CAE

It seems that Windows 3.0 will make a major impact on CAE tools. Users need geographical interfaces and CAE tool developers need a software environment that reduces their work. So far, only CAD/CAM Group (Cupertino, CA) has a Windows 3.0-based schematic capture offering high performance at PC prices. However, other vendors are hard at work to provide similar products. There are rumors that the planned real-time SUSIE 7.0 simulator from ALDEC, Inc. will run under Windows 3.0.

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### SLIM, LIGHTWEIGHT CELLULAR PHONE: THE P3 SERIES.

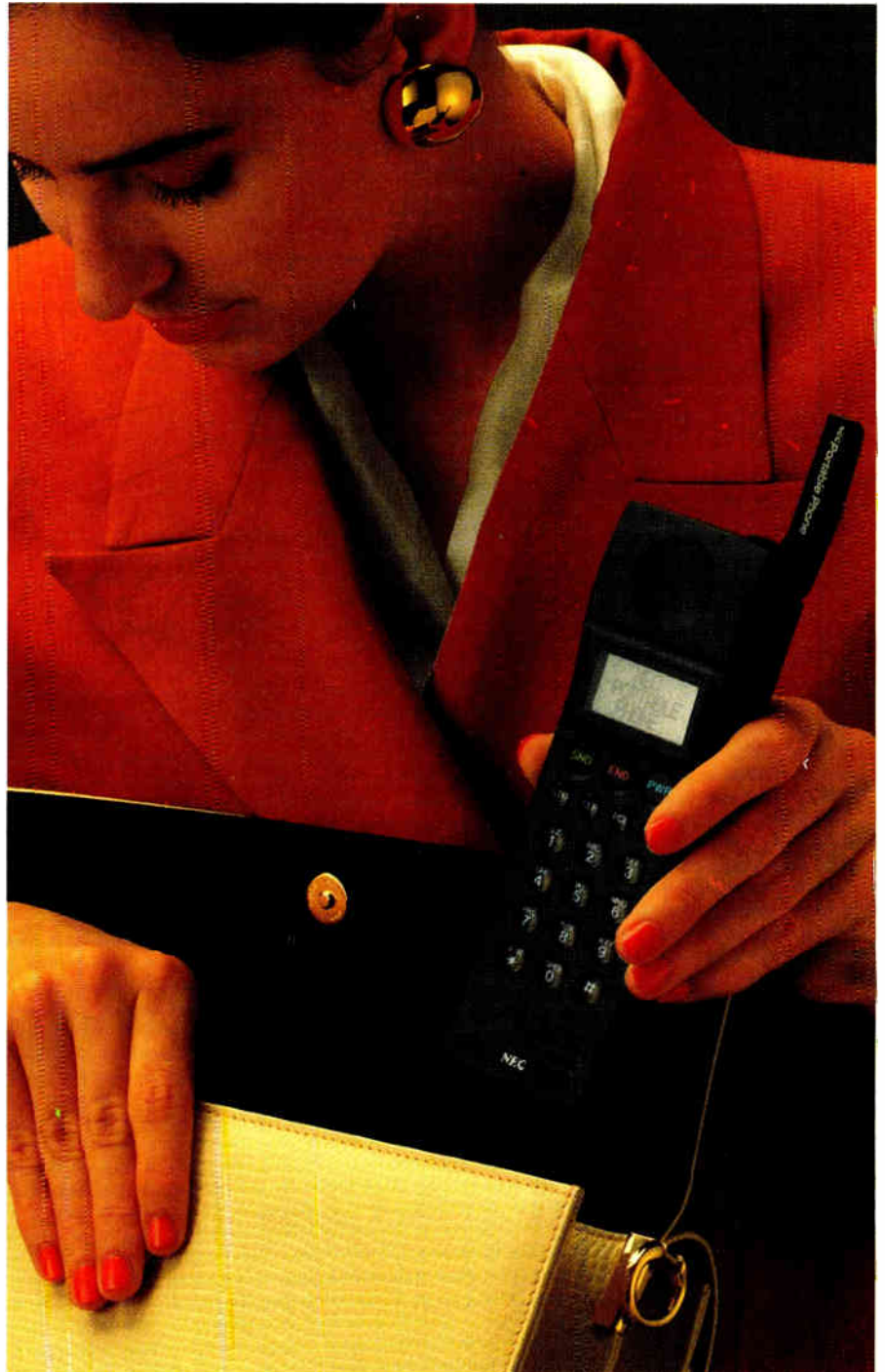
One of the fastest growing products in telecommunications is the portable cellular phone. Already a powerful business tool, it will soon be at the heart of personal communications. NEC has developed a new generation of portable phones for AMPS and ETACS systems, using leading-edge circuit and chip technologies.

The P3 Series cellular phone features outstanding portability. It measures 58mm wide, 25.5mm deep and 184mm high (2.3" x 1" x 7.2"). It weighs only 400g (14oz) and has a 270cc (16.5 cubic-inch) displacement, including a built-in battery. The antenna flips down to facilitate storage and carrying.

The P3 Series also gives users an exceptionally long period of continuous talk – 80 minutes: and its rechargeable NiCd battery offers an 18-hour standby period.

Compact design results from remarkably reduced component count through custom LSIs and thorough surface mounting. The P3 slashes power consumption with a highly efficient GaAs FET PA module, a low-power prescaler and a 3-CPU scheme for the logic block.

P3 phones have many convenient features including a 30-character LCD screen, a 99-number speed-dial memory and a built-in clock/timer.



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## NUMBER 144

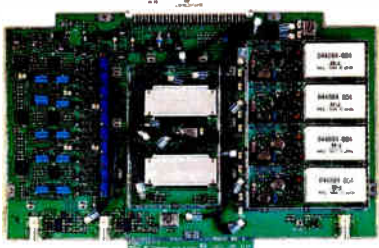
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### XPIC DOUBLES MICROWAVE RADIO CAPACITY.

**R**adio frequencies are a limited resource. That's why designers of digital microwave systems constantly strive to provide more bits per RF channel.

One efficient solution is cross-polarization, co-channel operation. It more than doubles capacity by transmitting vertically and horizontally polarized signals for the same frequency. Economical dual-polarization radios are made possible by XPIC, our cross-polarization interference canceller. Incorporating a precision transversal equalizer and controller, the XPIC module minimizes interference by generating reverse-phased cancellation signals.

XPIC is also the right choice for overlaying a new system on an existing one. For example, a 64QAM 140Mbps system or SDH radio with STM-1 capacity can be added to the same RF channel of an existing 16QAM 140Mbps system. NEC has already installed many digital microwave systems incorporating XPIC modules.



XPIC unit

### HONG KONG AUTOMATES MAIL PROCESSING.

**T**he Hong Kong Post Office has introduced an advanced mail processing system that works without postal or zip codes.

Hong Kong's Mechanized Letter Sorting System (MLSS) incorporates OCR/coding systems, computer-aided video coding machines and multi-selection letter sorting machines. Installed in two major mail centers

and seven district mail delivery offices across the territory, the MLSS speeds the processing of millions of letters every day.

The multi-line OCR/coding machine is an outstanding



feature of MLSS. It reads the alphanumeric information of typed or machine-printed addresses, then prints a bar code on the envelope for further sorting right down to the postman's delivering beat.

The machine has a scanning height of 120mm and a throughput of 32,000 letters per hour.

All the mechanized letter-sorting equipment are linked on-line to a computer system which acquires, collates and edits data for use by operational and engineering managers.

Hong Kong's MLSS project is one

good example of NEC's ability to offer a total solution geared to the needs of individual customers. NEC has 29 years of experience in mail automation, and our products are now serving in 34 nations.

---

### WORLD'S FASTEST 1-MEGABIT VIDEO RAM.

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**H**igh-end graphics systems require greater speed and higher resolution.

Our new high-density video RAMs meet these needs with faster access and enhanced functionality.

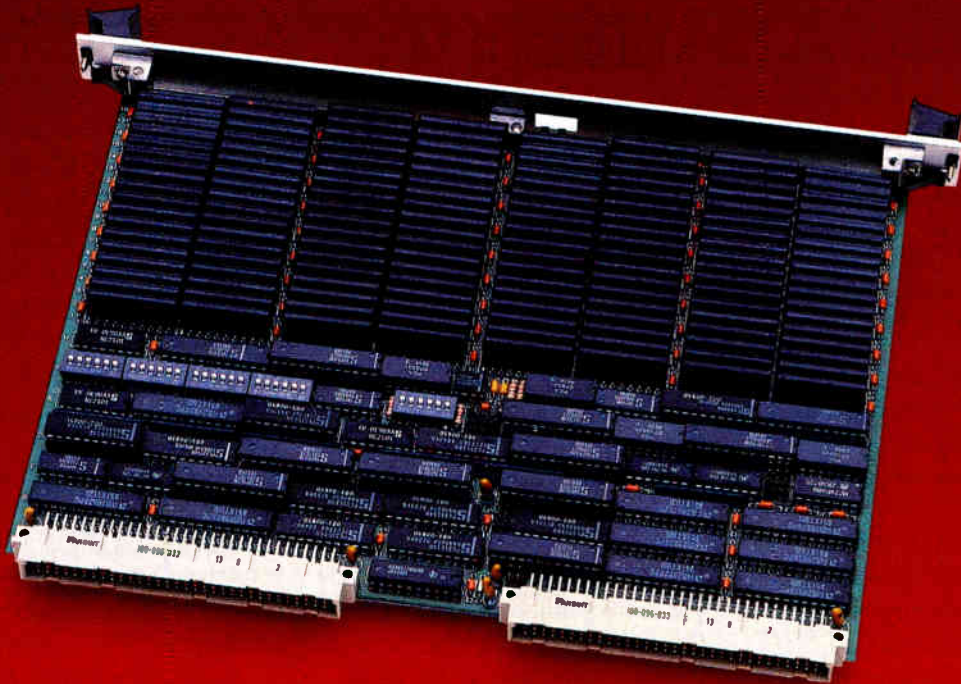
NEC is introducing a 1-megabit, dual-port graphics buffer in a 128K x 8 configuration. The  $\mu$ PD42275 features an 80ns RAS access time and numerous convenient functions.

Flash Write instantly clears the full screen and Block Write permits high-speed window fill. The Split Data Register simplifies real-time data transfers with relaxed timing. The Persistent Write Per Bit feature provides compatibility with popular graphics processors.

NEC is the originator of the 256K video RAM. We now offer an exceptionally broad choice of video RAMs at the 256K and 1-megabit densities.

# NEC

# The Highest Density, Fastest, VME-Compatible Memory



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### The Fastest Byte Parity

The VMERAM-FP1, available in 4 to 64 MB, provides the fastest sustained block transfer timing available. Typical operating speeds boast 100 ns read and 74 ns write.

Our company-wide pledge to deliver reliability and performance.



Quality Commitment

### Error Detection and Correction Options

Clearpoint offers several EDC boards for the VMEbus and the VSB subsystem bus. Our proprietary second generation EDC chip set with "extra bit" automatically replaces a bad DRAM and re-maps the array to include the new location.

- VMERAM-EC1: EDC with 64-bit cache and Clearpoint's exclusive "extra bit" technology, the VMERAM-EC1 includes 24- and 32-bit addressing, 8-, 16-, and 32-bit data transfers, and is available in 2 to 64 MB densities.
- VMERAM: The VMERAM is the low-cost alternative for EDC memory, with pricing comparable to parity memory. The VMERAM is available in 2 to 16 MB densities.
- VSB RAM-EC1: Features include "extra-bit" EDC and dual 64-bit caches for simultaneous transfer capabilities. Dual-ported for the VMEbus and VSB subsystem bus, the VSB RAM-EC1 is available in 2 to 64 MB densities.

### The Clearpoint Difference

Clearpoint is a leading vendor in the VME marketplace, with the most comprehensive service program available. All Clearpoint memory products are covered by a lifetime warranty and a toll-free technical support hotline. Dedicated inventory in multiple locations worldwide support our 24-hour replacement program.

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## FRONT

## HOW TO ATTRACT CAPITAL

The legislative wish list of the National Advisory Committee on Semiconductors, aimed at reducing the cost of capital, includes as one of its four proposals a suggestion that has surprised the Congress: shorten the depreciation life of semiconductor-manufacturing equipment from five to three years.

The committee's numbers crunchers estimate that a three-year depreciation term would increase the annual rate of capital investment in the chip business by 11%. A more radical proposal—a one-year term—would increase the rate by 26%.

Though it has been weighing the other three proposals (see table), the Congress has not even been considering changes in depreciation. The reason is cost. Implementing a three-year term would have a net cost to the

U.S. Treasury of \$180 million. The projected increase in capital investment in semiconductor-manufacturing equipment, however, would reach \$450 million annually.

The other making the

R&D credit permanent, reducing capital gains taxes, and increasing the incentives for personal savings—are all favored by the Administration and will probably be in the next budget. **E**

How The Picture Would Change			
Proposal	Cost of Capital %	Capital Investment %	R&D Spending %
<b>R&amp;D Tax Credit</b>			
Continue Current	-2 to -7	DNA	+1 to +2
Increase Rate	-44	DNA	+5
Charge Base	-5	DNA	+5
<b>Capital Gains Tax Cut</b>			
	not estimated	+7	not estimated
<b>Personal Savings Incentive</b>			
	-15	+3	not estimated
<b>Improved Depreciation Rules</b>			
3-Year	-16	+11	not estimated
1-Year	-29	+26	not estimated

SOURCE: QUICK, FINAN & ASSOCIATES INC.

## DISK VS. FLASH: THE PC MEMORY BATTLE HEATS UP

The war for the memory space in the nascent laptop-notebook-palmtop PC market has heated up. Advancing flash memory as a replacement for mechanical disk drives is Intel Corp., while ever smaller and more reliable hard-disk drives have been unveiled by Quantum Corp. But casting a giant shadow over everybody's parade was Japan's Toshiba Corp. with its announcement of a line of disk drives.

Intel's flash card, from its Flash Memory Operation in Folsom, Calif., is aimed at OEMs. It is based on Intel's ETOX II nonvolatile flash memory offering. The company says its card offers more than 1 million hours'

mean time between failure versus 50,000 for disk drives.

Countering that move is Quantum Corp. of Milpitas, Calif., with eight drives. Its Go-Drive Series of 2.5-in. models is for laptop and notebook models; the Pro-

Drive Gem Series 3.5-inchers are for portables and low-end desktops.

Finally, Toshiba rumbled into the picture by announcing a line of 2.5-in. drives. They are scheduled to hit the market next April. **E**

## NOW, 'TINY' MOSIS CHIPS AVAILABLE

## WORLDWIDE

Up to now, the smallest chips made under the Mosis design rules were available only to U.S. enterprises. These so-called Tiny chips, measuring 2.4 by 2.4 mm, were available only through Mosis, a program that is funded by the Defense Advanced Research Projects Agency, or Darpa. But that has changed.

Tiny chip capability is now being offered available commercially through the world thanks to Orbit Semiconductor Inc., the Sunnyvale, Calif., chip prototyping and production foundry operation as part of its Foresight multiproject wafer service. What's more, Orbit can handle mixed-mode designs, verifying each analog and digital segment through fabrication.

The Foresight service, based on the company's ten years of experience as a provider of prototype services, features fast turnaround. It offers reduced engineering costs by running numerous projects on a single wafer. The customer provides the data-base tape, and Orbit delivers packaged units within a guaranteed time period. **E**

## GaAs INTEGRATION LEVEL CLIMBS TO 1 MILLION TRANSISTORS

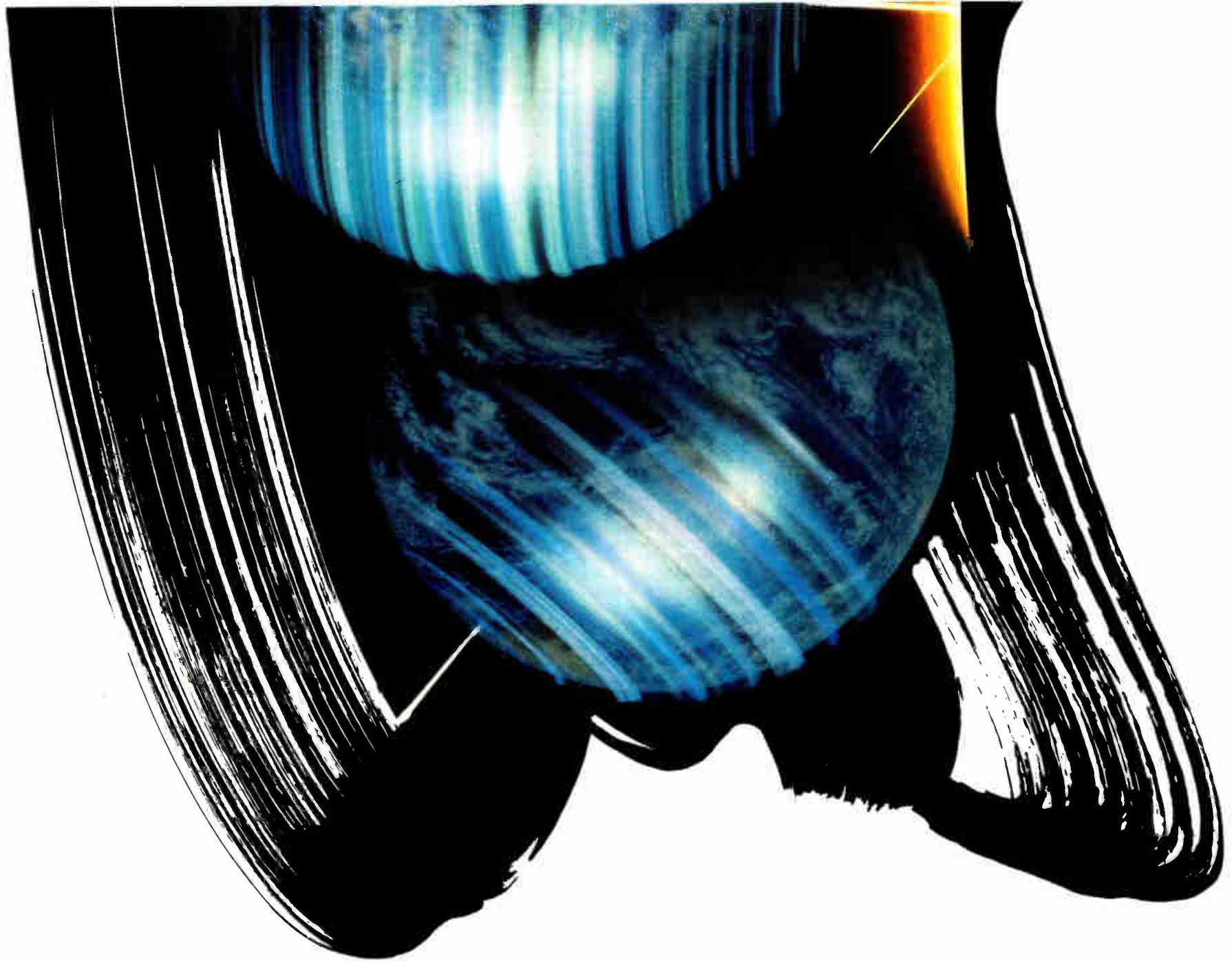
There may be trouble ahead, in the form of a rival technology, for biCMOS technology. A process developed by Vitesse Semiconductor Corp. of Camarillo, Calif., has pushed the level of integration for digital gallium arsenide circuits past 1 million transistors.

The threat to biCMOS in some applications arises from the fact that the new process not only raises GaAs to the same level of integration, but enables it to operate at higher speeds.

The basic transistor structure of Vitesse's H-GaAs III process achieves loaded gate

delays of less than 100 ps while dissipating less than 200  $\mu$ W at 1-GHz clock rates. By comparison, high-performance biCMOS offers 200- to 300-ps gate delay and 100- to 150-MHz, according to Vitesse. Look for products using the new process to appear later this year. **E**

*PIONEERS IN MEASUREMENT*





# Tiny Glitches Lead to Giant Wobbles

We take it for granted that the Earth rotates stably on its axis and that the stars are fixed in the sky above us.

Yet, Hipparchus discovered more than two millennia ago that there were very slight discrepancies in the measured positions of stars over the years. Compelled to look further, he found the difference to be greater than what could be attributed to error and analyzed it.



Hipparchus

Hipparchus realized that the position of the stars was actually shifting at a constant rate, year after year. This was later shown to be caused by the Earth slowly wobbling like a top as it turned on its axis.

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MP1608A 5GHz Pulse Pattern Generator

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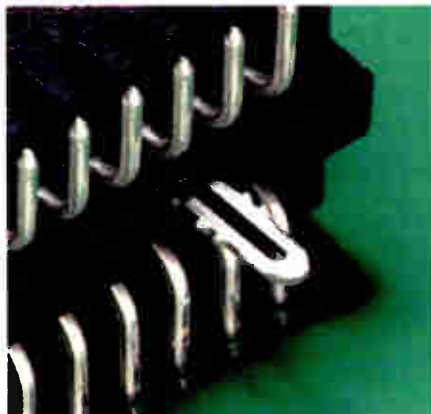
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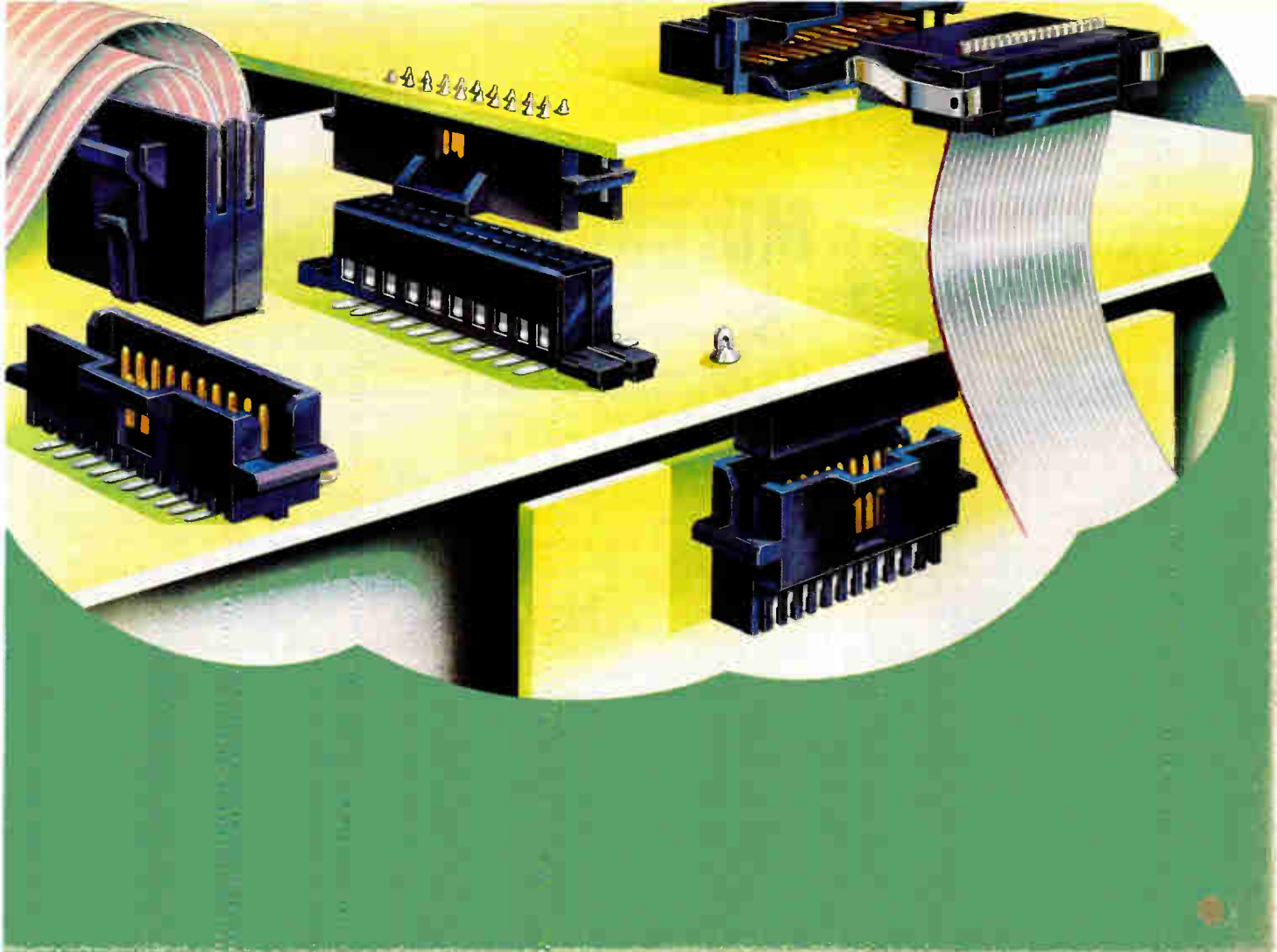
System 50 SMT receptacles and headers intermate with our complete .050" x .100" system, including cable-to-board types that expand your design thinking to include flat flex cable, .050" center flex etched circuitry, and .025" center ribbon cable.



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Surface-mount versions are available in vertical, double-row versions, fully shrouded, in select sizes from 8 through 100 positions. Our compact design uses the same reliable System 50 interface, with dual-beam phosphor bronze receptacles plated gold-over-nickel on the mating end, tin-lead on the tail.

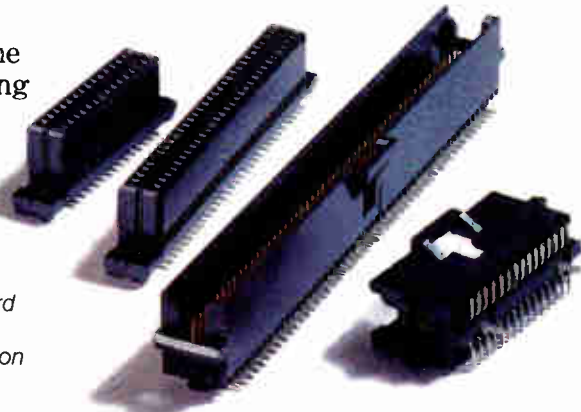
Dimensioning, tolerances, and positioning datums are engineered for robotic placement. A simple, low insertion



# Think system.

force hold-down secures the connector during processing and provides long-term strain relief. 94V-0 housings are compatible with reflow soldering.

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OFF

# MULTIMEDIA: APPLIANCE...

**S**OME SAY THE FUTURE OF multimedia will be decided as the battle between the Computer and the Appliance. For the computer camp, the issue revolves around making its platform adept enough to provide audiovisual entertainment, and affordable besides. For the consumer world, the issue is to achieve a technology level equal to or better than that of computers, but so well standardized that it can span world markets and developers.

In this debate, one question rarely surfaces—namely, what is the consumer's point of view? For the consumer has a very fundamental understanding of entertainment and individual productivity.

The fact is that the home computer will continue to make steady advances. But these units are bought as personal productivity centers for applications like filing, data basing, and homework, both children's and adults'. When there is time to spare, Flight Simulator kicks in. The truth is that a keyboard-driven device, designed to be viewed at a distance of less than 15 in., is not a family instrument.

If our vision of multimedia equates with entertainment and the home, we have to take this as our point of departure. We have to agree on standardization, because no consumer will be able to choose from a myriad of operating systems, memory sizes, storage systems, and audiovisual formats. And we mean standardization of the sort that guarantees the playability of each disc on each player, regardless of the tools or systems it was created with.

Next, if we are going to launch this multimedia player in the home we have to come up with something that's of an exceptional value compared with what we have today. We could call it the leapfrog factor vs. the incremental factor. If we are going to convince consumers that they are better off with this expensive new CD device just to improve video-game graphics and

sound, we ought to study history. Incremental value based on radically different technology won't work.

For example, RCA in the early 1980s launched the CED capacitance video disc to directly compete with the linear video cassette. The technology was different, but the benefits were the same. CED didn't make it, for it couldn't provide unique elements that could offset the "strangeness" of the big cartridges.


The CD audio system is a successful instance of a leapfrog launch. Introduced in 1982, it was radical enough in that it required the consumer to overhaul his entire stock of records. But the benefits

were tremendous: stellar sound, untouched by wear, easy handling, and greater mobility.

We are trying to apply those lessons to multimedia. Philips's Compact Disc Interactive (CD-I), to be launched in 1991, is standardized, not only in terms of audiovisual display and compression levels, but also down to the operating system and

interface level. The CD-I player has the look, feel, and operability of both the VCR and CD audio player. It has a remote control and joystick, rather than a keyboard; the high-quality image and audio that the audience of the 1990s expects; and, most importantly, true full-motion, full-screen digital video.

But technology doesn't sell itself. It is the software that makes a system succeed. Much of the resources involved in CD-I development have therefore been directed to title development.

When CD audio was first proposed, many were skeptical. The music business was in a downturn. The economy was in a recession. The CD seemed a very expensive solution to a need that, some thought, was already being met. And yet CD audio became the most successful electronics product ever. With CD-I, we are aiming to do exactly the same thing for multimedia.—*JEAN-PIERRE ISBOUTS, managing director, Philips IMS Authoring Group* 



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# ... OR HOME COMPUTER?

**F**EEED IT INTO THE COMPUTER and let's see what it comes up with." That's a traditional view of computers, replayed over and over in movies and TV—computers as one-dimensional data banks. Maybe that's why the home computer revolution stalled in the 1980s.

No more. With near total home penetration of TVs and stereos, and with the growth of video cassette recorders and camcorders, today's contemporary home has become an electronic playground, and computers are fast becoming a key component.

Of course, this playground is not just for children. In an era of "superparenting," today's families want consumer goods that are practical, accessible, and multifunctional. Like the new remote controls, which can be a command central for everything from TV and stereo to lights and door locks, computers are becoming, as one consultant put it, "as standardized as the home stereo system."

The market for multifunctional computers is driven by two factors: new technology and increasingly sophisticated demands by households. Today's users value computers that mimic the versatility and fun of their home entertainment systems rather than the productivity orientation of the traditional office computer. And for two-income families, the byword is "price/value." New home products that provide multiple services will be a key element of the decision-buying process.

Also pushing this demand may be, as most new research indicates, the fact that families are spending more of their leisure time at home. Commodore's own research shows these people are abandoning old hobbies and outside entertainment for home-based activities such as renting videotapes and playing computer games. As more families attempt to simplify their lives, find affordable entertainment, and pursue new forms of personal development,

they are discovering that the home computer is the ideal device to meet these needs.

At Commodore, we believe the most valued home computers are easy to use, fun, and versatile enough to grow as family needs evolve. We also believe Commodore's Amiga 500 meets these criteria—and then some.


With outstanding color graphics, easy-to-identify icons, and advancements in the mouse-activated operating system, the Amiga 500 has the interface any mother could love. In many households, computers like the Amiga 500

serve a multitude of functions: to devel-

op basic skills for young children; to complement school-based curricula with learning programs that are both intriguing and educational; to just have fun with games, music, and paint programs. Of course, computers still deliver word processing, and having a computer at home means hard-working parents can bring their

work from the office to minimize their time away from the family.

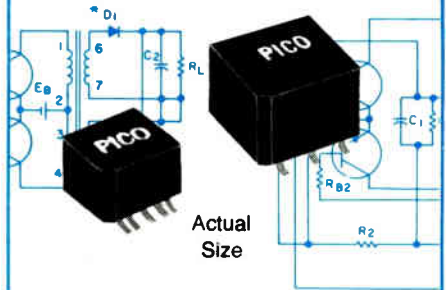
We're not stopping there. Now in development is a new product that redefines "user-friendly." This new computer integrates the multimedia capabilities of the Amiga with the large memory capacity of compact-disc players (see p. 82). Best of all, Commodore finally takes the fear out of home computing by including a remote-control device, which operates the computer the same way it would a TV, stereo, and other electronic equipment.

No one in the industry is ready to predict that home computers will mirror the VCR boom, but at Commodore, we're committed to developing products—such as the Amiga 500 and the 500-based CD-TV machine—that will eventually be as welcome in the electronic playground as TVs, microwaves, and VCRs.—*TOM KILCOYNE, director of consumer markets, Commodore Business Machines Inc.* 



**TOM KILCOYNE**

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CIRCLE 206

# TO WATCH

## TI BREAKS OUT A PARALLEL DSP

The first digital-signal-processing chip that is specifically architected for parallel processing has emerged, and it comes from the DSP leader, Texas Instruments Inc.

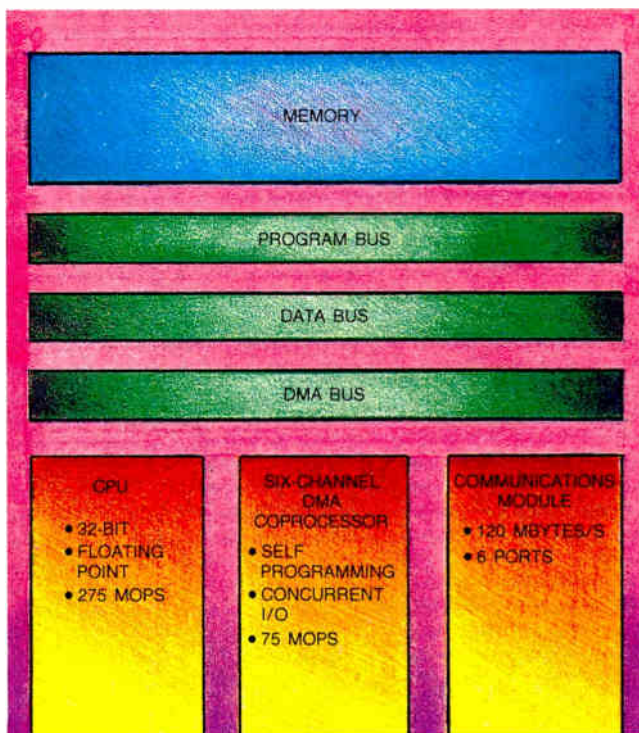
The TMS320C40's central-processor core is a direct lineal descendant of the Dallas-based semiconductor maker's 320C30, but the C40 has also added a six-channel direct-memory-access module and a six-port communications module to boost throughput—the real goal of parallel-processor systems.

The C40 delivers 50 million floating-point opera-

tions/s compared with the C30's 33 megaflops, but simple comparisons do not tell the full story.

Inside its processor module, for example, the C40 handles 275 million operations/s compared with the C30's 140 mops. Throughput between chips is 320 Mbytes/s compared with the C30's 140. Each of the six communication ports runs at 20 Mbytes/s and the C40's local and global buses each add 100 Mbytes/s.

TI also released development tools for parallel processing. Samples will be available in the first quarter. **E**



TI customized its 320C40 for parallel processing by adding communications and DMA modules.

## AMD ENTERS FLASH MARKET AT 1 MBIT

Add one more company to the list of chip makers that believe flash EEPROM (electrically erasable, programmable, read-only memory) will take the industry by storm in the 1990s.

Advanced Micro Devices Inc. has taken the plunge in a big way. Its first flash squeezes 1 Mbit on a die size of approximately 45K mil<sup>2</sup>. That's about 75% the area of its best competitor, says the Sunnyvale, Calif., company.

The Am28F010's 90-ns access time also sets a record for 1-Mbit flash EEPROMs, a technology widely believed to be the best memory solution for laptop computers and handheld gear that need programmable memory. Available now, the Am28F010 costs \$18.20. **E**

## SPC'S INFOALLIANCE SOLVES THE PROBLEM OF PC-DATA BASE BABEL

Distributed computing is finally getting serious attention from independent PC-software vendors. A breakthrough product from Software Publishing Corp. helps distributed computing reach full potential by unraveling the problem of incompatible data bases.

SPC's InfoAlliance combines Microsoft Corp.'s OS/2 and sophisticated graphics together into what the Mountain View, Calif., company calls data-source integration.

Long a leader in shrink-wrapped software for business applications, SPC is pulling together its products—including Harvard Graphics and PFS:First Publisher—with other packages to deliver easy access to almost all corporate information on PC platforms.

In essence, InfoAlliance offers a common graphical information interface that

imports and displays data files from dBASE III and IV, IBM Extended Edition Data Manager, Professional File 2.0, Lotus 1-2-3, and Microsoft's DIF worksheet.

System configuration requirements are an IBM Corp.-compatible computer

based on an 80386 microprocessor, 4 Mbytes of random-access memory, a 40-Mbyte hard drive, and OS/2 version 1.2. InfoAlliance systems will be configured on a per-customer basis, but a system for six users is expected to cost about \$4,100. **E**

## STARDENT TARGETS A GRAPHICS NICHE

Innovative use of reduced-instruction-set computing microprocessors has enabled Stardent Computer Inc. to provide high-performance graphics and image processing in a desktop system that carries a workstation price.

The Newton, Mass., company's Stardent 500 Stiletto is believed to be the first desktop unit to offer supercomputer-like instruction execution and high-performance graphics in a diskless,

uniprocessor version priced as low as \$17,900. It uses a 32-MHz MIPS R3000 integer processor, a MIPS R3010 scalar floating-point chip, and multiple Intel i860s for vector instructions and 3-d color.

That combination delivers enough compute power for a 32 million instructions/s peak, 48 million floating-point operations/s per processor, and 190,000 3-d drawn vectors/s. **E**

# 3.3V Technology Breaks 5V Speed Barrier

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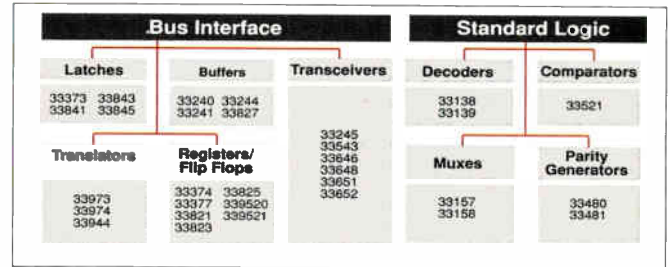
Performance's NEW 3.3V PCTD Logic Family, featuring 0.4 micron effective gate lengths (PACE III Technology) and center power and ground packaging, offers a 35% speed improvement over 5V FCTA, with dramatically lower power dissipation and half the ground bounce.

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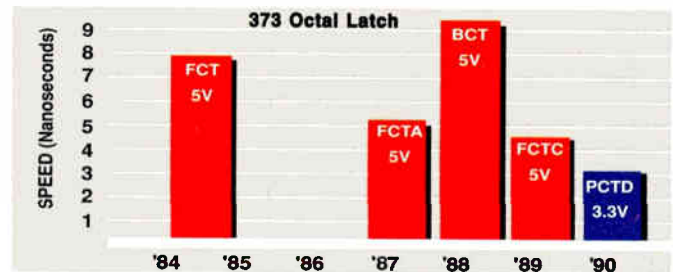
Tom Longo

### Performance's 3.3 Volt Logic Family



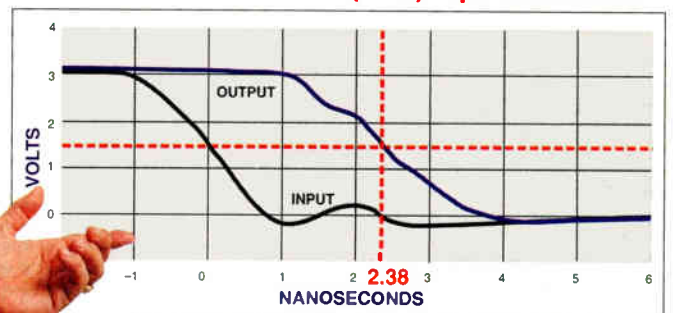
Twenty-five product types are available now with six more available by November, 1990. Included are buffers and latches designed for 5V to 3.3V logic-level translation without speed loss. Future superfast products, using center-pin power and ground with a 3.3V power supply, will include SCRAMs with 64 Kbit to 256 Kbit densities and PACEMIPs RISC processor products such as CPU, FPA and Wrap Functions.

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### P74PCT33373D 3.1ns (WC) Specification



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## SYNERNETICS SOLVES NETWORKING'S MORE-MIPS, LESS-BANDWIDTH PROBLEM

# ETHERNET MEETS FDDI

BY LAWRENCE CURRAN

**C**OMPUTER NETWORK managers have a growing problem: making sure the ever increasing mips power available isn't dissipated by shrinking network bandwidth as more machines are plugged into shared Ethernets. A startup company that's founded on Fiber Distributed Data Interface (FDDI) technology has come up with a family of products that solves that problem and then some.

Synernetics Inc., North Billerica, Mass., has a scheme that not only multiplies the Ethernet 10-Mbit/s bandwidth by running multiple Ethernets in parallel but also links them with FDDI to provide bandwidths measured in hundreds of megabits per second at each network node. A combination of a rack-mountable core system box, plug-in cards, and associated software supports as many as three 100-Mbit/s FDDI paths.

The company's Lan System 100—since renamed Lanplex 5000—differs from network-interconnect approaches by connecting the network's computer end stations to the network, says R. Bruce McClure, founder, chairman, and chief technical officer at Synernetics. In contrast, companies such as Cisco Systems Inc., Menlo Park, Calif., and Wellfleet Communications Inc., Bedford, Mass., offer products to connect one LAN to another, or to link LANs to wide-area networks or T1 lines.

Fundamental to the Synernetics scheme is the use of FDDI as a central technology to interconnect multivendor distributed computers. McClure founded the company in September 1988 to exploit that technology, and Synernetics began shipping its first product—the FDDI Station Management (SMT) software—last March [*Electronics*, March 1990, p. 19]. That software is an intelligent framework that unifies all attachments to an FDDI LAN, and it's included in the new system.

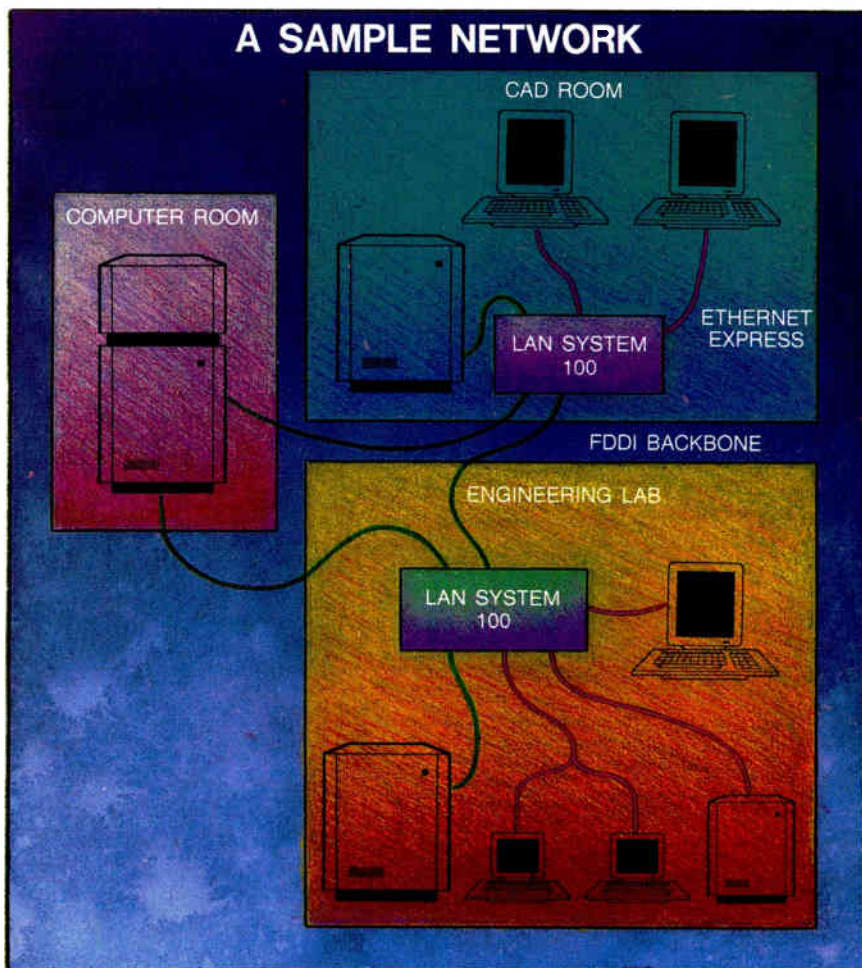
"Traditional Ethernet networks are beginning to limit the performance of workstations and servers," says McClure, because the 10-Mbit/s network bandwidth is reduced as more computers or other attachments are added to the network. But network users won't scrap their Ethernets and jump directly into fiber-optic communication, so Synernetics is linking the two media.

The core system hub provides a chassis, system power, a high-performance backplane, plus slots for as many as 12 cards—one system central processor and 11 option cards. The Motorola 68030-

based CPU card performs system management and diagnostics, but not data-packet processing. The chassis accommodates various combinations of FDDI system access and concentrator cards, and Ethernet Express cards, which can go in any slot.

An FDDI access card connects the Lanplex 5000 to an FDDI dual-ring or a higher-level concentrator; three internal FDDI backplane paths are available. Each FDDI concentrator card has four FDDI ports, and each port can connect to any of three FDDI backplane rings.

Each Ethernet Express card supports eight 10BaseT connections to an industry-standard IEEE 802.3 Ethernet version 2.0. This card uses a reduced-instruction-set-computing microprocessor—the Advanced Micro Devices 29000, which runs 20 million instructions/s—for packet processing, enabling it to forward data at 60,000



**LAN System 100, now Lanplex 5000, links Ethernets with FDDI, providing bandwidths in hundreds of megabits/s at each node.**

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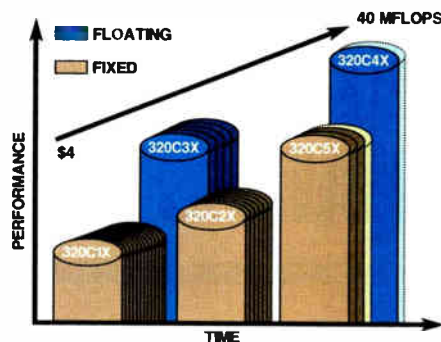
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packets/s and filter 590,000 packets/s. That's the rate required to accommodate one FDDI network and eight Ethernets. The system can handle as many as 256 end stations—workstations or personal computers.

Another segment of the Lanplex 5000 consists of LAN management and application software, which runs on Unix workstations or PCs on the network. This software unifies the management of multivendor LANs and interfaces to manager-agent software, which continuously monitors and controls LAN-wide characteristics.

The Synmetrics system can connect an Ethernet port to any end station, maintaining the full 10-Mbit/s bandwidth, in contrast to the traditional shared Ethernet approach, in which each attachment drains bandwidth because all nodes connect to one port.

"We cross-connect multiple individual Ethernets and multiply their performance by operating them in parallel," McClure says. "Then we distribute that performance with FDDI technology, with the Ethernet Express card translating packets compatibly between Ethernet and FDDI networks. If you connect

20 ports with our system, you get 200 Mbits/s of bandwidth," McClure notes, adding that the cost would work out to about \$1,500 per port. "Users can access all the end stations on a network, with unrestricted Ethernet bandwidth. A system with 11 option cards could provide 88 Ethernets or 880 Mbits/s of bandwidth," he says.

For his part, Steve Coit, a general partner with Merrill Pickard Anderson &

Eyre in Waltham, Mass., believes Synmetrics is well positioned to grow as FDDI grows. The firm has attracted what Coit regards as a Who's Who list of venture capital. Coit says Synmetrics recognizes that "FDDI is a means to an end—speed—and not an end in itself. The company premise is that users want faster and better-managed networks; network management is an important element." ■

## LITHOGRAPHY

# NEW SIEMENS SOFTWARE PROMISES BETTER E-BEAM LITHOGRAPHY, DENSER ICs SHARPER EDGES

BY JOHN GOSCH

**C**LEVER SOFTWARE RATHER than ingenious hardware design is becoming the key to advances in electronics, and that goes for instru-

mentation, quality control, or manufacturing. But it can also push circuit process technologies such as electron-beam lithography. It's this technology's performance that Germany's Siemens AG has advanced far beyond current

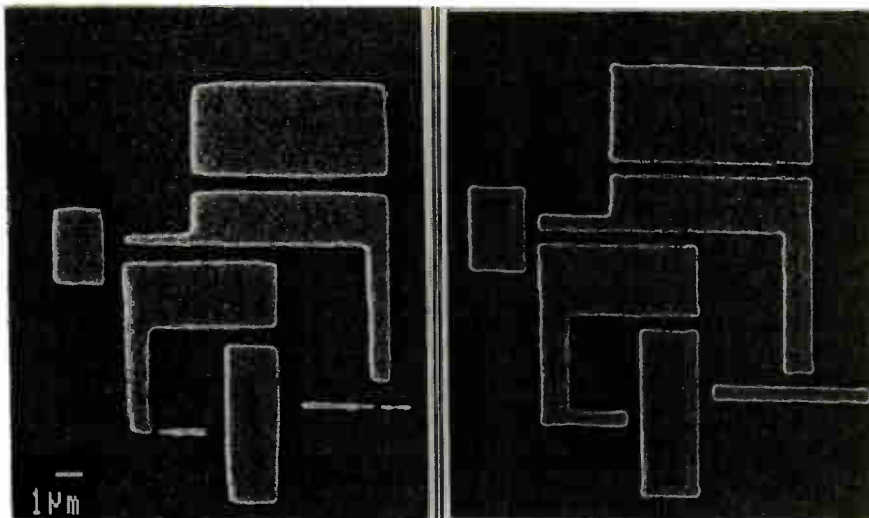
limits through intelligent software.

The push comes from a computer program jointly developed by the Munich company's Corporate Research Laboratories and the software house Sigma-C GmbH, also of Munich. Called Caprox, the program corrects the blurs and unsharp edges that occur in line structures as a result of electron scattering when an e-beam is used to produce submicron features.

Significantly, the correction takes little computing power, says Erwin Knappek, head of the e-beam lithography applications lab. So instead of a large number-crunching machine, a workstation of the sort found at most development labs can be used to run the program.

Caprox will have a big impact on submicron device design, Knappek predicts. With the new program, the design grid—that is, the distance between lines—can be narrowed fivefold, from typically 0.5 to 0.1  $\mu\text{m}$ . That translates into higher circuit density.

In many applications, e-beam lithography is the technology of choice because of the high overlay accuracy and the high theoretical resolution it offers:



**The Caprox software corrects the blurs that electron scattering makes in line structures (left), producing sharp edges instead.**

0.5  $\mu\text{m}$  for variable-shape beam systems and better than 30 nm for Gauss-beam machines. That makes the technology an ideal tool for producing masks and reticles for VLSI circuits with submicron structures. Also, because of its high flexibility, e-beam lithography is an excellent technique for writing patterns directly on the wafer. This

comes in handy in developing new types of semiconductor devices.

In practice, the high theoretical resolution is limited by the proximity effect, which is caused by electron scattering in the resist and substrate. This effect can make closely spaced e-beam-exposed regions diffuse into each other much as inkblots do on paper. The

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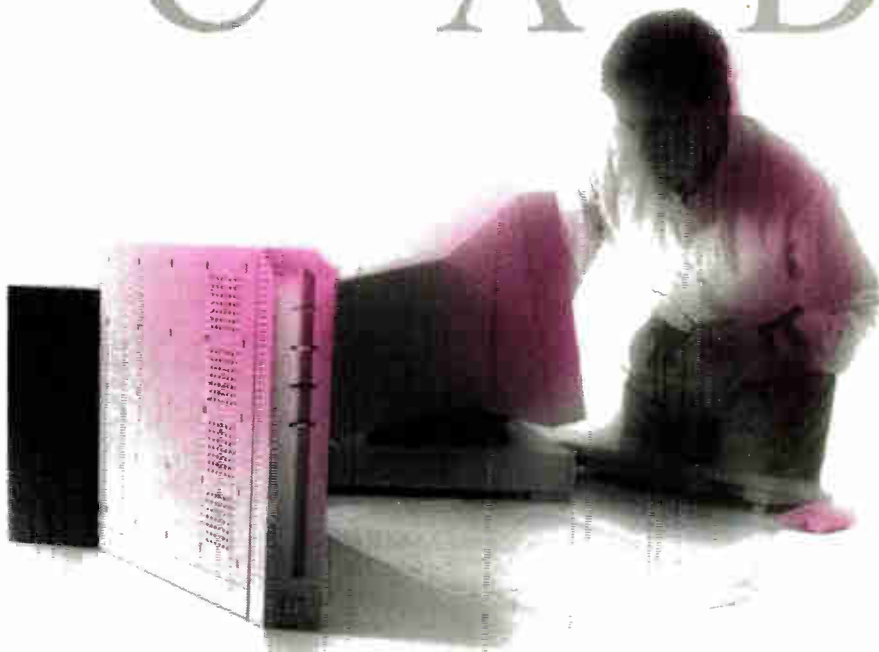
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CIRCLE 191

results are blurred edges and merged regions of the pattern. That, in turn, can lead to parameter changes, shorts, and even circuit failure.

To be sure, with mathematical methods derived from game theory, electron scattering can be predicted and its effects minimized by altering device geometries—for example, by spacing lines farther apart—or changing the e-beam's intensity. The prediction methods, howev-

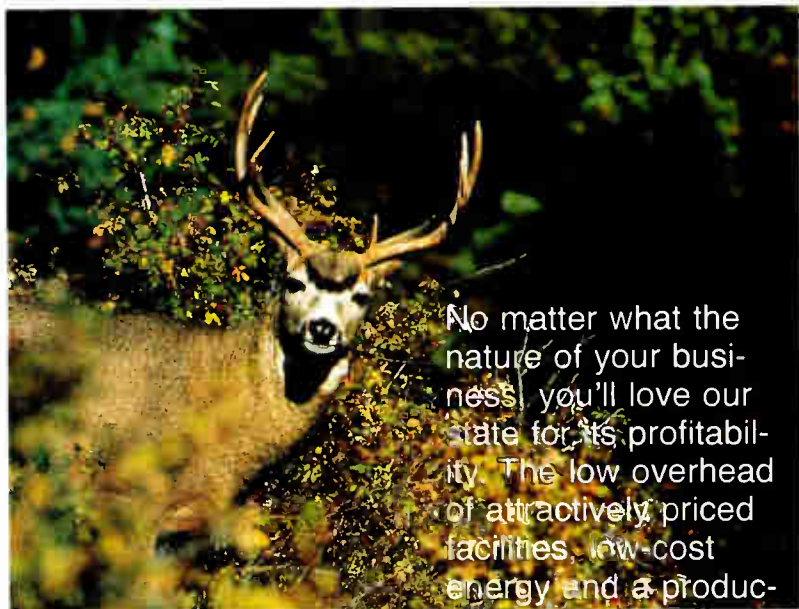
er, call for enormous computing power, and the number-crunching process involved can take days, if not weeks, for a complex VLSI device. For that reason, circuit makers generally shy away from such prediction methods.

This is where Caprox, the computer-aided proximation technique, comes in. The circuit designer examines the layout on a monitor and designates the regions most prone to proximity effects

and needing correction. The e-beam system is then programmed so that the beam, through electron dose variations, produces well-defined lines with sharp, unblurred edges. Structural fidelity is thereby maintained.

With Caprox it takes only four hours to correct a VLSI circuit of state-of-the-art complexity, says Christian Kalus, managing director of codeveloper Sigma-C. This big savings in time, compared with the number-crunching scheme, results from the fact that only a circuit's critical parts are treated. Such parts generally account for no more

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than 3% to 5% of the whole device.

For each type of structure, the corrections must be calculated only once, Kalus says. They are then stored in a library and can be called up for another circuit with the same structure without having to be recalculated.

The Caprox program has been readied to the point where Siemens is using it in developing circuits that call for direct-write e-beam techniques. It will be used in production in about three years.

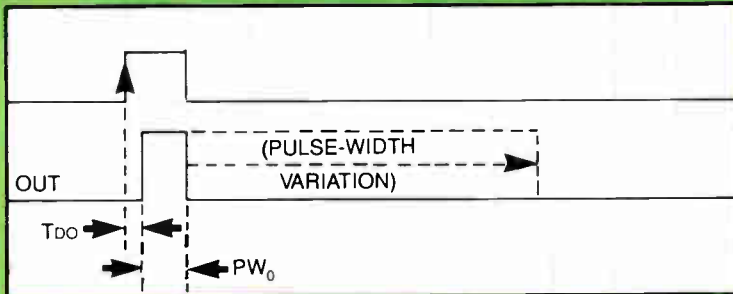
Caprox can be run on almost any workstation, such as those from Digital Equipment, Hewlett-Packard, and Sun Microsystems. It can be ported to different computer operating systems and e-beam machines with write strategies as implemented by variable-shape and Gauss-beam systems.

Meanwhile, the development teams are working on a Caprox version that determines the correction without human interaction but by image-processing techniques. Such a Caprox version, however, will call for considerably more computing power than the simpler one with user participation, Kalus says. **E**

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CIRCLE 202

MANUFACTURING

## NARROWING OPTIONS

# BAN NEAR ON CFCs

BY JACK SHANDLE

**T**HE TIME WHEN THEY will no longer be permitted to use chlorofluorocarbons to clean flux residues is drawing near, so the printed-circuit-board community is getting a bit edgy as it awaits results of research on alternative processes. Now, work is starting to bear fruit. Results reported at the International Conference on Flux Technology last month offered no definitive solution, but they did thin the number of realistic options.

The timetable for phasing out CFCs was set down by the Montreal Protocol in 1987 and modified recently. Using 1986 consumption as a base, the goal is a 20% reduction by 1993, 50% by 1995, 85% by 1997, and 100% by 2000.

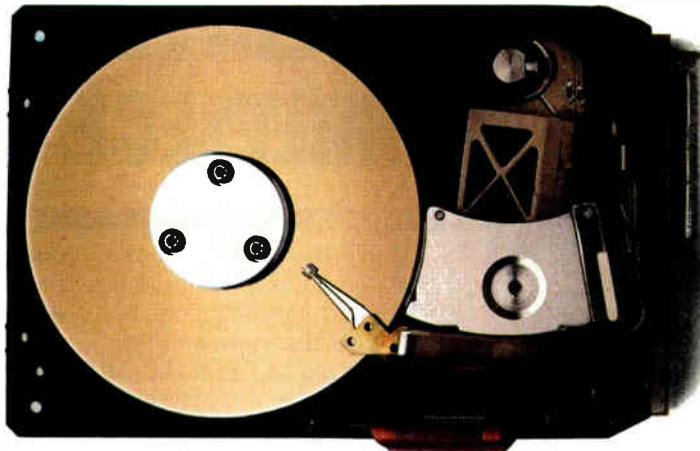
That's why attention was focused on the Carnegie Mellon Research Institute in Pittsburgh, the scene of the conference. Among the high-profile alternatives offered was Digital Equipment Corp.'s microdrop aqueous cleaning process. The process delivers good cleaning for devices of pins with 25-mil pitch, according to DEC, and might be extended to even finer-pitch devices.

Progress was also reported on other alternatives. Zytec Inc., a power supply manufacturer in Redwood Falls, Minn., reported that low-solid fluxes could meet military temperature/humidity standards. This is important because although corporations are moving away from CFCs, the Defense Department has not yet embraced alternatives. "People are anxious for the military to bless some of the new alternatives that are coming along," says Laura Turbini, associate director of the Manufacturing Research Center at Georgia Institute of Technology in Atlanta.

The problem for both the military and industrial communities is complicated by the fact that there is no single right alternative. "The board, substrate, and cleaning are all a package," says Turbini. "There are eight to ten differ-

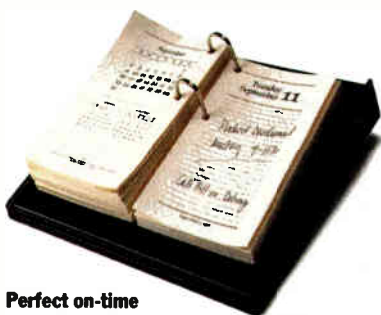


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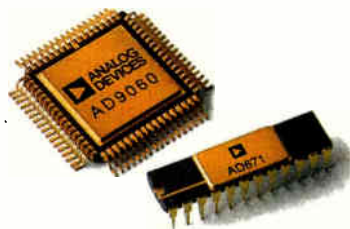


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ent roads you can go down."

Alternatives to CFCs fall into at least three categories: water-soluble fluxes, semiaqueous cleaning with detergents, and low-solid, no-clean fluxes, in which the residues are supposedly noncorrosive and can be tested successfully on a bed-of-nails tester. The use of rosin fluxes has, in the past, meant cleaning by CFCs, but effluents from the process are suspected of con-

tributing to the depletion of the earth's ozone layer. It is still not clear that substitute solutions will effectively clean the corrosive residues, especially on surface-mount boards.

However, as a practical matter, CFCs could be reduced much more quickly. The cost of CFCs has "doubled, tripled, and quadrupled in recent years, so the financial deadline may be the overriding one," says Turbini. **E**

CONSUMER ELECTRONICS

NO SETTING NEEDED

# A PERFECT TIMEPIECE

BY JOHN GOSCH

**I**S THE WORLD READY FOR a wristwatch that never needs to be set and always shows the correct time? One that runs with split-second accuracy and automatically adjusts itself to standard or daylight savings time? Sounds like a science-fiction object or a gimmick from an experimenter's workshop. Actually, this timepiece is a down-to-earth product now hitting European markets.

The secret is radio control. A small antenna in the band of the watch, made by Germany's Junghans GmbH and called Mega 1, picks up time signals originating at the German National Standards Laboratory in Brunswick. There, the time pulses are derived from nature's most precise clock: a cesium time base accurate to within 1  $\mu$ s.

The time signals are distributed by a Post Office-run station in Mainflingen, near Frankfurt, operating at 77.5 KHz. Modulated onto this frequency, the time signals are broadcast over an area with a radius of 1,500 km, about 930 miles, covering most of Europe. The transmitter sends time signals to clocks at railroad stations, bus and subway stops (as along the Metro underground rail system in Paris), telephone time-information services, radio and TV stations, and traffic-control equipment.

Junghans, a \$110 million clock and watch maker in Schramberg, in Germany's Black Forest region, has been using these time signals for controlling consumer-type wall, table, and alarm clocks. It is now putting them to work in its Mega 1, the world's first radio-controlled wristwatch.

The accuracy of the time pulses from the standards lab mean that theoretically the watch does not deviate by more than 1 s in 1 million years. The Mega 1, which comes in five models, retails for \$230 to \$320 depending on model.

It is from innovations like the Mega 1 that the Black Forest company,

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CIRCLE 221

'I'M WALKING!'

# FES OFFERS NEW HOPE

BY AMY ROSEWATER

**O**N NOV. 10, 1988, EDDIE Keating, now 23, was shot in the head in a U. S. Marine Corps training camp accident. "They told my mom I'd never walk again," he says, "and I said, 'No way.'" He was right.

Keating is one of 10 patients at the Cleveland Veterans Administration Medical Center using an experimental electronic system called FES, for functional electrical stimulation. FES's sensors and electrodes stimulate muscle movement and function for patients with damaged central nervous systems—mostly paraplegics and stroke victims. "The technology is amazing. I'm walking," says Keating.

Now the physicians working with FES are preparing to move to the next step. This month the first fully implanted system to help stimulate muscles of the lower extremities will be placed in a paraplegic's body, much in the manner of a cardiac pacemaker. Until now, the equipment used by Keating and the others in the program has been mounted on a belt arrangement.

Further down the road, says E. B. Marsolais, the physician who heads the 25-person Cleveland team, the group plans implantations in three or four more patients. Marsolais also wants to implant devices in stroke victims right after they are stricken to lessen paralysis.

FES marries electronics and biomedicine. The implanted version, which operates via radio-frequency signals, is run by a portable external device combining a transmitter, controller, and signal processor. The nonimplanted models consist of a computer controller that radios commands to electrodes and sensors on the patient's body. The patient sends "muscle messages" to the computer by clicking a two-button switch on his or her finger that selects the function from those on an LCD: for example, walk, stand, climb stairs. Pressing another switch ends the action. **E**

which has 1,000 employees, thinks a push will come to its watch business. That's a business that has seen Far Eastern manufacturers make broad inroads into what was once the territory of German and Swiss companies.

The heart of the Mega 1 is a miniature printed-circuit board measuring 26 by 28 mm that contains the display, a receiver IC, and a controller IC. A 3-V lithium battery covers the pc board in sandwich fashion.

The elastic antenna—its sensitivity is 50  $\mu$ V/meter—is integrated into the leather band. It picks up the 77.5-KHz carrier and feeds it to the receiver IC. The latter extracts the time signals, decodes them, and puts the information as BCD (binary-coded decimal) into the register of the controller IC.

Basically a 4-bit microprocessor clocked at 32.768 KHz, the controller handles all watch management functions: it turns on the receiver IC for the watch-synchronization process, controls the decoding of the time signals, compares the indicated with the fed-in time, and ensures that the watch runs synchronously with the time signals it

receives from the transmitter.

To minimize current consumption, the Mega 1 is normally synchronized with the time signals just twice a day. And it is only during the synchronization process that the receiver IC is switched on. At all other times, the Mega 1 runs as a precise quartz watch. Its current consumption is typically 5.5  $\mu$ A, low enough for the battery to last more than two years.

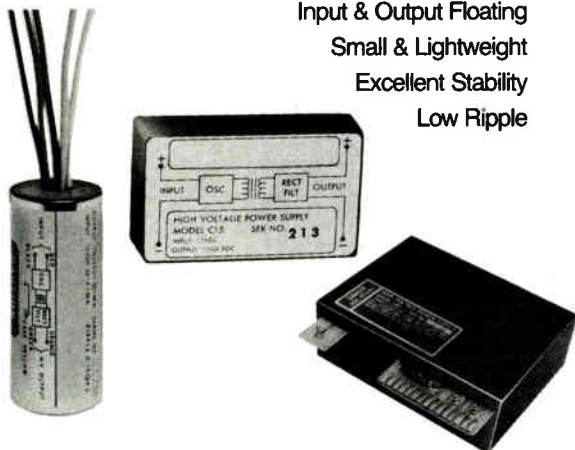
The 13-digit liquid-crystal display simultaneously shows nine time and function indications: seconds, minutes, hours, day of week, day of month, month, low-battery warning, receiver on, and receiver control.

The Mega 1 features a station-call button to check the time-signal receiving function. When the button is depressed momentarily, it erases the displayed time indications. All digits then begin to change and within a short time they come to rest at the exact time in accordance with the time signals. Two other buttons are for time zone settings in one-hour steps. One button advances the time and the other sets it back. **E**

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CIRCLE 221

World Radio History

# What happens when the market



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## OBSERVER

## SWITCH MAKERS SCORE IN THE EAST

**E**ast Europe and parts of Asia are the new battleground for Western producers of digital exchange systems. The prime contenders so far are Germany's Siemens AG with its EWSD switch and France's Alcatel NV with its E10 equipment, as well as the System 12 from Standard Elektrik Lorenz AG in Germany, a subsidiary of Alcatel.

For its part, Siemens has just delivered a digital exchange to the Soviet Union that will go on line this fall. A second one will follow shortly. And last June, Siemens and the USSR government agreed on a joint venture for making EWSD switches in Kiev, capital of the Ukraine.

Elsewhere in the East, the German company and the Polish firm Telecom Zwut in Warsaw will eventually produce EWSD systems for a million subscribers a year. And in Hungary, a joint venture deal envisions marketing that system with a chance of building it later. Much the same is a possibility in Bulgaria and Czechoslovakia.

Farther East, Siemens has supplied a small EWSD system, one for 3,000 subscriber lines, to China. What's more, China has ordered equipment for some 450,000 lines in EWSD technology, which will make Siemens the fourth largest supplier of public switches to that country. At present, the German firm is setting up a joint venture in Beijing with an annual capacity of 300,000 lines. And in Vietnam, the company has bagged an order for a system in Ho Chi Minh City, formerly Saigon.

As for Alcatel, working

with a Yugoslav company, it is setting up a plant for E10 switches there. And via its subsidiary in Spain, it is delivering systems and technology to Poland to convert elec-

tromechanical switches to digital types.

SEL's System 12 will also be delivered to Poland. In Hungary, SEL and a native company are readying a fac-

tory to build the System 12; by 1992 it will have a capacity for 300,000 subscriber lines a year.

Amid all this activity, the question is, "Where are the Americans?" A Siemens spokesman, noting the East is open to all switch makers, says one problem may be that U.S. manufacturers do not realize that they must not only sell equipment but also help establish manufacturing sites in Eastern countries and transfer technology. **E**

### Making Hay in Eastern Europe

Supplier	Switch	Customer/Partner
Alcatel	E10	Yugoslavia, Poland
Standard Elektrik Lorenz	System 12	Poland, Hungary
Siemens	EWSD	USSR, Poland, China, Vietnam

### DEVALUED DOLLAR? NO PROBLEM FOR COMPANIES IN GERMANY

**G**ermany's electronics industry has weathered the crisis over the diminishing value of the U.S. dollar without much harm so far. In theory, a lower dollar—during the past three months its value dropped about 10% to a 42-year low of 1.55 deutsche marks to the dollar—should make German goods more expensive in the U.S. and other dollar areas such as Canada and South

America, and products made in such areas less expensive in Germany.

But that has not been the case. The reason, according to the Frankfurt-based Electrical and Electronics Industry Association, is that only about one tenth of German electronics exports go to those countries where trade is based on the U.S. dollar. On the other hand, almost 80% of the German exports

are destined for West European countries, and sales in those places are invoiced in deutsche marks.

The figures for Siemens AG, Germany's biggest electronics producer, are about the same. "So far, our exports have not significantly suffered," says a company spokesman. "Only about 10% of foreign sales are invoiced on a dollar basis." What's more, the products sold in dollar regions are primarily capital goods whose sales are normally negotiated on a long-term basis and are thus immune to the vagaries of short-term fluctuations in dollar value.

As for imports from dollar countries, the products in question are mainly capital goods, such as computers, communications equipment, and test equipment. These deals are made well in advance and are contracted over a longer term.

The result of this emphasis on big-ticket items in trade is that competition on home markets has not become any stiffer as a result of the lower dollar. **E**

### PHILIPS DEVELOPS CHIP FOR NEURAL NETWORKS

**T**he French arm of the Philips Research labs, Laboratoires d'Electronique Philips, has come up with a very large-scale IC that implements the hardware for neural network techniques. It could be the heart of neural networks for pattern or automatic face recognition, signature identification, document analysis, recognition of medical images, and voice-activated dialing.

The main feature of the so-called L-neuro, for learning neuro chip, is its on-chip

learning capability. All learning rules can be realized by programming the general learning unit.

The L-neuro's capabilities have recently been demonstrated on image compression, where it implements a neural algorithm for principal component analysis. This permits the relevant features in an image to be determined, thus enabling image compression. The algorithm requires the learning of those features, which the L-neuro chip achieves in real time. **E**





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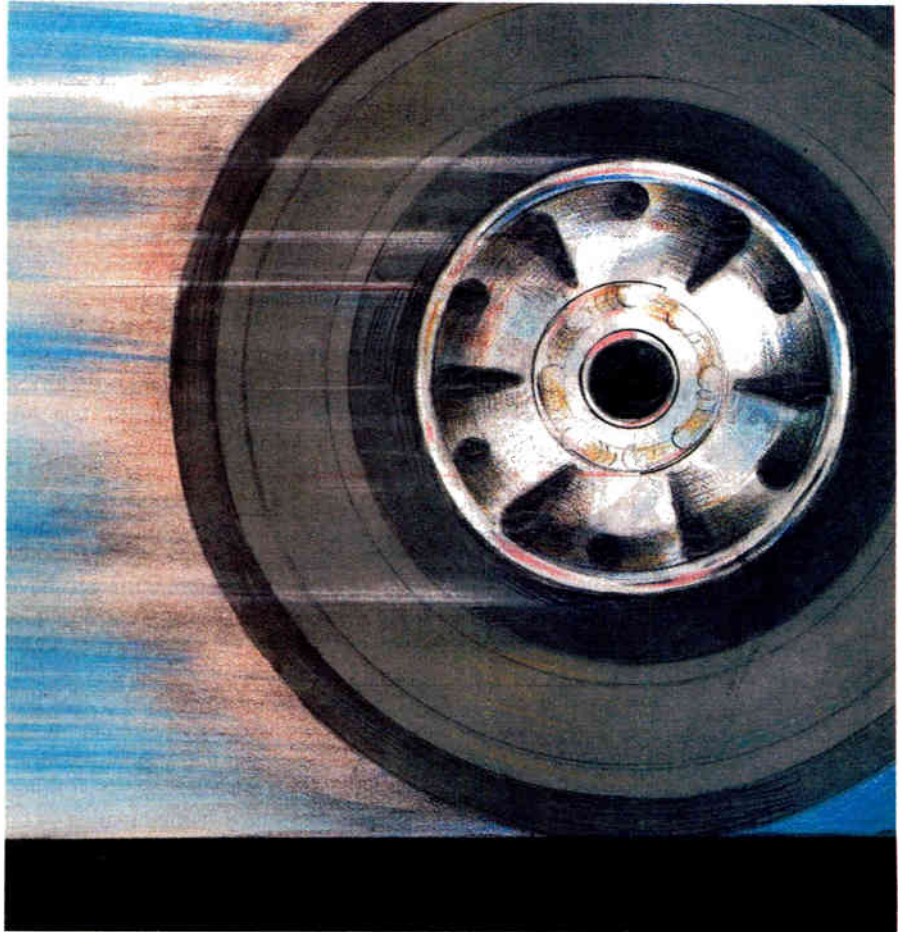
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**HIT THE GROUND RUNNING**

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**HDTV**

## AS EUROPE'S EUREKA PROJECT ENTERS PHASE 2, HDTV WORK MOVES OUT OF THE LABS

# GATHERING STEAM

BY PETER FLETCHER

**I**N MID-JULY, VISITORS TO Strasbourg, France, were treated to a special viewing of highlights of the World Cup soccer games and live broadcasts of the European Parliament then in session. What was so special about this viewing? The programs were broadcast in high-definition TV.

The Strasbourg festivities marked the inauguration of a new European consortium, Vision 1250, a kind of club for European broadcasting interests. Its founding membership roll includes 14 companies—manufacturers, program producers, and broadcasters—each chipping in \$66,500 a year to pay for the maintenance of the equipment they intend to pool. At its disposal the group will have at least 70 HDTV cameras, five to 10 fully equipped outside broadcast units, and at least one ultra-large-screen projector that—its maker says—can throw a 100-ft-wide high-definition picture over a distance of 500 ft.

The group's formation is just another step along the road the Europeans are taking toward HDTV. Events have been

moving fast, most significantly in the expanding Eureka HDTV project. In the last year, Eureka, which has become a vast pan-European program, has entered the second phase of a 10-year plan. Now work on all elements of HDTV technology has left the laboratories, and earnest progress is being made toward "precommercial" reproduction.

With a commitment of around \$600 million in total, this second phase, Eureka 95, was formally launched on July 1. Its objectives are specific: by 1992, the major participants aim to have manufactured at least 1,000 wide-screen TV receivers designed to show pictures with full 1,250-line vertical definition and with 1,440 pixels per line horizontally. Further, they will reproduce high-quality digital stereo sound—and probably allow simultaneous multilingual commentaries to be broadcast live from the 1992 Olympic Games in Barcelona, Spain.

At the same time, the essential equipment the broadcasters need to produce their programs—cameras, videotape machines, studio editing and control equipment, and the outside

broadcast vehicles to house them—will also be ready, Eureka vows.

By the time Eureka 95 has run its full course, in 1995, it is intended that its major participants—Thomson of France, Philips of the Netherlands, Robert Bosch of Germany, and Nokia of Finland—will be in full commercial production with a range of high-definition consumer electronic equipment. This will include TV receivers, domestic videotape recorders, and video-disk systems—and even domestic high-definition video cameras.

That is the upside of the plan. The problem is likely to be finding paying customers. Most observers agree that the customers will come—some even go so far as to forecast that 700 million European consumers and the people who make and distribute TV programs to them will ultimately be prepared to spend more than \$100 billion a year on HDTV equipment. The question they can't quite find an answer for is "When?"

"If anybody says he knows what the HDTV market is doing at the moment, well... just don't believe them," says John Bird, director of information services at electronics industry analyst BIS Mackintosh Ltd., in Luton, UK. "There is no doubt that in the longer term it should become big business, and that by the end of a decade there will be a sizable percentage of European homes with a high-definition receiver. The unanswerable question, though, is what year shall we start the decade."

Bird says that most forecasters—him-

*(Continued on p. 49)*



**Europe is already enjoying the benefits of the HDTV transmission standard, MAC, on regular TVs. MAC eliminates the interference patterns (left, in trousers and head scarf) of standard PAL broadcasts.**

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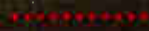
# Executives

ON THE GO



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FOR INFORMATION, CIRCLE NO. 13



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World Radio History

## TAJ WOOS EXECS...



High-roller executives are being tugged east and west by the newest and most extravagant upscale casino resorts in Atlantic City and Las Vegas. Donald Trump labels his \$1 billion Taj Mahal, the 17-acre casino and hotel complex that opened on Atlantic City's Boardwalk in April, "the eighth wonder of the world." Among its credentials: a 120,000-sq-ft casino that's the biggest in the world; 1,250 rooms and suites; \$14 million worth of Austrian crystal chandeliers, including two dozen in the casino valued at \$250,000 apiece; a dozen restaurants; and 175,000 sq ft of convention and exhibit space. On the top 12 floors of the 51-story tower are 237 luxury suites and the exclusive Maharajah Club. The 51st floor features seven luxury two-bedroom penthouse suites, topped by the 4,500-sq-ft Alexander the Great, which has its own butler as well as steam room, sauna, and weight room. Cost is \$10,000 a night but no one ever pays; the lavish suites are given to big spenders and special guests. Regular room rates now are \$140 and \$150. FOR INFORMATION, CIRCLE NO. 15

## ...SO DOES MIRAGE

In Las Vegas, the \$630 million Mirage is "a special place," says owner Steve Wynn. "It's a resort hotel which includes a casino—not a casino which includes a hotel." The Mirage, which opened last

November on a 100-acre site north of Caesars Palace, has 3,049 rooms in three 30-story towers. There's no "cheap neon," which Wynn says typified "yesterday's Las Vegas." Rather, the Mirage appears as a tropical paradise in the desert. Its entrance is marked by a lagoon with a five-story waterfall and a volcano which erupts every few minutes. The casino measures 60,000 sq ft but the gaming areas are grouped under separate Polynesian-style roofs to give the feeling of intimacy. Attractions include a 53-ft, shark-filled aquarium; the royal white tigers of illusionists Siegfried and Roy; five restaurants; and over 60,000 sq ft of convention space. Rooms are \$89-\$159, suites \$325-\$750, and six lanai bungalows \$750-\$1,250. In June Circus Circus Enterprises opened the largest hotel in the world—the \$290 million Excalibur, containing 4,032 rooms. With rooms \$45-\$110, it aims at a more middle-class market. The Mirage competes directly with the spectacular Caesars Palace and Wynn's Golden Nugget, both completely renovated.

*Atlantis submarines have sufficient life support systems to stay submerged up to 72 hrs.*



## DIVING IN STYLE

Even if you're not a scuba diver or snorkeler, you can discover the brilliantly colored fish, exotic marine life, coral formations, and other natural wonders of life beneath the sea—while enjoying the air conditioned comfort and safety of a tourist submarine. Atlantis Submarines International operates the largest fleet—six submarines in Grand Cayman Islands, Barbados, St.

Thomas/U.S. Virgin Islands, Guam, and Hawaii (Kona Coast of Hawaii and Waikiki Beach in Honolulu). It will launch its seventh sub in Aruba in November. The 65-ft-long, \$3 million subs, which dive to a maximum 150 ft, seat as many as 46 passengers and three crew members. They have 26 2-ft portholes and a 52-ft front viewport. The hour-long voyages cost \$58-\$85 a person (604/875-1367).

## A TOUCH OF CLASS

*Checking in at the Mirage includes checking out a 20,000-gallon aquarium.*

To appeal to executives required to travel at coach rates, MGM Grand Air—the luxury airline flying between New York and Los Angeles—has added a "Grand Class Coach" to its premium "Grand Class First" service. The line now flies three DC-8 Super 62 planes, reconfigured for 79 seats, 40 of them coach. For \$623 one way (same as full-price coach on other airlines), the "Grand Class Coach" traveler receives the equivalent of typical first-class service, or better: oversized seats with a phone and TV for every pair, free movie screenings, gourmet entrees served on china, and complimentary cocktails. "Grand Class First" passengers pay \$1,067 one way (same as full first class on other airlines) and receive even more: individual reclining and swiveling "sleeper" seats, dining table seating for 20 passengers, a stand-up bar near several large TV's, a fax machine, and the privacy of two staterooms that can convert to twin or queen-sized beds. MGM Grand Air (800-933-2MGM) flies twice daily to and from New York's Kennedy Airport and Los Angeles.



# MINUTE MAN

► At 6 o'clock nearly every morning, Harvey Mackay hits the floor running. In a few minutes he's off on his seven-miler. "With all the traveling I do, if I didn't run I'd be a basket case," says the man whose dizzy day of activities usually doesn't wind up until one the next morning. Even then he's reluctant to go to bed. Why? "I might miss something."

A "time freak" who opens his company sales meetings by holding up a watch and calling time "our *only* competition," who deliberately keeps his watch 11 minutes fast, who schedules appointments and meetings at times such as 3:10 rather than three o'clock ("that way people remember"), who over a two-year period scientifically reduced his nightly sleep from eight to seven to six and finally to five hours, Harvey Mackay is an executive on the run.

He's also an executive on a mission: to show that success—at play as well as work—can be assured, even come easily, if you simply "do your homework" and are "prepared to win." This means leaving little to chance. "If you're really organized, you don't have to hurry. You can beat 80% of the competition just by showing up. Show up on time with a plan, a commitment to carry it out, and then execute it—and you'll beat the competition 100% of the time," says this super-salesman, whose energy and fitness hide his age ("57 and holding"). To him, "superior information" is the ultimate "weapon."

With this approach, he has built Mackay Envelope Corp. of Minneapolis into a \$35 million business, and himself into a smash hit in bookstores and lecture halls across America. His new book—*Beware the Naked Man Who Offers You His Shirt*, subtitled *Do What You Love, Love What You Do, and*

JUDY KAMISSEN

By Jim Braham



**EXECUTIVES ON THE GO** periodically will profile dynamic executives who can make an impact and a difference in our lives. Harvey Mackay, who leads off this series, is such a leader.



PAUL TEPELBY

Whether he's in a hotel or car, Harvey Mackay carries along his cellular phone. It's one of about 35 "time savers" that go into his briefcase for every trip.

WITH "FANATICAL" ATTENTION TO DETAIL AND AN  
BUSINESSMAN/AUTHOR HARVEY MACKAY SHOWS EXECUTIVES HOW TO SUCCEED  
— AT PLAY AS WELL AS WORK.



PAUL TEPELBY

COVER PHOTOGRAPHY: ANDREW HOLBROOK/BLACK STAR

*Deliver More Than You Promise*—is another easy-to-read primer of short, simple business “lessons” topped by clever, snappy titles. Like *Swim with the Sharks without Being Eaten Alive*, it’s a best seller.

His publishing success has propelled his lecture popularity to the point where he commands \$20,000 for a typical one-hour presentation, and he gives 40 to 50 a year. He’s also a sports-oriented Minneapolis civic leader, donating a quarter of his time to volunteer work. As an avocation, he has counselled more than 500 college students.

The man, obviously, is organized. He seems to prepare for *everything*: “I have a fanatical attention to detail, but it’s not that difficult. All success is, really, is having a predetermined plan and carrying it out successfully over a long period of time—reaching your potential!” The result becomes, to quote one of his pet phrases, “a piece of cake.”

Thus, want to be creative? Start reading books on creativity. Hang around with creative people. “All of a sudden, it’s a funny thing, you start to become creative.”

Want to become a better tennis player—advance from class B to A? With the Mackay way there’s usually a list of things to do. In this case, one, find a really good “mentor” or teacher. Two, take “copious” notes, and refer to them often (Mackay still has his golf notes from playing for the University of Minnesota in the 1952 NCAA championships). Three, tape the lessons so you can hear them while driving. Four, videotape yourself playing tennis for “visualization.” Five, attend tennis tournaments. Six, watch tennis on TV. Seven, ask your instructor for “the five best books on tennis—not just the technical but the mental aspect, too.” Eight, hang around with tennis players, and play with better players. Nine, compete in tournaments. Result: Harvey Mackay, who took up tennis in his mid-30s, is now No. 1 ranked in his age group in Minnesota.

Want to run a 26-mile marathon—even though you’re 55 years old and the most you’ve ever run is three miles? Again, simple. Follow practically the same steps as for tennis, plus “change your eating and sleeping patterns,” and in time the event itself becomes “incidental!” Even before the 1988 New York Marathon began, he already had “won” How? “By trying my guts out for 100 days. Perfect practice makes



PAUL TERPLEY



perfect,” says Mackay, preparing now to run his second New York Marathon Nov. 4.

In promoting his books, Harvey Mackay followed his own advice. Before selecting a publisher he researched the industry, visiting bookstores across the country. He even hired his own publicist and attended the Frankfurt, Germany, book fair to personally solicit foreign buyers.

“It’s all research, doing your homework, preparing to win,” he stresses, citing his early September trip to the Soviet Union as an example. Finvest, the Soviet chamber of commerce, invited him to speak on national Soviet TV about free enterprise and the American way of doing business. His audience: “the whole damn Soviet Union!” he exclaims. “I will have an opening seven-minute talk—so what do you think I’m going to do? I’m going to deliver the speech in *Russian!*” Last month he hired his own “Russian instructor. It is one of a half-dozen languages he has studied.

In his appreciation of time, travel (“the best education you can give a child”), contacts, research, and curiosity (“I have an insatiable curiosity to know about human beings”), Harvey Mackay has adopted habits he learned from his “mentor”—his father Jack, who was a veteran Associated Press reporter and bureau chief in the Twin Cities. “My whole life is one-on-one networking,” Harvey says. “When I was about 18, my dad taught me that every person you meet for the rest of your life, assuming you want to keep in touch with him or her, goes into a card file. You do that for about 40 years and you’ve got a pretty good network.”

Rolodex is the “key,” says the man who in 40 years has accumulated some 6,500 cards or names, in several files. “It’s simple,” he says. “Every time you go to a conference or a party or you sit on an airplane, you meet somebody and ask him for a card, and you jot down maybe one or two salient points.” His cards include such personal data that, when a man phoned recently from Bombay, for example, Mackay was able to quickly flip through his Rolodex and ask: “How’s your daughter Carol?” Says Mackay, “This shows I care about them. People don’t care how much you know about them once they realize how much you *care* about them?”

Approximately 20% of his 6,500 cards, alphabetically arranged, represent people with whom he maintains regular contact.

**P** EOPLE  
DON'T CARE  
HOW  
MUCH YOU KNOW  
ABOUT THEM  
ONCE THEY  
REALIZE HOW  
MUCH YOU  
CARE  
ABOUT THEM.

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World Radio History

The others are sorted by cities, states, and countries. When he travels, Mackay simply looks up his cards for that area and jots down the names and phone numbers of people he intends to call. So lavish has been his praise for Rolodex—"the most important word in the English language"—that he has written a book on how to best use it. *The Harvey Mackay Rolodex Network Builder* will be available in late September.

Of course, much of Mackay's information comes from reading 35-40 hours a week—mostly business and current events—in all the major business journals, news magazines, and local and national newspapers. He also gleams much from the Cable News (TV) Network.

Instructional or inspirational cassette tapes provide further information. Mackay has more than 300 tapes to listen to while traveling. "Most people drive 12,000 miles a year. If you live to be 72, that's 3½ years in a car," he reasons. "Why not turn your car into a university?"

Much of this year Mackay has been crisscrossing America on a combined book and lecture tour, and even the interviews to him present opportunity: "You *learn* from a Larry King or an Oprah Winfrey. You get a chance to study at their feet. Any new experience is another opportunity." The tour also permits him to visit his son in Los Angeles or daughters in New York and Detroit.

Despite all its problems, Mackay seems to thrive on travel. In fact, he and Carol Ann, his wife of 29 years, have a goal to see every country in the world; they have visited about 60 of the approximately 170. "Flying is like jogging. At 30,000 feet it's all in the attitude," says the upbeat Mackay. "It can be so fabulous with the nice views, the peace and quiet, and the fascinating people you meet. Of course, 40 below zero can be exciting—if you *want* it to be exciting."

The detail-minded Mackay offers some tips to make traveling more pleasant. For example, he always sits "on the side of the plane where I can see the sunset and sunrise. It's a little thing but it really makes traveling nice."

When the airline doesn't have the seat he'd prefer, he asks whether any "non-revs" (non-revenue passengers, usually airline personnel) are aboard, and requests one



PAUL TEPLER



of those seats if desirable. "The airline will ask the 'non-revs' to move—but you have to know to ask this!"

At hotels, Mackay also makes sure he enjoys the finest view. "It costs virtually the same, you just have to ask," says Mackay, who insists on being on an upper floor, with a view of water, skyline, mountains, or the like. He even knows what room numbers to request. He also prefers hotels near a park, track, or golf course on which he can run.


No matter where he goes, he carries his "prioritized" reading material, for business and pleasure. In larger cities, he arranges to be picked up by a town car at the airport. Why? "To take advantage of night reading. Cabs don't have a reading light in the back!"

His briefcase always contains his 35 or so "time savers," including a cellular phone with extra batteries, a tiny dictating machine, a list of 250 phone numbers of people he calls regularly, postage stamps, Swiss Army knife, Post-it notes, 25 new dollar bills, and change. He carries his list of favorite restaurants for that city.

Just as meticulous about his health, Mackay neither smokes nor drinks coffee, and rarely drinks alcohol. What he does drink is an astounding amount of water—as many as 20 glasses a day. He didn't need to be convinced by his marathon "running coach" to consume 16-20 glasses daily to prevent dehydration. He already knew the wonders of water, that it cools the body, improves circulation and digestion, and fuels the muscles. "Whether you're a runner or not, water is fabulous. It gives you unbelievable energy!" Mackay exclaims.

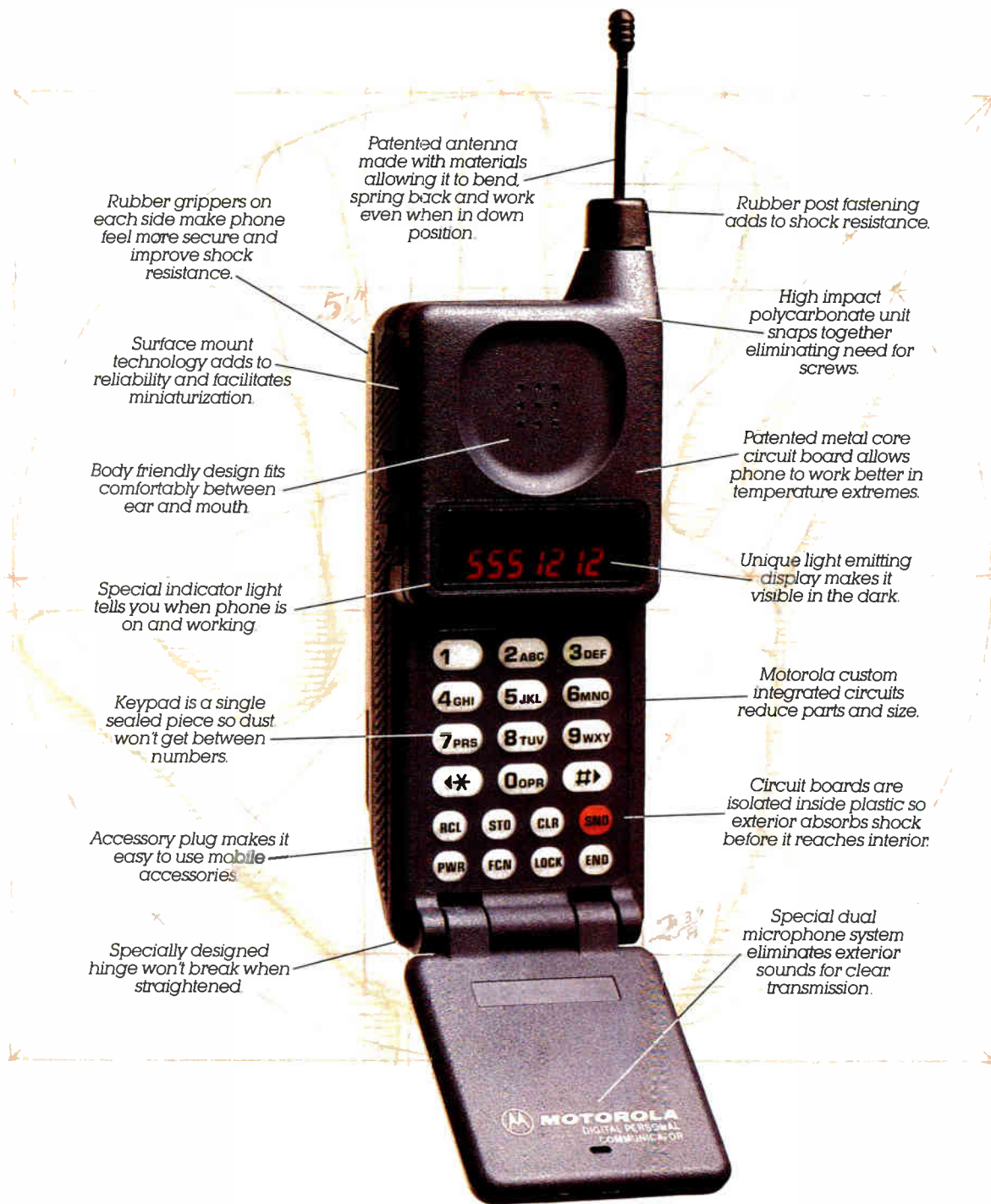
"Totally addicted" to running for its relaxing benefits, Mackay also uses his seven miles daily as an opportunity to work on speeches—and even Minnesota's winters don't deter him.

As for work, Mackay says that he's not a "workaholic," that his family comes first. He takes his wife on about a third of his business trips. For two weeks every holiday season the family vacations together; every four years he takes them all to the Olympics.

He "cannot fathom" ever retiring. To him his job is not work, just as it wasn't to his father, who "was successful and happy and loved what he was doing. Find what you love to do," says Harvey Mackay, "and you'll never have to work a day in your life." 

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SHOWING UP.**





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and  
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guest  
is a  
VIP.

## WITH A SOUL

► Bearded, cultured, and charming—a man surely ordained by central casting to play host and general manager of a small, elegant European-style hotel—Dario Mariotti sips his coffee and ponders the question: what makes his hotel, and others like it, so very, very special?

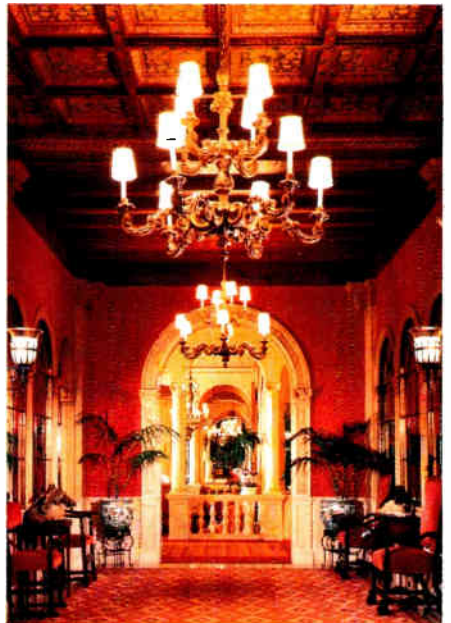
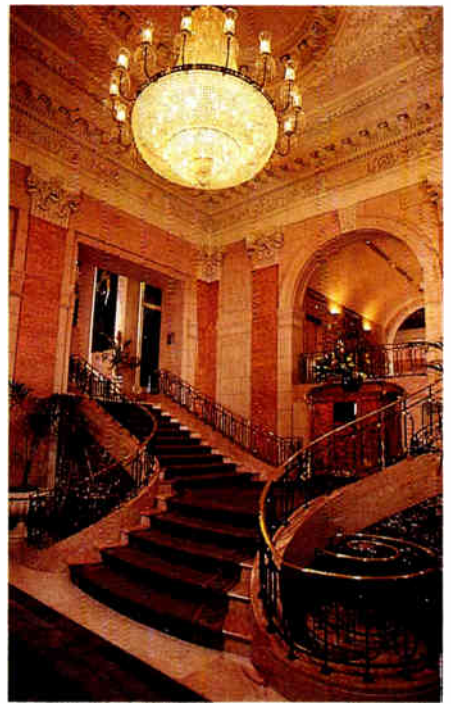
"It's the size. It's like the difference between a deluxe bus and a limousine," says the cheery Italian, settling back into a plush chair in the sunken lobby lounge of Manhattan's Mayfair Regent Hotel. "Big hotels are very good for their size, but a general manager of a big hotel is like the mayor of a city more than the general manager of a hotel. I see 75% of our guests. I know most of their names. Big hotels are valid for conventions; Americans do that very well. We Europeans do better at smaller hotels."

"A hotel with a soul," the Mayfair Regent has been aptly described. Similar sentiment might be accorded the Carlyle, Lowell, Plaza Athenee, Pierre, and Stanhope—all generally considered the *creme de la creme* of New York's finest small luxury hotels—as well the jewel-like Peninsula, Ritz-Carlton, Parc Fifty One, Mark, and Westbury. With no more than 250 rooms apiece, each specializes in personalized, VIP service, each in its own distinctive manner. Room rates typically begin at about \$250 a night.

Most of these hotels are on New York's fashionable Upper East Side, in the center of high style, society, and wealth, within walking distance of the museums, galleries and concert halls, high-fashion shops and boutiques, apartments of the rich and famous, as well as Central Park.

With each, less is more. Often the hotel appears more like a private club or residential building. The entrance is small and discreet, but friendly. A few highly capable staffers await behind the desk

BY JIM BRAHAM



New York's finest small hotels present a welcome sight, from the Westbury (left) where a Rolls-Royce is not in the least uncommon, to the Peninsula (above) where a sweeping marble staircase leads up to the lobby, to the Mayfair Regent whose lobby is among the loveliest of public rooms.

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*Yakov Smirnoff,  
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FOR INFORMATION, CIRCLE NO. 11

and you'll see no lines or signs, certainly no conventions.

Return guests represent the majority of business, and client preference and whims are recorded and extended at each visit. No request seems excessive. Two tickets to *Phantom of the Opera*, toughest tickets on Broadway, you say? No problem, says Frank Bowling, vice president/manager of the Carlyle. “By the way,” he adds, “did you know that Andrew Lloyd Webber wrote some of *Phantom* while staying here?”

At many of these hotels, afternoon tea is a favorite activity, usually in a small lounge area off the lobby. The dining rooms are elegant but relaxing, the food and drink superb. Operators often man the elevators and room service is around the clock.

The luxuriously comfortable rooms are frequently adorned by fresh flowers, and perhaps a fruit bowl. The baths are marble, the mini-bars well-stocked. Multiple phones and lines are common, as are stereos, VCRs, 6-ft bath towels, terrycloth robes, exotic soaps and toiletries, bathroom scales, hair dryers, evening turndown service, complimentary shoeshines overnight, and complimentary newspapers at your door in the morning.

At these hotels, privacy of the many celebrities is protected, but hosts aren't above dropping a few names. As Mariotti says, “We get our share of Hollywood and business people, bankers, and glamorous ladies. We don't court the large official groups because it disrupts the hotel. But Mrs. Reagan likes to stay here, so what are you going to do?”

## ◆◆◆ THE CARLYLE

Unlike most of its competitors, the classically elegant Carlyle doesn't advertise. New York's only Mobil Five Star hotel doesn't have to. The 60-year-old *grande dame* has everything: location, service, and facilities. Towering above its residential neighbors, the 35-story Carlyle permits outstanding views of Central Park and the skyline. Every one of its 196 rooms is unique in decor and has a stereo entertainment center including a CD player and VCR. Practically every room has a Jacuzzi and fax machine, and fresh fruit and flowers are standard. Service is impeccable from a veteran staff that outnumbers guests. A new fitness center sports the latest equipment. The Carlyle Restaurant features the finest French cuisine, Bobby Short is still singing strong in the Cafe Carlyle, and Bemelmans Bar remains a favorite watering hole. (Room rates \$250-\$1,300; Madison Ave. at E. 76th St.; 800-227-5737).

## ◆◆◆ THE MAYFAIR REGENT

Displaying papers from around the world, the newspaper rack in the lobby lounge of the Mayfair Regent receives considerable

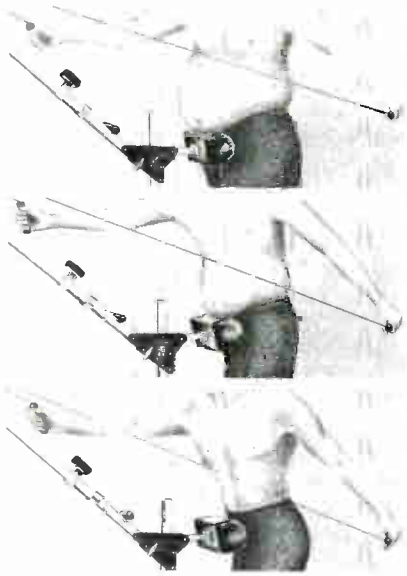


Dining is also feast for the eyes at Le Regence restaurant in the Plaza Athenee (left), the Jockey Club in the Ritz-Carlton (below), and the Caryle Restaurant (bottom left).



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 27830

attention. Little wonder: in this "European island in New York," as managing director Dario Mariotti calls his 16-floor hotel, about 40% of the guests in the 80 rooms and 1119 suites are European. When we visited, Queen Sofia of Spain was staying, but you'd never find that out from the white-gloved elevator operators for whom *mum's the word*. One of America's best (and priciest) restaurants is off the lobby: owner Sirio Maccioni's Le Cirque, where both people-watching and cuisine (pasta primavera is his specialty) are spectacular. Among new services: a fitness room and pocket-sized cellular phones (\$15 daily rental). A soap lady daily brings to the room a basket of unusual European selections. (Rates \$265-\$1,700; 610 Park Ave. at 65th St.; 800-545-4000).



### THE LOWELL

With only 60 rooms, the Lowell "is able to care for and pamper our clients to the hilt," says general manager Martin Hale. Outnumbering guests by a more than 2-to-1 ratio, the concierges (dressed in morning coats and striped trousers) and other staffers do everything from stoking a log fire (most rooms are suites, with wood-burning fireplaces) to stocking your refrigerator (every apartment has a kitchen) to tailoring an individual menu for your room. The only New York member of the exclusive Relais & Chateaux Chain, this intimate haven of understated opulence is an historical-landmark building, completely renovated. The independent Post House steak palace is off the boutique-sized lobby. (Rates \$240-1,200; 28 E. 63rd St.; 212/838-1400).



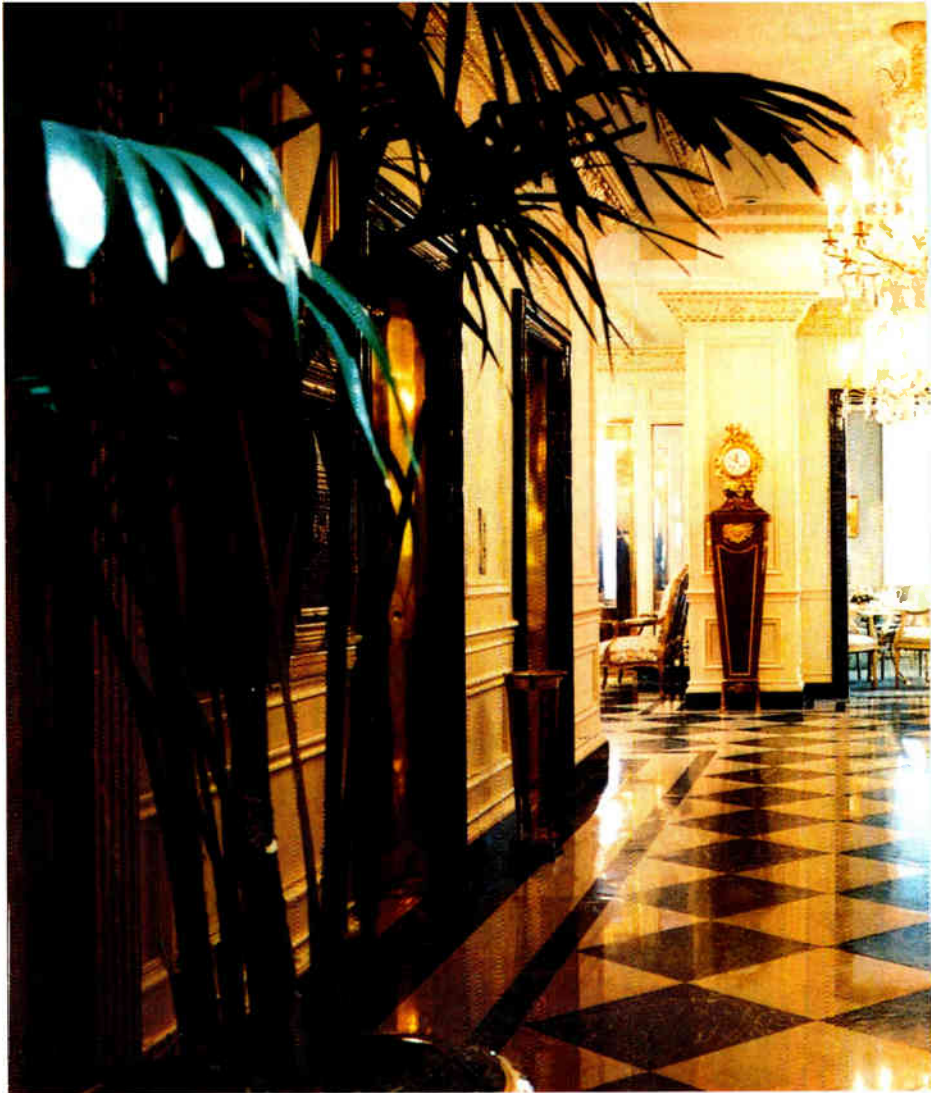
### THE PLAZA ATHENE

At this sister hotel of the famed Hotel Plaza Athenee in Paris, incoming guests realize immediately that they are in no ordinary hostelry. For one thing, they sit down at the front desk to register. That's just a hint of all the personalized attention forthcoming in this exquisite, 17-story European gem, for the last six years a Trusthouse Forte property. The 160 rooms—most of which have pantries and refrigerators—echo the luxurious, but understated, good taste of the public areas. Le Regence restaurant is a feast for eyes as well as palate. When guest leave, they receive another indication of all the extra-special service and surroundings: the average room rate of \$350 is highest in the U.S. (Rates \$245-\$1,950; 37 E. 64th St.; 800-CALL THF).



### THE PIERRE

The toast of Upper Manhattan since it opened in 1930, the Pierre remains a grand tradition, ideally situated on Fifth Avenue along Central Park. The 205-room hotel has been given a fresh, new look by the Four



The Stanhope (above) has been restored in the tradition of the grand hotel

Seasons management that took over in 1981, without losing a bit of its European charm, service, or elegance. The Cafe Pierre is one of New York's finest hotel dining rooms and the classic Rotunda—with its marble staircase, soaring ceiling, and floor-to-ceiling murals—is a favorite meeting spot. (Rates \$265-\$1,750; Fifth Ave. at 61st St.; 800-332-3442).



### THE STANHOPE

One of the first signs of spring in New York comes when the Stanhope opens its Terrace sidewalk cafe. It's a perfect spot for people-watching and resting between visits to the Metropolitan Museum of Art and Central Park, both directly across Fifth Avenue. The elegant and intimate Stanhope (141 rooms, including 88 suites)—since 1926 a home away from home for business and art leaders—recently underwent a \$28 million restoration by the Grand Bay Hotels. The new owners aren't tampering with formality: the hotel remains the only one in Manhattan where ties and jackets still are required (except for breakfast) in the dining areas. (Rates \$245-\$2,000; 995 Fifth Ave.; 800-828-1123).







of Europe, while art deco features some suites in the Parc Fifty One Hotel.



### ◆◆◆ THE RITZ-CARLTON

At the Ritz-Carlton on Central Park South, be sure to request a room on the north side. From these 77 rooms (among the hotel's 228), the view is spectacular: Central Park with all its greenery, framed by the skyscrapers along Fifth Ave. and Central Park West. Off the intimate, pine-paneled lobby is the popular Jockey Club restaurant and bar, where Norman the bartender seems to know everyone and crab cakes are everyone's favorite. The Ritz-Carlton chain, which took over the onetime Navarro residential hotel last year, will begin a \$30 million renovation in late September; additions will include a health club. (Rates \$190-\$1,200; 112 Central Park South; 800-241-3333.)

### ◆◆◆ PARC FIFTY ONE HOTEL

Not all of the cabbies have heard of the Parc Fifty One, but they will. The former Grand Bay at Equitable Center (before that the old Taft Hotel) has been completely renovated and since January part of Park Lane Hotels International. The first European-style luxury hotel on the West

Side, near midtown business as well as the theater district, is a surprising jewel, exquisitely decorated and furnished. Its relatively large lobby and public areas are deceptive, for it has only 178 rooms on seven floors. From the marble-floored lobby with its piano bar and lounge, a staircase leads to the Mezzanine Cafe for breakfast. The popular Bellini by Cipriani restaurant (privately owned) is on the ground floor. Amenities include clean reading: the complimentary Sunday New York Times comes with white gloves. (Rates \$220-\$925; 152 W. 51st St.; 800-338-1338.)

### ◆◆◆ THE PENINSULA

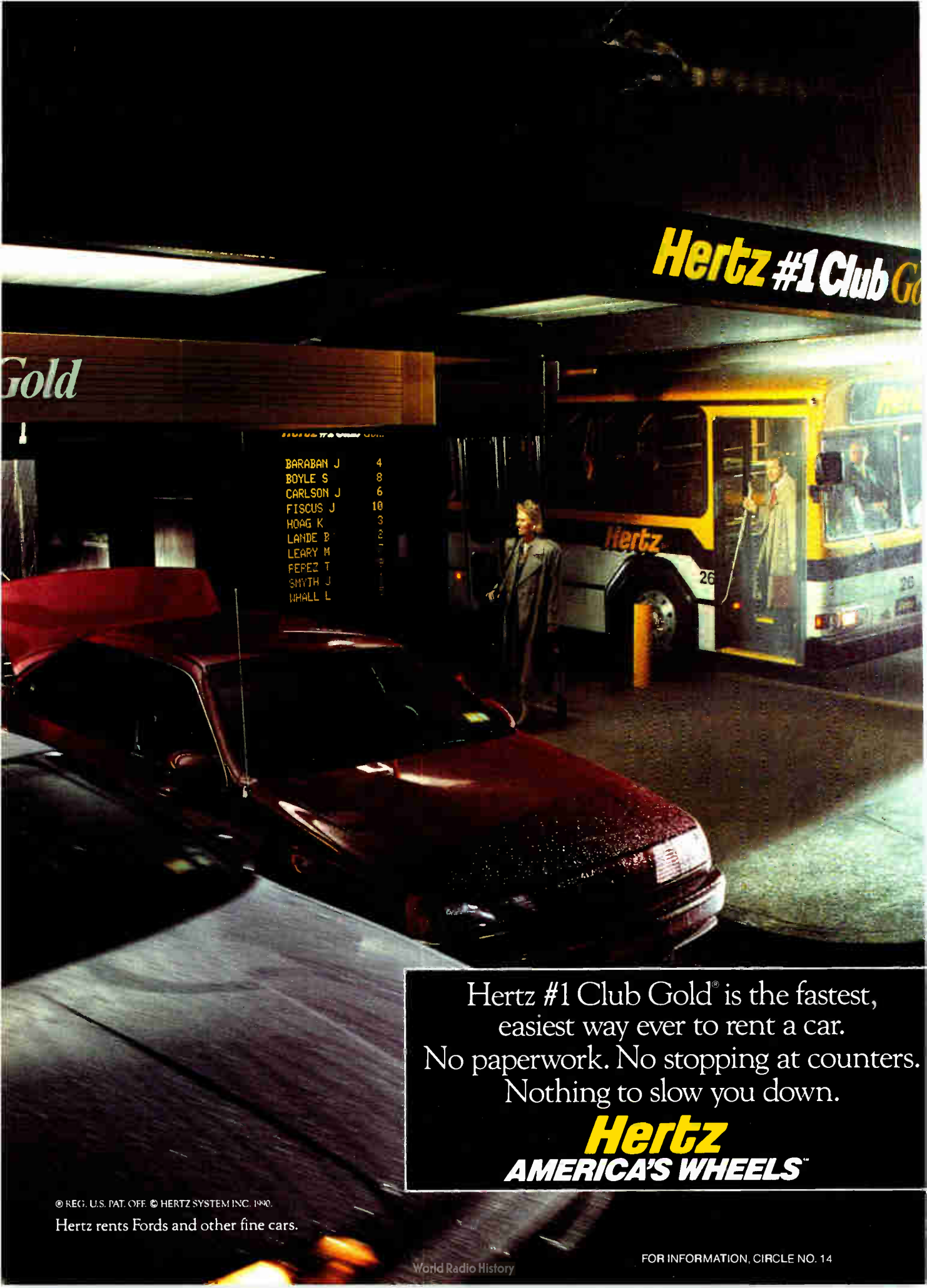
With sweeping marble staircases leading up to the lobby and dining rooms, the 23-story Peninsula—at the corner of 51st and Fifth Avenue—appears at first to be a large hotel. Not so, the former Hotel Maxim's de Paris (originally the Gotham) has but 250 rooms. Completely remodeled and now owned by Hong Kong's Peninsula Group, the hotel offers grand, elegant public areas and large, well-appointed guest rooms, with over-sized marble baths. The 21st and 22nd floors house a new, 35,000-sq-ft. health spa, with a 42-ft. glass-enclosed pool. On the rooftop, the Pen-Top Bar & Terrace (also glass-enclosed) serves lunch with a view. For more formal dining, there's the Adrienne and Le Bistro restaurants, as well as the Gotham Lounge. (Rates \$220-\$2,500; 700 Fifth Ave.; 800-262-9467.)

### ◆◆◆ HOTEL WESTBURY

From its small but stately marble lobby to its 235 elegant guest rooms (all furnished with writing desks), the Hotel Westbury reflects the warmth and grace of an English country manor. Like the Plaza Athenee, it was acquired (in 1983) by Trusthouse Forte Hotels, which has spent \$12 million in restoring the 64-year-old Upper East Side landmark. The Polo Restaurant, one of the city's finest, specializes in French-inspired American cuisine; there's piano music in the Polo Lounge. (Rates \$240-\$2,000; 15 E. 69th St. at Madison Ave.; 800-CALL-THF.)

### ◆◆◆ THE MARK

A block north of the Carlyle, the new, 16-story Mark offers a quiet alternative to its long-established neighbor. Opened in 1926 as the Hyde Park and renamed the Madison Avenue Hotel seven years ago, the 180-room, neo-Italian Renaissance property with the striking art-deco facade was taken over last year by the Rafael Group. The new owners have spent \$30 million in renovation, and it shows. Additions include Mark's Restaurant, just beyond the elegant lobby. (Rates \$250-\$1,500; Madison Ave. at E. 77th St.; 800-THE-MARK.)



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# SOLUTIONS WANTED

**T**HE ACCENT IS ON THE practical in Phase 2 of the pan-European Eureka HDTV project. "The first phase—1986 to 1990—was to develop prototypes in response to Japanese advances in HDTV," says Patrick Sandouly of member company Thomson Consumer Electronics in Paris. "Phase 2 will last two years—1990 to 1992—and is working on technology to solve the question of what technologies are needed to make HDTV."

For example, says Sandouly, "we need to develop technologies for displays. The wide-screen cathode-ray tube can only go to around 1 to 1.5 meters diagonal. Above that the tube is too heavy and too big—it will be stupid if the sets could not be got into people's rooms." Eureka will investigate other solutions, he says, "maybe liquid-crystal displays."

Another technology on the must-have list is digital recording techniques for professional and consumer use, Sandouly says. "The next item is the charge-coupled device for use as a target for professional cameras first. We have to develop all of these in Europe. These are the three main items."

Eureka's funding is derived partially from industry and partially from the national governments of the participating companies in proportions negotiated by the individual nations. "For example, in France Thomson gives 60%, the government 40%," says Sandouly. "In the Netherlands it's 50 : 50. But overall, roughly speaking, one third is government funding and two thirds is from industry."

There's activity as well beyond Eureka. "In mid-June it was announced that there would be a general agreement on research between Thomson and Philips [International NV]," says Sandouly. The two companies will together devote \$3.8 billion to HDTV technologies over the next five years. "It's a general agreement on what needs to be done and how it can be done, and that's all," Sandouly says. "No joint ventures or other European programs, just a survey of technology beyond what will be done in Eureka. It covers the whole consumer electronics market."—P. F.

(Continued from p. 48)

self included—take their model for the growth of HDTV from experiences in the introduction of color TV in Europe, which, he points out, has taken around 20 years to reach its full potential. Thus, Bird says, "it will be 2010 before the market really gets going." Others are less pessimistic, but broadcasters and equipment makers alike have no expectation of major sales much before the year 2000.

Although it may take up to 20 years to get more than 50% of European households set up with a full-facility, 1,250-line wide-screen TV receiver, tape recorder, video-disk player, and camera, they will not have to get by with today's TV standard in the meantime. The transmission standard that has been given the European seal of approval for HDTV is actually in use now. By the end of 1990 at least 15 channels will be in service using the Multiplex Analog Component (MAC) system in one of its two variants. The British have five channels broadcasting on the D-MAC standard, while the French, Germans, Dutch, and Scandinavians are transmitting with D2-MAC.

At present, these broadcasts carry pictures that can be displayed on existing TV receivers. They are made up with 625 lines and decode to a conventional 4 : 3 aspect ratio. But the MAC technique was designed at the outset to be used for direct broadcasts from satellite to small-diameter domestic earth stations, with little consideration for compatibility with the existing sets designed for reception of terrestrial broadcasts in the PAL or Secam standards used by European TV companies. The result is that using a system that was designed in the 1980s to offer the best performance that current technology could provide, there is a noticeable improvement in picture quality even though the display device is a standard TV receiver.

MAC was designed at the outset to be "upwards-compatible," says Gary Tonge of the Independent Broadcasting Authority in the UK, "and as HD-MAC, it has been adopted for European 1,250-line high-definition transmissions. It could well become a standard for use in terrestrial and cable TV distribution, too." When MAC was designed, says Tonge, "compatibility with PAL or Secam standard receivers was not an issue. Since satellite broadcasts are made at a frequencies in the band

between 11.7 and 12.5 GHz, you would have to buy an external down-converter anyway—and the additional cost of building in a decoder for a new format was marginal."

Its satellite broadcasting origins mean the MAC standard has some built-in features that will bring additional benefits. There were two major factors—the need to overcome the effects of noise in the transmission path from the satellites and a desire to provide multiple sound channels for a multilingual continent. "Unlike terrestrial broadcasts, which use amplitude modulation, the satellite downlinks are frequency modulated to minimize power," Tonge explains. "A feature of FM systems is that noise increases with baseband frequency. Both PAL and Secam signals use subcarriers for sound and chrominance information that become susceptible to noise. So we designed MAC to be better matched to FM transmission."

**T**HE RESULT IS A TIME-division-multiplex scheme that divides the TV signal in a series of sequentially transmitted packets, each of which defines an element of each picture line. There are three types of packet, two of which are digitized and compressed analog elements describing the video content, and the other a duo-binary-encoded 206-bit data burst. All are contained within the line-scan period—64  $\mu$ s for a 625-line picture with a 50-Hz frame rate.

Each line of luminance information is compressed by a factor of 3 : 2 and thus occupies 52  $\mu$ s, while color-difference information is compressed by 3 : 1 to occupy 17.5  $\mu$ s on alternate lines. The 10- $\mu$ s data burst provides a mean data capacity of around 3 Mbits/s. One line out of the 625 is designated to carry nothing but data. Duo-binary coding allows a data rate of 20.25 Mbits/s to be carried in the 8.5-MHz bandwidth required by MAC.

To a large degree it is this data-payload capacity that makes MAC "future-proof"—and gives rise to the minor inconsistency that has led to two MAC versions. The essential difference between D-MAC and D2-MAC is that the latter has been tailored to use less bandwidth than D-MAC and thus has half the data capacity.

The reason that the British have adopted D-MAC, with its higher data rate, is that British Satellite Broadcasting

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**CIRCLE 247**  
World Radio History

Ltd. wants to sell the spare capacity to business users for data broadcasting. It also uses the additional data channels for conditional-access information and for encrypting its broadcasts to restrict their reception to paying subscribers.

In the future, the data burst will also be used to contain information to enhance the resolution of the video signal. Already, BSB and some of its counterparts on the European mainland have plans to start broadcasting pictures for display on wide-format receivers with a 16:9 aspect ratio. BSB will start in January 1991 sending pictures with 625 lines.

These wide-screen broadcasts will still be viewable on conventional 4:3 sets, but transmission will use one of the data channels to control truncation of the picture at the sides, depending on picture content. Broadcasts with the full 1,250 lines will commence in 1992. At the same time, others are experimenting with higher-definition broadcasts using digital information to increase frame rate from 50 to 75 Hz—or in some cases 100 Hz—to reduce flicker.

It is this flexibility that convinces the Europeans that MAC would make a sound basis for a single world standard. In particular they note that the MUSE standard put forward by the Japanese runs at a 60-Hz frame rate, which, they say, is impractical to use in Europe. On the other hand, they point out that MAC can be controlled to interface with 60-Hz standard signals.

But without doubt, it is a perceived threat from the Japanese that has prompted the birth of the Vision 1250 consortium. "Program companies will tell you that high-definition program production is in full swing," says Bird of BIS Mackintosh. "Indeed, there were 33 productions presented at the international TV symposium at Montreux, Switzerland, this year. But the majority were made with Sony equipment to the Japanese standard. At the moment, if a European TV producer wants to make a high-definition program he has no option but to buy or borrow hardware from Sony Corp."

And that raises an important point. "Time does not stand still, and the fact of de facto standards is an issue," says Bird. "The Japanese companies are now moving forward with commercial systems and finding customers for them. The people who drive and originate and control a standard tend to get a really solid ground-floor position." ■

HDTV

## JAPAN'S NHK RETHINKS ITS HDTV TIME FRAME, BUT PRODUCTS ARE ARRIVING FAST

# A BROADCASTING DELAY

BY SHIN KUSONOKI AND MASAKI ICHIKAWA

IT'S CALLED HI-VISION IN Japan, and that nation has been in the forefront of high-definition TV since 1965, when research and development began on what was then called High-Quality Television. Japan's public broadcasting company, Nippon Broadcasting (NHK), introduced the world's first HDTV product in 1977: a 30-in. cathode-ray tube with an aspect ratio of 5:3 and shadow-mask pitch of 340  $\mu\text{m}$ . And NHK was the first in the world to actually begin regular HDTV broadcasts—an hour a day starting in June 1989.

Today work continues apace on HDTV in Japan, despite a few snags encountered along the way—most notably, NHK's decision to delay until next summer full-scale broadcasts. The big Japanese electronics companies are busy developing HDTV chips and equipment, while the private broadcasters are working on enhanced-definition TV—EDTV, which is known as Clear-vision in Japan—as a way station between today's NTSC standard and full-blown HDTV.

NHK began its HDTV-broadcasting experiments at the 1988 Seoul Olympics using its new band-compression technology, the MUSE (Multiple Sub-Nyquist Sampling Encoding) format. MUSE, which transmits via satellite, operates by compressing into 8 MHz a 20-MHz luminance signal and two chrominance signals (7 MHz). The HDTV telecasts from Seoul were a lead-up to using this format in test broadcasts from the broadcasting satellite BS-3a, launched in August of this year. NHK had planned to begin regular broadcasts sometime this year, but now has opted to postpone transmissions until the summer of 1991, when the satellite BS-3b is scheduled to be launched.

There are two major causes for the delay. One is the unexpected popularity of satellite broadcasts once they came into regular use. This has made it

difficult to carry out HDTV tests, especially since, starting this year, fees are being charged for the reception of satellite broadcasts.

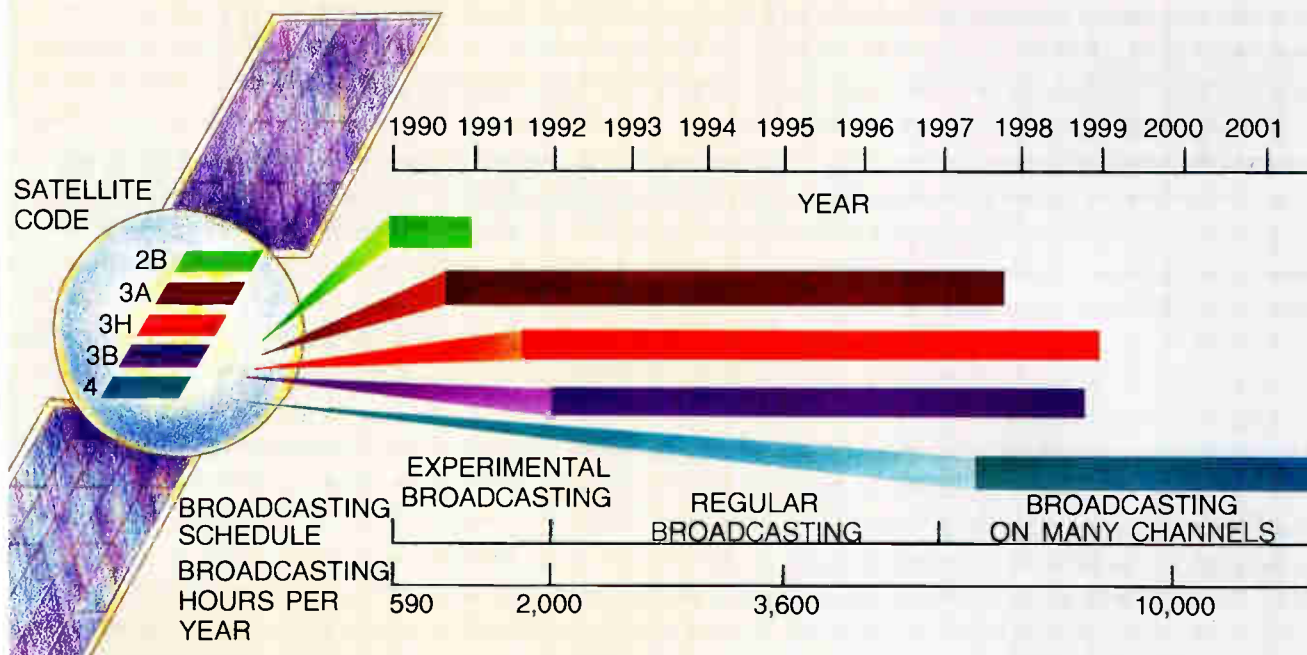
In addition, the standardization of the international specifications for HDTV has not progressed as planned. At the general meeting of the International Radio Consultative Committee (CCIR) in 1986, the standards proposal made by Japan, the U.S., and Canada was not adopted due to opposition from the European Community. Around this time, Japan was still hoping to be at the forefront by having MUSE made the international standard. The fact that test broadcasts were begun a year earlier than planned indicates the confidence that NHK (and the Ministry of Posts and Telecommunications, which oversees communications and broadcasting) had in MUSE.

THEN, IN 1988, THE U.S., too, embarked on an independent course when the Federal Communications Commission announced that the U.S. HDTV standard must be compatible with NTSC—something MUSE is not. Japan, the U.S., and Europe thus stand in three separate corners. NHK is now tweaking its standard to make MUSE-based formats that are NTSC-compatible. But the standardization problems have delayed Japanese equipment makers' mass-production and marketing blitz.

In this mood, the CCIR's general meeting this year failed to reach complete agreement on the standards problems. Nevertheless, a proposal was made for the Common Image Format (CIF) in line with compromises on the Japanese and EC standards. Although taking account of the CIF, NHK plans to ready a dedicated Hi-Vision channel using the satellite BS-3b next year. Since BS-3b is the standby satellite for BS-3a and will have only one transponder available for Hi-Vision, it cannot be used for full-fledged HDTV broadcasts. So NHK is now looking ahead to the 1997 launch of BS-4.

The organization is also devoting its

# LAUNCHING HDTV



**A holdup in satellite availability has altered NHK's plans for full-scale HDTV broadcasts. While additional broadcasting time will be available in 1991, full-fledged service will wait till the 1997 BS-4 launch.**

energies to software. "We need attractive software if the hardware is to become popular," says Kenji Aoki, NHK's director. "The major issue we are facing now is what to do about software for Hi-Vision. NHK has daily one-hour Hi-Vision broadcasts, amounting to 400 hours annually, at a software cost estimated to be in the vicinity of \$574 million. This is expected to reach \$1.2 billion this year." By 1995, he says, the 3,600 hours of broadcasting will require a software expenditure of \$3.4 billion. The target for the year 2000 is 10,000 hours, with software costs exceeding \$12 billion.

By announcing concrete figures like these, NHK is encouraging other broadcasting stations and manufacturers to become active in producing HDTV software. Aoki says that one of the two NHK channels of BS-4 will be for HDTV, as well as two or three of the six channels available for private broadcasting stations. So the software need is huge.

On the hardware side, NHK is working to have Hi-Vision take root in households by developing a small TV that can be hung on the wall. The prototype announced in 1989 uses a 33-in. plasma display and is NTSC-compatible. This prototype will be able to produce Hi-Vision pictures by fall. A 50-in. version is due in 1995.

At the stage prior to HDTV, the technology to watch is EDTV, or Clear-

vision. This technology produces a high-quality picture while maintaining NTSC compatibility. Through the higher picture quality, the extended bandwidth is multiplexed and compressed into the current TV channel bandwidth (6 MHz). Development of this format was begun by the private stations to counter HDTV, whose development is dominated by NHK. Broadcasts began in August 1989.

**UNLIKE THE U.S., WHERE** satellite broadcasts are not received by ordinary households, there is a clear distinction in Japan between ground waves for EDTV broadcasts and satellite waves for HDTV broadcasts. Thus, the TV manufacturers are working on both formats. Development is advancing especially for second-generation EDTV, with the aim of approaching the quality of HDTV by incorporating wide aspect and pulse-code modulated sound. In fact, the trend is toward combining these technologies through the development of sets that can receive both HDTV and EDTV pictures (possibly the second-generation EDTV). Reception will be via ground waves, and in this sense the standard would appear to conform to the U.S. Advanced TV standard.

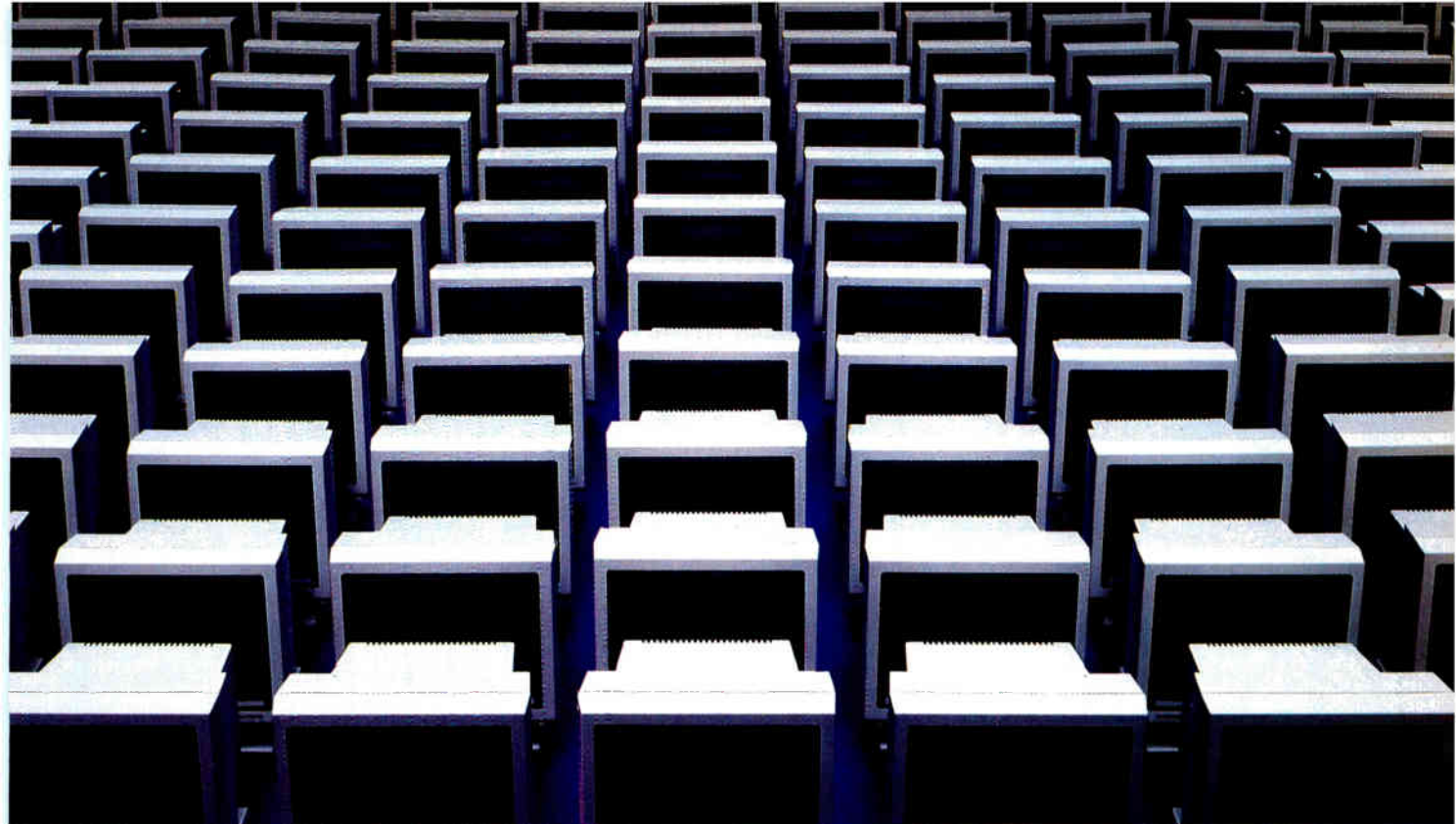
According to the Ministry of Posts and Telecommunications, the cumulative scale of demand for Hi-Vision by

the year 2000 will be \$94 billion, an attractive target indeed not only for NHK but also TV manufacturers and chip makers. In August 1989, the combination of Toshiba, NEC, Matsushita, and NHK brought out a prototype decoder chip for the MUSE format. Toshiba developed the core component that detects the picture movement, NEC concentrated on the field memory, and Matsushita handled the signal processing. Later, Sharp, Sony, and Hitachi joined the team as well.

Similarly, Mitsubishi and Sanyo have also attempted to join in the development activities; they are working on the down-converter needed for an ordinary NTSC-format TV set to receive Hi-Vision broadcasts. Mitsubishi has succeeded in putting a down-converter on the market for an affordable \$148.

In displays, Toshiba Corp. has come up with 32- and 36-in. direct-vision CRTs and a 50-in. rear-projection projector. The 32-in. CRT houses an LSI decoder for the MUSE format and a signal-processing circuit for EDTV. Recently Toshiba has been marketing a 200-in.-screen rear projector for events and spectacles (retail price: \$8.7 million). Toshiba will step up development in important peripherals such as video disks and charge-coupled devices for HDTV cameras.

For its part, Sony Corp. was early to take up HDTV development—its first



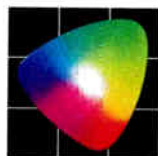
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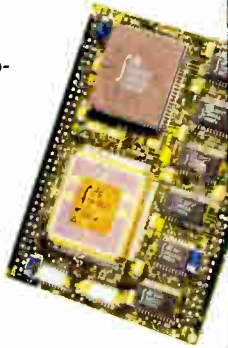
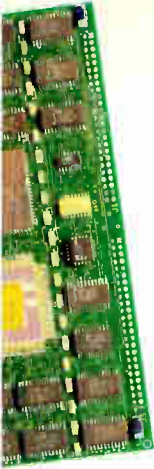
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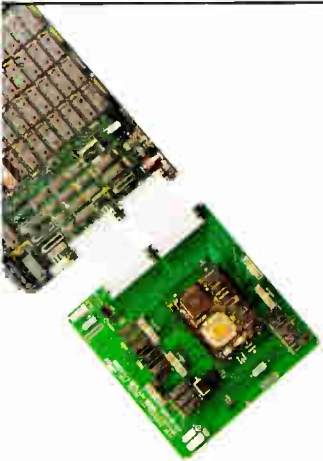
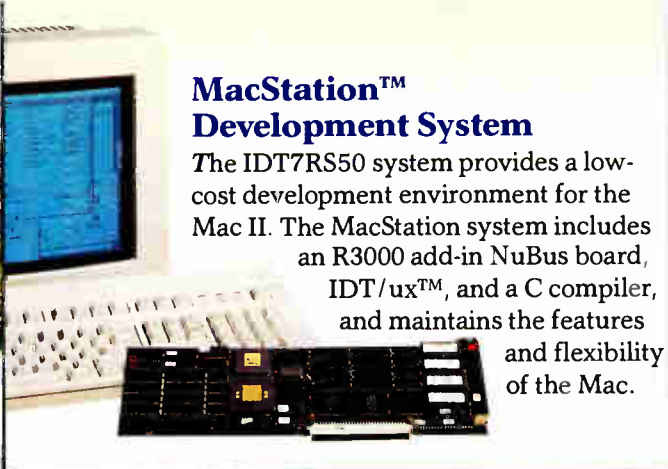
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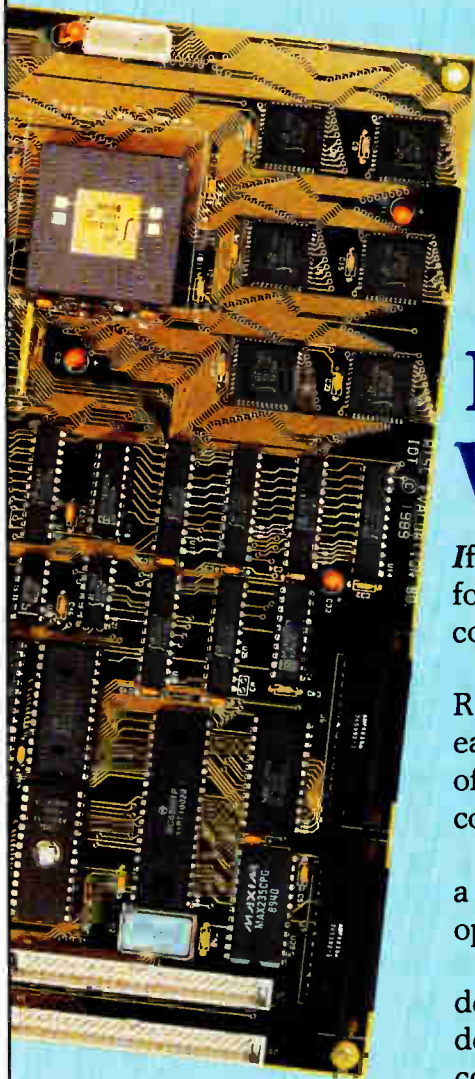
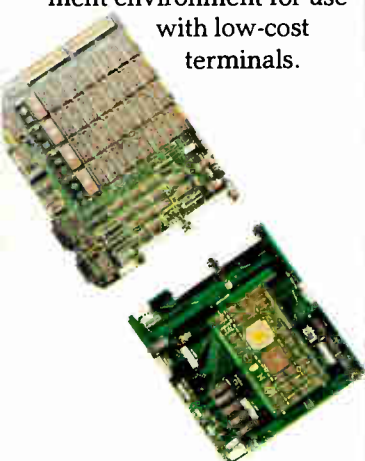
The IDT7RS50 system provides a low-cost development environment for the Mac II. The MacStation system includes an R3000 add-in NuBus board, IDT/ux™, and a C compiler, and maintains the features and flexibility of the Mac.



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World Radio History

products came out in the late 1970s, and with its substantial development capacity in digital VTR and optical video disks, Sony aims to develop integrated systems from cameras through to recording equipment. In software, subsidiary Sony PCL provides powerful support.

NEC Corp. is making the most of its strength in semiconductor production. Its biggest success is in the sale of the world's first 4.3-Mbit HDTV field memory. It is also well ahead in the development of circuits for MUSE decoders and has a prototype CCD with 2 million pixels, another first. NEC is also working on software development.

Meanwhile, Matsushita Electric Industrial Co. is reinforcing its position in the U. S. using the Panasonic Advanced TV-Video Laboratory, established in Burlington, N.J., last January, as a foothold. Rather than proposing ATV standards, the lab can test proposed standards to support decision making from the sidelines, and can move swiftly to develop products based on those decisions. Matsushita has also developed a 50-in. rear-projection TV, which it claims would sell for around \$13,500 if demand ramps up to 10,000 sets a month.

**W**ILL JAPAN POSE A threat to the HDTV market in the U. S.? Whereas Japan is attempting to set up HDTV broadcasting using satellite communications, the U. S. operations are premised on using ground waves. From this point alone, it would seem difficult for Japanese enterprises to enter the U. S. market. The lack of standards compatibility is also a problem, although NHK has been steadily revising its MUSE format to match the U. S. proposal, which won't be completed until at least 1993.

The revised versions of MUSE include MUSE-6, MUSE-9, and Narrow-MUSE. MUSE-6 can transmit in the same 6-MHz bandwidth as current ground waves. This means that it is NTSC-compatible but will double the degree of definition if a dedicated receiver is used. Also NTSC-compatible, MUSE-9 further improves picture quality by adding to the 6-MHz ground wave. Narrow-MUSE, however, requires a special receiver, since it compresses the original HDTV signal to 6 MHz to transmit it. By broadcasting the NTSC signal simultaneously, compatibility is maintained.

The TV manufacturers are proceeding with development to meet these various standards. **E**

**HDTV**

## IN THE U. S., HDTV IS BECOMING A FOCAL POINT FOR THE COMPETITIVENESS ISSUE

# POLITICAL LIGHTNING ROD

BY JACK SHANDLE AND AMY ROSEWATER

**I**N THE BASEMENT OF A spanking new, red brick office building in Alexandria, Va., technicians at the Advanced Television Test Center are systematically installing the video testbed that will help determine a U. S. standard for high-definition TV. The mood is upbeat. ATTC executive director Peter Fannon confidently predicts that testing of the seven competitors will start before the end of the year and finish on time in 1992.

Meanwhile, across the Potomac River in Washington, squabbling reigns. Numerous bills have been introduced but little has happened. Democrats and Republicans are at war over industrial policy, and HDTV is the highest-profile hostage. With any luck, HDTV could become the focal point of the competitiveness issue when the 1992 presidential campaign gears up early next year. The only reason Fannon's group can move forward with its testing is that it is privately funded by a consortium of TV networks and industry associations.

The scenes on the two sides of the river sum up the U. S. situation succinctly, if somewhat simplistically. Unlike in Europe and Japan, industry and government are clearly out of step: HDTV has been politicized.

Democrats, led by Rep. Richard Gephardt (D., Mo.), proposed in May a \$400 million funding package [*Electronics*, July 1990, p. 15] that could have been a response to the Bush Administration's reassigning Craig Fields, chief of the Defense Advanced Research Projects Agency, for being too zealous an advocate of Darpa funding for dual-use technologies, such as HDTV. "I don't know if the issue is as much technological as it is political," says Frank Merat, Case Western University associate professor of electrical engineering.

For a significant part of the electronics industry, this state of affairs—so natural for Washington—is very distressing. Some HDTV advocates argue that

the technology has the potential for being a stronger market driver in the 1990s than the personal computer was in the 1980s. The very vastness of the consumer market is one reason, says Narpat Bhandari, president of Vanguard Semiconductor Corp., Milpitas, Calif., but there will be spinoffs too.

"IC technology developed for HDTV will migrate into virtually every system using video encoding and decoding, compression, storage and retrieval, image enhancement, and display techniques," he says. The Congressional Office of Technology Assessment has forecast the entire HDTV market—chips, transmission systems, and home tuners—at \$12 billion by 2003.

Such assessments are impressive, but represent a rather narrow perspective in the context of HDTV's lightning-rod role in the debate over what sort of industrial policy is best for the U. S. "HDTV has become the symbol of a bigger picture," says Lester Thurow, dean of the Massachusetts Institute of Technology's Sloan School of Management. "The question is, is HDTV the right place for the U. S. to jump back in?"

**S**EVERAL POLITICIANS ARE already campaigning on HDTV. After all, the average voter can relate better to HDTV than he can to DRAMS. "It's really important that we deal with this issue and not stick our heads in the sand," says Rep. Norm Mineta (D., Calif.). "The Japanese realize [HDTV] is important and the Europeans realize it too. And all we're doing is playing ball." Mineta has proposed legislation providing federal dollars for copyrighting software and patents, export facilitation, and science education.

Rep. Don Ritter (R., Pa.), whose district includes hard-hit steel towns like Allentown, Easton, and Bethlehem, included HDTV as part of his 1988 campaign. AT&T Microelectronics is designing HDTV circuits in Allentown in cooperation with Zenith Electronics Corp. "Although [the voters] may not under-

stand HDTV, they sure understand foreign competition," an aide says.

Mineta compares the HDTV issue to the U.S.'s loss of the video cassette recorder market: "I don't think that we make one VCR today," he says. Ironically, one American company—Go-Video Inc., based in Scottsdale, Ariz.—is in a legal fight with six Japanese companies for the right to manufacture double-deck VCRs in the U.S. [*Electronics*, March 1990, p. 76]. Its chief executive officer sees far more in the HDTV issue than simply getting government funding for research and development. "We have a much more difficult and basic problem," says R. Tereen (Terry) Dunlap. He believes HDTV will encounter Go-Video's problem: cartel behavior by Japanese vendors. "The government should be involved, but it needs to enforce U.S. antitrust laws to stop the illegal activities of Japanese manufacturers," he says.

Congress has a surfeit of competition-booster bills, and those drafted by House Republicans loosen antitrust laws in the case of consortia, decrease capital-gains taxes, and make permanent the R&D tax credit. House Democrats, on the other hand, have been searching for federal dollars.

H.R. 4611, titled National Cooperative Amendments of 1990, which passed in the House on June 5, addresses the concern for making U.S. manufacturing competitive, and this would include HDTV consortia. The bill reduces the antitrust penalty liability for joint ventures designed to devel-

op a product, service, or process. Any facilities used must be on U.S. soil, and foreign participants cannot make up more than 30% of the project.

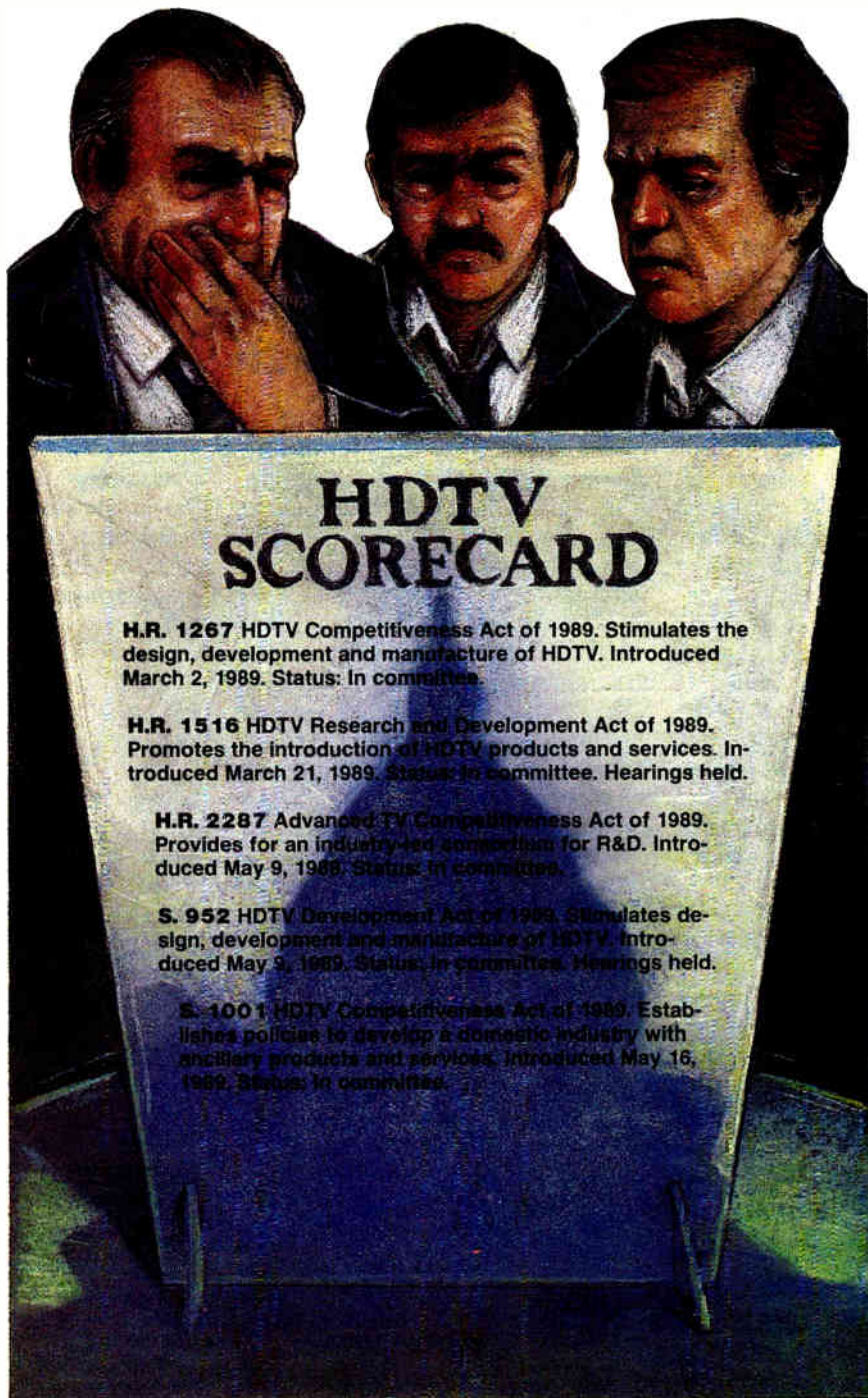
Other recent Democratic legislation concerning HDTV includes an "action agenda," a megabill package devised by House Majority Leader Gephardt and Mineta to jump-start American high-tech involvement. This plan, which is currently in the House, involves \$400 million over a three-year period.

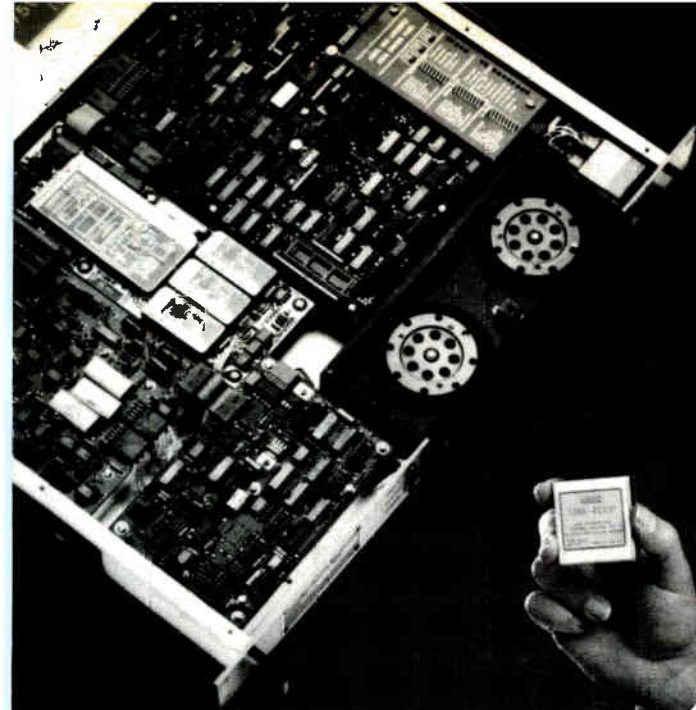
The government organization furthest along the HDTV trail is, of course, Darpa. It is widely believed in Wash-

ington that Fields's ouster came as a result of his work with HDTV-related projects, although he denies this is the case. Regardless, it added fuel to an already hot political fire. Not only has Mineta attacked the administration for the ousting of Fields, but he has also accused it of "muzzling" Secretary of Commerce Robert Mosbacher. At first, Mosbacher seemed to support federal involvement with projects like HDTV; now he appears to have shied away, Mineta charges.

In June, Sen. John Glenn (D., Ohio) held hearings on The Trade and Technology Promotion Act (S. 1978), a bill that would create a civilian counterpart to Darpa, among other things. When Mosbacher did not attend the hearings, Glenn went on the attack: "It is one thing to disagree about ideas for enhancing U.S. technological competitiveness. It is quite another to be completely closed to new ideas altogether," the senator said.

In still another instance of political infighting, an Office of Technology Assessment report titled "Helping America Compete" berated the administration for lacking "leadership in developing scientific and technical information policy." Both the White House and the Department of Commerce declined comment. "The problem is there is no guidance, no direction, until the FCC chooses a standard," says Merat of Case Western. "We're disorganized. We have no leadership. The government is so deregulated. And that's why we lose." ■





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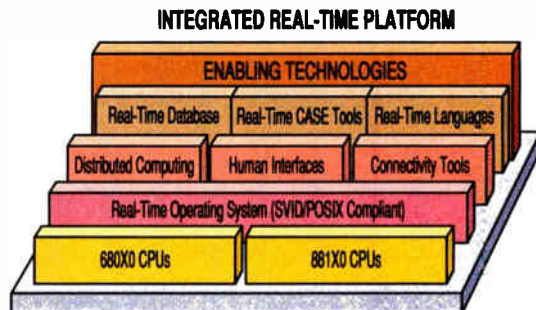
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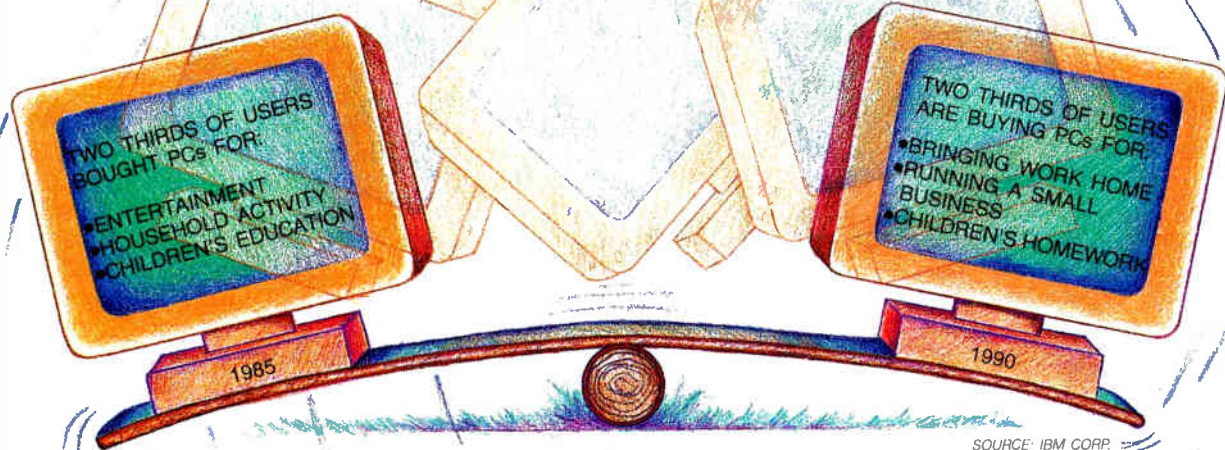
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## THE HOME USER: A CHANGING PROFILE



An IBM study of 100,000 households shows a major shift in the reasons computers are being bought for the home. The company hopes this growing computer literacy will mean a big market for the PS/1.

# CAN IBM GO HOME AGAIN?

## BIG BLUE MOUNTS A MARKETING BLITZ FOR ITS PS/1 AS TANDY AND COMMODORE ALSO MOVE IN THE HOME MARKET BY SAMUEL WEBER

**T**HE HOME COMPUTER market, a rocky shoal on which companies like Texas Instruments, Coleco, and even IBM foundered in the early 1980s, has once more become a target for computer manufacturers. With the national rollout last month of its Personal System/1, IBM Corp. is taking another plunge into the murky waters in which its first home computer, the PC Jr, drowned.

The company apparently believes the time is ripe for a new attempt, and so do a couple of its competitors. Commodore Business Machines Inc. and Tandy Corp. have both developed machines and marketing ploys designed to overcome the resistance of computerphobes—the folks who have shunned PCs because they seemed too

hard to use, too expensive, and only marginally useful. While Commodore and Tandy are aiming squarely at this group, Big Blue is banking on the growing computer literacy of the U. S. worker to give the PS/1 a toehold. At the same time, it's basing its marketing campaign on service, low cost, and user-friendliness in an effort to appeal to the neophyte user, too.

Many industry observers remain skeptical about the PC's prospects for penetrating the consumer market this time around. "For most people, there's still no compelling need to use a computer," says Richard A. Shaffer, publisher of the *Technologic Computer Letter* in New York. "I think the home market is going to be a great market, but not necessarily for those machines targeted at it," says

Esther Dyson, publisher of the newsletter *Release 1.0* in New York.

Even Apple Computer Inc.—which at 24% holds the largest share of a home market estimated at 23.5 million units this year—sees little to get excited about. "We haven't seen any sea change in the tendency to buy personal computers that would lead us to any additional effort in the home market than we are doing now," says Bruce Mowry, director of small business marketing for Apple in Cupertino, Calif.

Such sentiments have been voiced ever since Texas Instruments Inc. retired its 99/4A home computer in 1983 and IBM abandoned the PC Jr in 1985, dealing a major blow to the PC industry's as-

sault on the American home. A good portion of the computers bought for home use today are not "home" computers at all. They're PCs, clones, or Macintoshes—the same machines used at work or at school. No one knows how many of them end up gathering dust in the hall closet.

But IBM has done its homework, says Skip Gladfelter, marketing manager for the PS/1 in Lexington, Ky., and is convinced the home computer is the next great wave in consumer electronics. The home market, he says, has done a complete flip-flop since the days of the PC Jr. He cites the result of studies done every six months by IBM on alternating halves of 100,000 households.

"In the middle 1980s," says Gladfelter, "two thirds of the people who

bought machines did so first for entertainment, second for household activity, and third for children's education." But by this year, he says, "our projections show that 66% will buy one for bringing work home, running a small business, or children's homework." Purchasers in these segments tend to be "semi-computer-literate," as Gladfelter puts it, and this is the buyer that IBM is aiming at with the PS/1.

Just how many buyers is that? Perhaps as many as 44.5 million by 1994, says market research house Dataquest Inc. in San Jose, Calif. At \$500 to \$2,000 per system, that's a figure that should gladden all PC makers, who have seen their once meteoric market flag in the past couple of years. Historically, says Dataquest, most of the home-computer market growth has come not from the newly converted novice unsuccessfully targeted in earlier attempts. Instead, it's come from users who work or run businesses at home or from families that buy a computer as an adjunct to their children's school work—precisely the IBM target market.

According to Gladfelter, more than half of the U.S. work force either uses or shares a computer on the job, or at least works around the machines. "People are more familiar with and less afraid of computers now," he says, "so the great unwashed masses are rapidly disappearing. We are not after the old home-computer market or interested in opening the great unwashed to computers. We are going after the center of the market for pretty serious applications." Still, IBM hopes to break through to the rookies as well.

To do so, the company has put together a package of hardware, software, and services that makes the PS/1 an appealing, no-fuss machine. To beat the cost barrier, the system is priced at \$999 to \$1,999. To overcome the "fear factor," the company claims to have made the PS/1 as easy to set up and use as a home appliance. Yet its hardware is powerful enough to meet the needs of the business-at-home user.

Based on a 10-MHz Intel Corp. 80286 microprocessor, the PS/1 comes in four versions. At the low end is a single-diskette model (1.44-Mbyte, 3.5-in. diskette) with monochrome VGA display and 512-

Kbit random-access memory. At the high end is a model equipped with a 30-Mbyte hard disk, color VGA display, and 1-Mbit RAM. Gladfelter says 82% of purchasers are opting for the high-end PS/1 with all the options. All models come with a mouse and a modem. Bundled with the hardware is IBM DOS Version Release 4.01 in ROM; IBM PS/1 DOS shell in ROM; Microsoft Works 2.0, which offers spreadsheets, data bases, word processing, and communications; and access to two on-line services.

The first is Prodigy, a nationwide interactive personal service offering travel reservations, stock quotes, electronic

from the usual PC distribution channels. Many industry watchers believe today's slower demand means that existing distribution channels are saturated, which is one reason IBM is turning to consumer outlets. In such a setting, analysts say, a recognizable brand name is absolutely essential, giving IBM a decided edge over any no-name clones that might want to cash in on the home market.

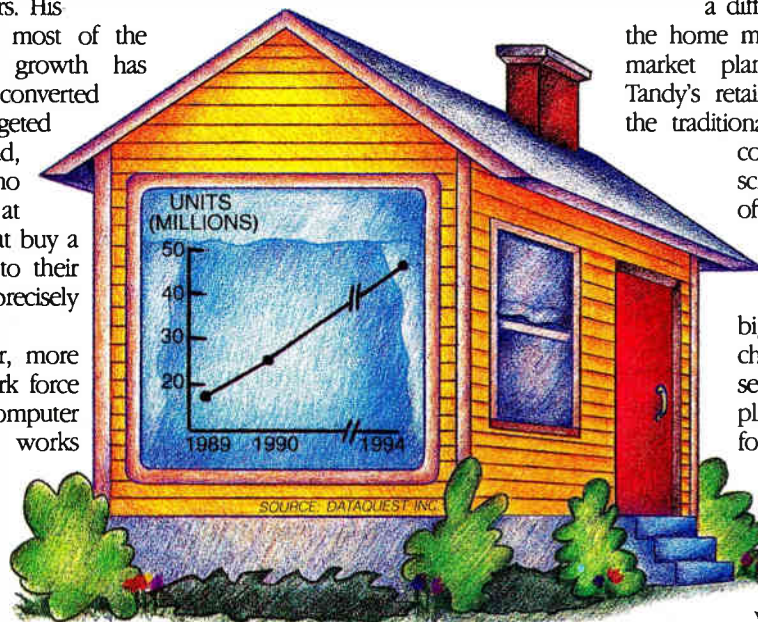
This accent on the home is old news at Tandy. The Fort Worth, Texas, company has been selling into the home market for some time. Last July, it introduced the Tandy 1000 RL, which in some ways parallels the capabilities of the PS/1 but springs from a different view of the needs of the home market. Ed Juge, director of market planning for Radio Shack, Tandy's retail outlet chain, agrees that the traditional reason to buy a home computer is for work or school. "But if I were a home office user, I would probably not opt for what IBM is providing," Juge says. "I would probably go for a bigger, more powerful machine." The 1000 RL is better seen as a high-tech home appliance. "It really is designed for people who don't need a computer at home, who don't have any homework to do, who don't want to know what a database manager or word processor is," Juge says. "We looked at the things

people do at home every day and tried to find which of those would lend themselves to the application of computer technology in a way that makes sense."

The result is an AT-compatible machine with a comprehensive enhanced 24-program set of Tandy's Deskmate software designed for "everyday" applications. The set includes organizer programs for taking inventory of personal possessions or organizing collections, and travel planning. There's a kitchen program for keeping recipes and planning meals. Another program offers financial planning and personal accounting. And there is a series of what Tandy calls Mathcards that perform a variety of common calculations.

Prices for the 1000 RL range from \$750 with a monochrome monitor and a 3.5-in. floppy disk to \$1,299 for a CGA color monitor and 20-Mbyte hard

## MORE PCs ARE GOING HOME



mail, and on-line banking, shopping, and games. The other is Promenade, an education and entertainment service with on-line classes, encyclopedia, computer forums, and publicly available software.

Perhaps the most innovative aspect of the PS/1 is the support and service IBM is offering, an effort designed to offset the consumer's fear of breakdowns and high repair bills. In conjunction with Prodigy, the user can get help on-line or by phone seven days a week, 18 hours a day. A system malfunction will be diagnosed on-line by an IBM expert, and if need be a new part will be shipped express, in 24 to 48 hours. And IBM will send United Parcel Service to pick up the old part.

The PS/1 is being offered nationwide in thousands of retail outlets, including Sears Brand Central—a far cry

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disk. Unlike the PS/1, a modem and mouse are optional, but the machine does offer digital sound recording and playback. A full complement of options will run the cost up to just under \$1,600, still considerably less than IBM's top-of-the-line unit. As for service, Juge points out that Radio Shack has more than 7,000 locations where users can have their machines serviced; or they can seek help by phone or on-line via a modem.

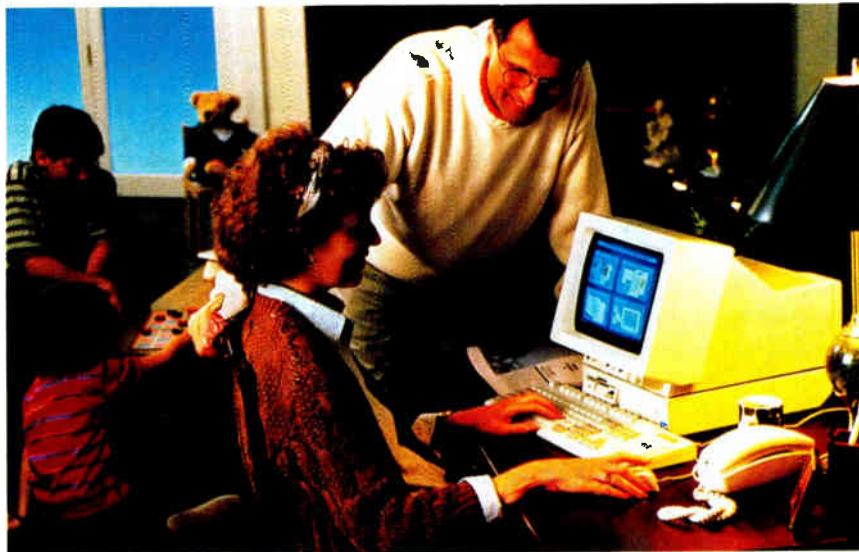
Like Tandy, Commodore has always focused heavily on the consumer market. Its C64 computer was highly successful in the early 1980s and boasts an installed base of 7 million to 10 million units, says Tom Kilcoyne, director of marketing at the West Chester, Pa., company. Now Commodore is aiming its Amiga line at the home market.

Last April, Commodore dusted off the low-end Amiga 500C, which had been primarily sold by dealers, and began a major merchandising push. It's a Motorola 68000-based machine that features high-resolution video graphics via a radio-frequency modulator connected to a color TV. The 500C sells for \$599 and comes with three major software packages: Amiga Textcraft for word processing; "Where in the World is Carmen Sandiego," a popular educational program; and Tetris, a best-selling game. Like its competitors, the Amiga 500C is designed for easy setup and service.

"One of the biggest problems consumers have is how to set up the box, and worrying about what if it should break," Kilcoyne says. "We've developed an innovative program called Commodore Express, a joint program with Federal Express. It's a combination of a 24-hour hotline as part of the warranty program, and a service program by which Federal Express will pick up your defective machine and have it back to you repaired in 72 hours."

Kilcoyne claims the lack of compatibility with DOS-based PCs is not a problem. "Our position is that this is a 'first' computer," he says. "The person who uses the computer at work is probably not our customer. We think we answer the question a lot of parents are asking themselves today: is there life after the video game?"

A new variation of the Amiga 500 soon to be launched by Commodore may enhance its position as an entry product into the home. Essentially an Amiga 500 motherboard assembled in a box with a CD-ROM drive, the Com-



### BRINGING IT ALL BACK HOME

*Based on a 286 processor, the PS/1 is robust enough for home-business use. IBM says 82% of buyers opt for the high-end model.*

modore Dynamic TV (see p. 82) can play compact disks, video games, and special applications disks currently being developed. Input is through a wireless infrared hand-held device. As with the Amiga 500C, output display is a TV receiver. The price at introduction will be under \$1,000, Commodore says.

**M**EANWHILE, APPLE, THE company that Dataquest says has the largest share in the home market, remains unimpressed by all the hoo-ha. "The way I look at the home," says Apple's Mowry, "is that it's not a market—it's a location where business and/or general-purpose computing is conducted. There may not be enough discrete attributes to allow any one manufacturer to go after it in a meaningful way."

Mowry holds that none of the new machines offers any new technology and could quickly become obsolete. "Both Tandy and IBM are offering the same text-based system, and not a very robust one at that," he says. "Tandy has been offering Deskmate software for years, icon-based, so what's new there? Recipe management? Household budgeting? This is not new stuff, it's repackaging old software that's not selling too well, putting it in a box, and saying here's a better value than ever. Frankly, things haven't changed that dramatically in the last three or four years that I could give you better reasons in 1990 to buy a computer than I could in 1986."

Most industry observers fall in on the side of Mowry. "I think the real

home market is for things like fax, and otherwise it's really for a work computer used at home," says publisher Dyson. "I think the notion of taking all the teeth or guts out [of a PC] and selling it for roughly the same price for half the performance for use at home fundamentally won't work." She calls the PS/1 "sort of a condescending PC."

For the computer to succeed in the home, it will have to be repackaged, says publisher Shaffer. "It's already happening. Take a compact-disk player, for example. Here we have basically a high-speed digital-to-analog converter with computers used for track-search techniques and error correction. It's a very sophisticated digital machine, but people don't think of it as a computer."

Shaffer believes that "computers will disappear into the home the way micro-controllers disappeared into our toasters and ovens. The stand-alone computer will still be what it always was—an office machine. Most people don't have copiers or postage meters in their home. Those are business machines, and I don't see why we should be perplexed that most homes don't have business machines in them."

But IBM's Gladfelter is blithely enthusiastic about the prospects for the PS/1. "We feel we may be at the beginnings of one of the true new consumer products of the 1990s," he says. "We've been talking to a lot of our PC specialty and outlet dealers, and they don't see a lot of products on the horizon that show the promise [for growth] the way this computer does." **E**

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64K	UM61165	2 x (2K x 16)	25/35/45
64K	UM6264AL	8K x 8	70/100/120
128K	UM61168	8K x 16	25/35/45
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# CHIP SET VENDORS RALLY AROUND THE 386SX

THEY'RE ALSO PUSHING STANDARD-CELL SOLUTIONS AND GREATER INTEGRATION FOR 286 PRODUCTS **BY JONAH McLEOD**

**A**T THE BASE OF THE FOOD chain for personal computers is the chip set. This handful of integrated circuits surrounding a central processing unit is what distinguishes and differentiates computers made by the plethora of PC clone manufacturers in Asia and the U.S.

The state of the \$543 million chip set market tells a great deal about the general health of the PC industry. Increased competition has forced the average selling price of these chip sets down 25% a year. To protect their ASPs, IC vendors are implementing products in standard cells, which are more cost-effective and harder to copy than the gate arrays previously used.

In addition, IC vendors are turning out products specifically designed for Intel Corp.'s 20-MHz 80386SX CPU, a 16-bit-bus version of the 32-bit 80386DX. Analysts call the SX-based system the hottest PC of the year. Chip sets to build this product, which are available from new as well as established chip set vendors, support cache capability that boosts system performance to the level of a noncache 80486, Intel's high-end CPU.

Finally, IC vendors are turning to higher integration as a means of increasing their product lines. Some vendors are looking at integrating chip set functions and the 80286 CPU on a single chip; Advanced Micro Devices Inc. is the first with such a "motherboard on a chip" (see p. 77). Others are integrating add-in card functions onto a single chip mounted directly onto the PC motherboard.

The chip set market was worth \$465 million last year, growing to \$543 million in 1990 and \$590 million in 1991, according to Dean McCarron, vice president of technology at IC research firm In-Stat Inc. in Scottsdale, Ariz. In 1989,

chip sets for 80286 and 80386SX systems accounted for \$328 million of that total and 32-bit systems made up \$137 million. The 32-bit segment will reach \$186 million in 1990 and \$260 million next year, In-Stat says. Chip sets for 80286- and 80386SX-based systems will grow to \$357 million in 1990 and decline to \$333 million in 1991.

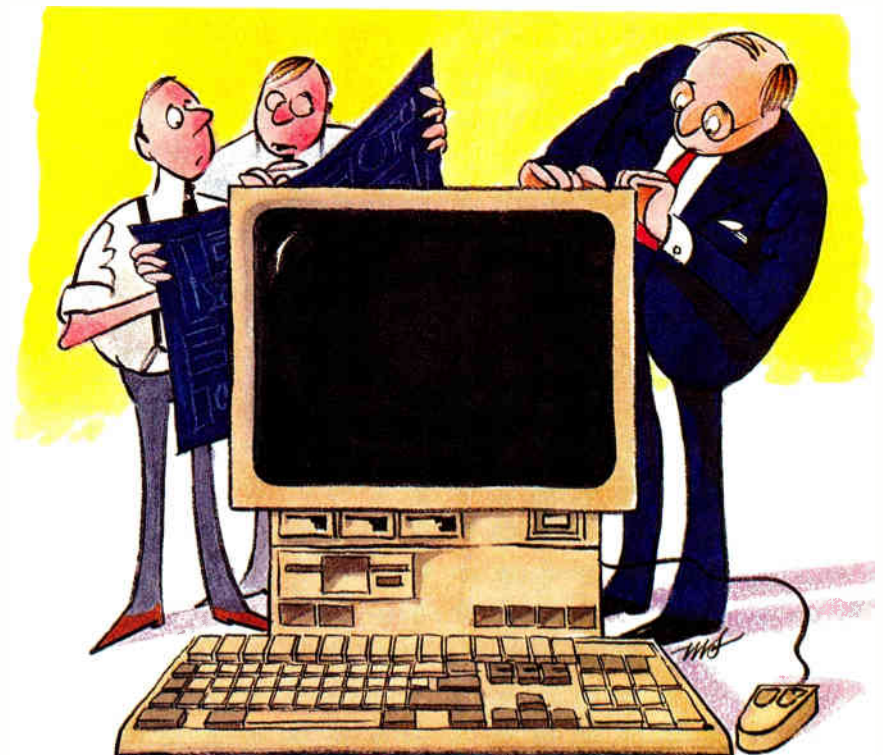
McCarron says that Chips & Technologies Inc. of San Jose, Calif., has the lion's share of the market, shipping \$220 million worth of product last year. A distant second was VLSI Technology Inc., also in San Jose, with \$70 million. Next in share comes GS Technology of Moun-

tain View, Calif., followed by Headland Technology, Xymos, Western Digital, and Texas Instruments.

To climb on that list, suppliers with their own foundries, especially TI and VLSI Technology, have begun to slice prices, leading to a drop in ASP. McCarron says the ASP for 16-bit chip sets could drop 25% per year. In fact, one reason the market for 16-bit chip sets is likely to dip in 1991 is the price squeeze.

To protect their market share from this price erosion, other suppliers are turning out more integrated designs that cannot be as easily duplicated by competitors. Up to now, chip set ven-

**COMPUTERS**



## WHITHER THE CLONES?

*The flurry of 386SX activity raises questions about the 286 clone market. One direction is IBM's PS/1, based on a 286 plus ASICs.*

dors merely created their own gate-array versions of Chips & Technologies chip sets, McCarron says. Now Chips and others are going for greater integration using standard-cell designs that require a higher level of design expertise to duplicate. SCAT (single-chip AT) from Chips, Topcat from VLSI Technology, and SuperAT from National Semiconductor are examples.

Another is Summit from NCR Corp. The Ft. Collins, Colo., company claims this standard-cell offering affords a 30% integration increase over a gate-array implementation. The two-chip set is expected to lower total system cost by a factor of 10.

Yet another way IC manufacturers are going after higher ASPs is by designing products specifically for the 80386SX. McCarron says that while ASPs for the 80286 chip sets have come under severe pressure, ASPs for chips sets sold specifically for the 386SX have not. This is because only a few suppliers are shipping products in quantity.

"The 80386SX-based products are the hottest products on the market," says JoeAnn Stahel, president of StoreBoard, a Dallas market-research house. "Units grew 11% per month in June and July, and sales should remain strong through Christmas." StoreBoard collects and publishes shipment statistics from computer retail stores. (The firm does not track consumer electronics or department stores, nor sales through value-added resellers or system integrators.)

Until recently Intel offered only 16-MHz versions of the 80386SX product. McCarron says that of the 4.8 million SX chips sold this year, 4.2 million—or 88%—will be 16-MHz devices. Because of the identical speeds, clone manufacturers could use existing chip sets meant for the 80286 CPU to build an 80386SX-based PC. However, with the availability of the 20-MHz version of the 386SX, clone vendors have yet another way of differentiating their products. Adding a cache to the CPU provides 80486-like performance at little more than the cost of an SX-based system.

Chips & Technologies' PEAKSX 386SX chip set offering announced in September features the 83C835 two-way set-associative cache and is typical of the solutions the market will field. Vinod Mahendroo, director of corporate marketing at Chips, says adding cache to the 386SX has undermined the noncached 80386DX and 80486-based designs. He sees these systems all being designed as

cache-based systems.

In fact, the SX market is split into two sectors, says Raj Jaswa, vice president of marketing and sales at Opti Inc. in Santa Clara, Calif. One demands low cost and the second wants high performance. In August, Opti introduced its high-end 83C281 and low-end 82C282 chip sets to serve these two markets. "The 83C281 provides integrated direct-map cache that has the same performance as two-way set-associative cache but for less cost," says Jaswa. Opti's strategy with the 82C281 is to provide a low-end 80386SX solution that offers slightly more performance than other chip sets. It has a more limited direct-map cache but provides a 15% performance boost over other chip sets that support page/interleave operation.

**T**HE INTENSE CONCENTRATION on the 386SX market leads to the question of what's going to happen to the 80286 market among clone suppliers. Analysts project a decline in this segment. "The 80286 market is shrinking except for the portables market," says Stahel of StoreBoard. (However, Stahel concedes the declining figures could reflect 80286-based systems moving through distribution channels her company does not count.)

The combination of integrated chip sets and the 80286 is making the handheld PC market—typified by Poquet Computers—a high-volume business, says Michael Slater, editor of the industry newsletter *Microprocessor Report*. The ultimate integration is the 80286 combined with the surrounding chip set. "The technology exists to enable such a combination," says McCarron at In-Stat. One example of how integration is giving new life to 80286-based systems is IBM Corp.'s Personal System/1 home computer (see p. 63). The system contains a handful of application-specific ICs and the 286.

There is one impediment to this happening: having to rely on a sole source for both CPU and logic. Sole sourcing is likely because to differentiate its product a chip maker is not going to integrate the same functions as its competitor. The current problems OEMs

## CHIP SET TRENDS

Average selling price is dropping 25% a year.

Vendors are using standard cells; they're more cost-effective and harder to copy than gate arrays.

In 386SX chip sets, caching boosts system performance to 80486 level. In the 286 market, the drive is toward the "motherboard on a chip."

are facing trying to get sufficient quantities of 80386SX chips from Intel points up the shortcomings of a sole source for a CPU.

The same kind of integration seen in chips for handheld computers is occurring in desktop systems as well. Chip suppliers are providing

single-chip solutions for VGA graphics and input/output control and power management for battery-operated systems. The trend in the desktop market is to integrate the functions once contained on add-in cards onto chips that go right on the motherboard, says Larry Choice, director of the PC products business group at National Semiconductor Corp. in Santa Clara, Calif.

For example, National has just introduced its PC8477 single-chip floppy-disk controller, which can handle vertical-mode recording. It has an on-board analog data separator that Choice says provides better operating margins than the digital data separator found on other single-chip offerings.

In late August, Cirrus Logic Inc. in Fremont, Calif., rolled out its GD6340 VGA controller for color LCDs. It increases the number of displayable colors on any liquid-crystal-display panel by an order of magnitude, thus providing the nearest image to a CRT possible on an LCD. Moreover, it requires only two 256-by-4 dynamic random-access memories to create a complete VGA function for a portable computer.

The battle for real estate on the motherboard is the next great competitive arena for chip set vendors [*Electronics*, May 1990, p. 76]. Each IC maker is partitioning the motherboard and add-in card functionality slightly differently. For example, Western Digital Corp.'s new 7500/7600/7600LP chip set contains four "superchips," one containing storage control for floppy and hard disks as well as real-time clock and power management. A second contains the core logic, a third handles data communications, and a fourth video control.

It is becoming increasingly difficult for system vendors to mix and match chips from different suppliers. How well system OEMs accept these chip set offerings remains to be seen. ■



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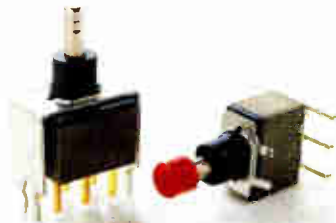
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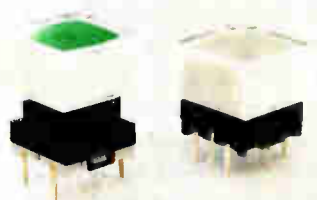
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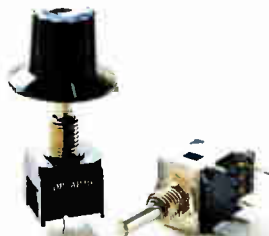
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# WORKSTATION GRAPHICS WITH A PC PRICE TAG

## RISC-BASED CHIP SUPPORTING 8514/A AND VGA BRINGS A SIGNIFICANT DROP IN GRAPHICS-BOARD COSTS **BY SAMUEL WEBER**

**F**OR THE FIRST TIME, A RISC engine has been applied to high-resolution personal computer graphics, and the result is a low-cost, high-performance graphics controller that implements all the popular IBM Corp. graphics modes, including the Personal System/2's 8514/A high-resolution standard. What's more, performance tests running under Microsoft Windows indicate that a high-resolution graphics board based on the new chip will run significantly faster than equivalent products offered by other vendors.

The new Integrated Graphics Array (IGA) from Integrated Information Technologies in Santa Clara, Calif., should find avid acceptance among original-equipment manufacturers and makers of add-in boards. Because the chip works with low-cost dynamic random-access memories instead of expensive video RAMs, board manufacturers have an easy upgrade path. The controller can be initially installed as VGA only, but by adding DRAMs, it can be upgraded easily to 8514/A.

Up to now, graphics boards that include 8514/A capability have been quite expensive, running more than \$1,000. With the new low-cost IGA chip, the manufacturing cost of a 0.5-Mbyte board would be substantially less than that, says Y.W. Sing, IIT's vice president and cofounder. For the user, the chip will bring workstation-level graphics to the PC at modest cost.

"To provide a successful next-generation graphics solution in the PC market," says Sing, "you have to meet four criteria: you have to provide a high-

performance graphics engine, you have to have 1,024-by-768-pixel resolution with 256 colors, it has to be low in cost, and you must be fully compatible with VGA. And we meet all four points in any card built with our chip."

It wasn't long ago that VGA—the Video Graphics Array standard—was the sine qua non for PC graphics, at

**GRAPHICS**

\$1,290, plus \$1,560 for an 8514/A monitor. Although monitor prices have declined in the interim, 8514/A cards from several vendors, including IBM, still top the \$1,000 mark.

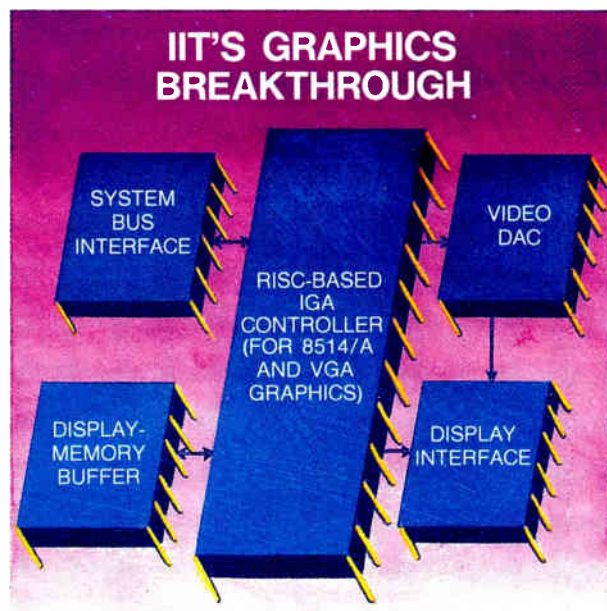
Another approach to high-performance graphics is Texas Instruments Inc.'s TMS34010 and 34020 graphics controllers [*Electronics*, May 1990, p. 103]. But although fast, the TI approach, too, is relatively expensive.

Vendors with 8514/A-compatible offerings include Chips & Technologies Inc. with its 82C480 single-chip device and Western Digital Corp. with a two-chip set, the PWGA1. Neither directly supports VGA.

The IIT chip, by contrast, supports VGA, CGA, MDA, EGA, and Hercules in addition to 8514/A—no easy task considering the standards' differing technical needs. In the pixel-oriented CGA, EGA, and VGA, the central processing unit on the PC motherboard directs the graphics board's frame-buffer logic on a pixel-by-pixel basis. But 8514/A directs the CPU to send high-level graphics commands to a graphics engine for drawing lines and rectangles, making

bit-block transfers (Bitblts), scissoring and other graphics operations, and moving objects around on the screen.

Most graphics adapters capable of implementing both VGA and 8514/A require what amounts to two separate subsystems, one for each standard. Because most available software is designed to support the VGA modes, high-end PCs that implement 8514/A must still provide a VGA mode. Thus most 8514/A boards provide some sort of VGA pass-through



*The IGA needs only one set of RAM buffers, video DACs, and TTL interface chips.*

640 by 480 pixels for standard VGA and 800 by 600 for so-called "Super VGA." But then came 8514/A, with its 1,024 by 768 pixels. With the advent of 8514/A support of such applications as Microsoft Windows, Presentation Manager, and AutoCAD, serious users find that VGA is lacking, Sing says.

But all those pixels don't come cheap: in April 1987, when 8514/A was introduced, an 8514/A card for the PS/2 and 512 Kbits of video RAM weighed in at

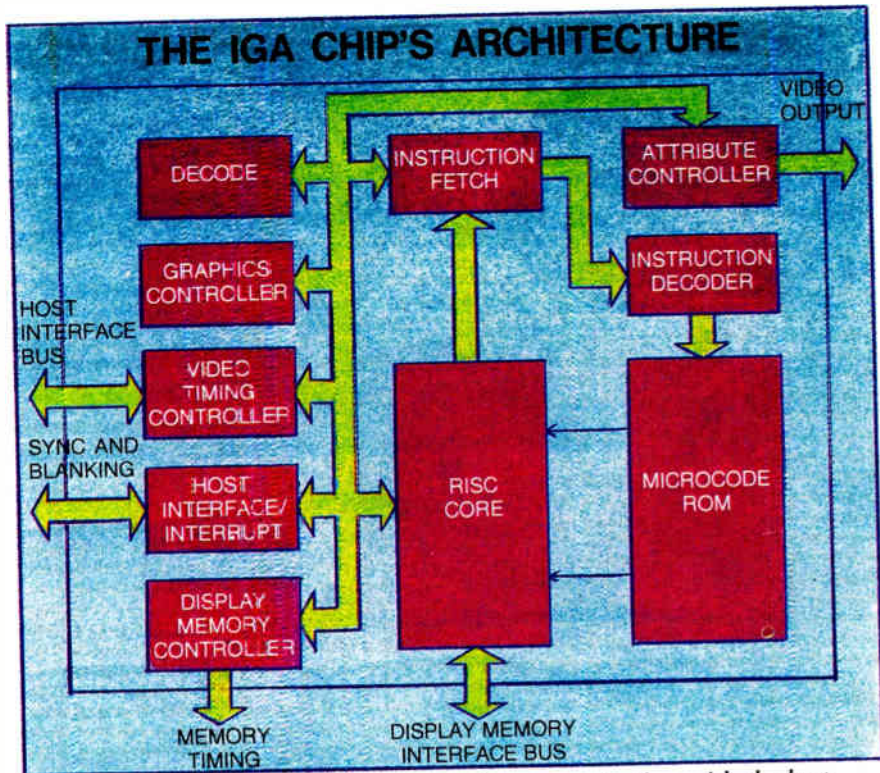
capability without full VGA functionality. To provide both means two processors, two frame buffers, two sets of TTL interface chips, two digital-to-analog converters—and concomitant high cost. But the IIT chip handles both standards with only one set of RAM buffers, video DACs, and TTL interface chips. The result is lower cost and reduced board area. In fact, it is possible to consider putting the IGA on the motherboard, since the chip will automatically switch to the appropriate mode.

IIT is a three-year-old company founded by Sing and Chi-Shin Wang, both formerly with Weitek Corp. of Sunnyvale, Calif. Its current sales level of \$20 million is expected to quadruple this year, according to Sing. The company's first products were floating-point coprocessors compatible with Intel Corp.'s 287/387 but twice as fast. IIT's strategy, Sing says, is twofold: to provide a total solution for the PC motherboard and also to provide high-performance applications. Currently in the works are designs for a 386/486-compatible CPU [Electronics, May 1990, p. 78] and an image compression/decompression chip for multimedia, both targeted for next year.

Essentially, what IIT designers have done with the IGA is to combine two diverse architectures on a single chip. According to Sing, the VGA architecture has five basic components: a bus interface unit that talks to the AT or MicroChannel bus; a CRT controller that controls all the cathode-ray-tube signals; what IBM calls a sequencer, which generates all the internal signal timing and controls the frame-buffer video-RAM timing; a graphics controller that handles all the graphics data; and an attribute controller that handles text and screen manipulation.

The 8514/A architecture is less well-defined, says Sing, but basically it partitions into four components: bus interface unit, CRT controller, timing generator for the frame buffer, and graphics engine. "To put the two together," Sing says, "you have to share a lot of the logic. Right now we share the logic of the bus unit, the CRT controller, and the DRAM controller. That's how we are able to put all this on a single chip."

To accomplish this feat means mastering three tasks, adds Gene Parrott, vice president of sales and marketing. "First you need to design a RISC machine that will solve the problems of both diverse architectures. The VGA



*The host interface/interrupt controls communication with the host interface bus and passes data to all the other units on the board.*

part is a pixel painter, and the 8514/A is a graphics engine—two very dissimilar animals—and you need to have full knowledge of the register-level architectures of both of them." Next, says Parrott, "your RISC engine must be designed to share a lot of the functions between those two parts." And finally, "implementation must be by a full custom design—not a gate array. There are just too many gates."

**I T IS THE ONLY VENDOR** to use a reduced-instruction-set type of graphics engine; most solutions now available rely on state machines. But "a state machine is fixed, designed for a specific application, and can't be changed," Sing says. "Our design is much more flexible because changing the microcode can change the function or features."

The IGA is a 1.2- $\mu$ m, custom-designed CMOS VLSI chip with a RISC processor running at 25 million instructions/s. This single chip is the equivalent of the three large gate arrays used by IBM and other vendors as a hard-wired graphics engine.

The RISC engine takes commands from the CPU, decodes and executes them. The drawing engine provides the hardware support for all major graphic functions—line draw, Bitblts, rectangle

and polygon fill, patterns, vector fonts, and so on. The display processor configures itself using the control registers, reads video memory, and outputs an image to the screen. It also provides all the hardware necessary to emulate VGA, EGA, CGA, Hercules, and MDA.

The CPU sends drawing instructions to the graphics controller via the host bus interface. The graphics controller performs drawing computations and sends the pixel coordinates to the display-memory interface bus.

The decode function interprets instructions sent by the system CPU. The attribute controller receives data from the display memory via the graphics controller and the RISC core, then formats it for display. The instruction-fetch section maintains the flow of instructions from the CPU to the IGA. The instruction decoder provides primary-level decoding of the instructions fetched from the CPU, which in turn drive the microcode ROM.

The latter provides a second level of instruction decoding that produces the microinstructions needed to drive the RISC core computer. The display-memory controller generates basic timing for the display-memory RAMs while the video timing controller generates horizontal and vertical synchronous timing and refresh addressing. **E**

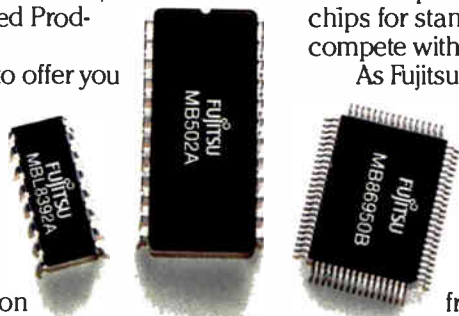


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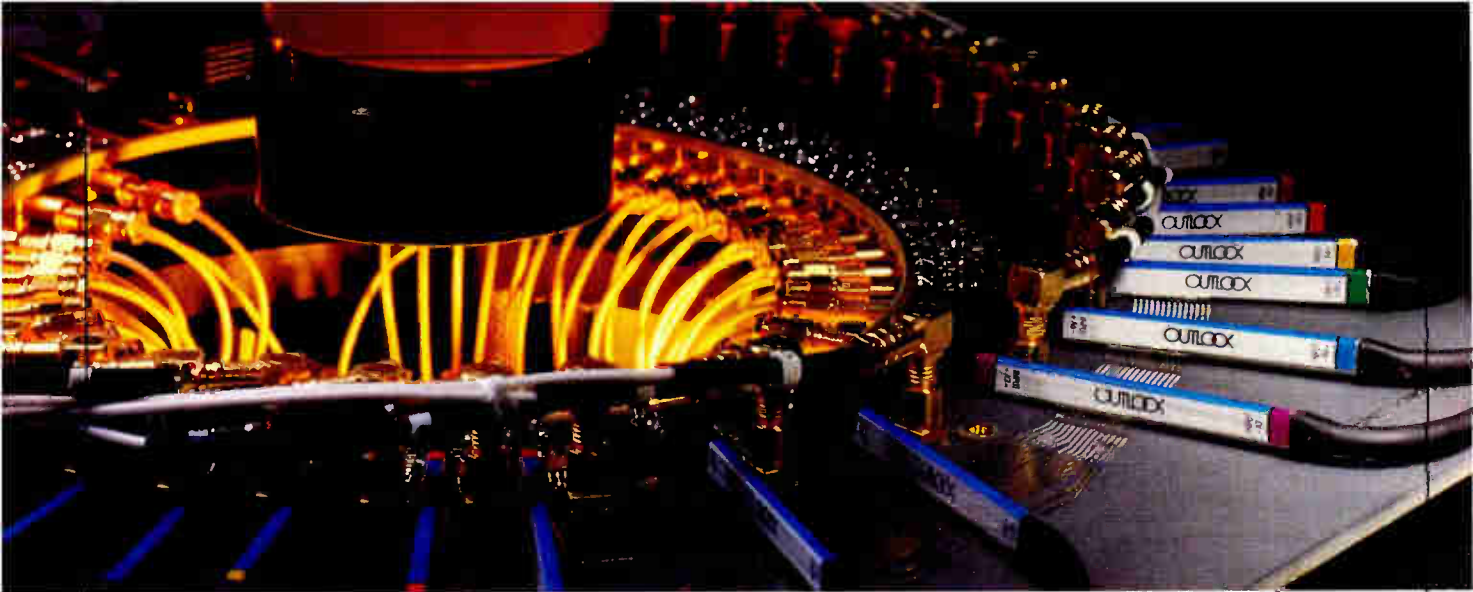
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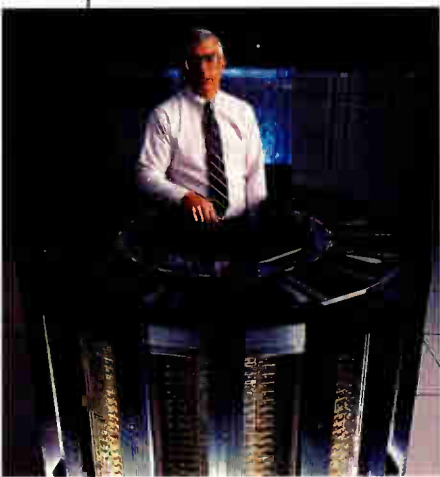


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"We couldn't have tested the Cray3's GaAs ICs without it." — Doug Wheeland, V.P., Hardware Development, Cray Computer Corporation.

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# 'MOTHERBOARD ON A CHIP' BECOMES A REALITY

AMD IS FIRST WITH A PROCESSOR/LOGIC IC, A CLASS OF CHIP THAT MAY BE THE ULTIMATE LAPTOP SOLUTION **BY JACK SHANDLE**

**T**HE AMAZING SHRINKING PC has taken another sip of its magic potion, this time administered by Advanced Micro Devices Inc.'s chip architects in Austin, Texas. AMD has become the first with an integrated "motherboard on a chip," and other chip makers are certain to follow suit.

AMD's Am286ZX and its low-power cousin, the Am286LX, incorporate the functionality of the original IBM Corp. AT motherboard—including the 80286 microprocessor—on a single chip. The space-saving implications of this class of chip will likely change forever the laptop and notebook PC market. Such chips will make it possible to build VGA displays, internal modems, and high-performance hard-disk drives into notebook-size personal computers for the same \$2,000 that now buys CGA displays and a single floppy disk, says Mike Webb, marketing director of AMD's PC Products Division.

The Sunnyvale, Calif., company's breakthrough comes when AMD is expending plenty of corporate energy and resources to nail down part of the microprocessor market. Just as the Am286ZX/LX is rolling out of the engineering department, AMD's lawyers are fighting for the company's uncontested right to manufacture its version of Intel Corp.'s 80386. Some analysts go as far as saying that AMD is betting the ranch on the court's decision, which was due to be handed down late last month.

The new AMD chips replace about 175 chips on the original AT motherboard. Significantly, the integration does not include a display controller, disk-drive controller, or serial and parallel ports. Webb contends these functions are easily satisfied by chips for memory control, disk control, graphics, and communications now being mar-

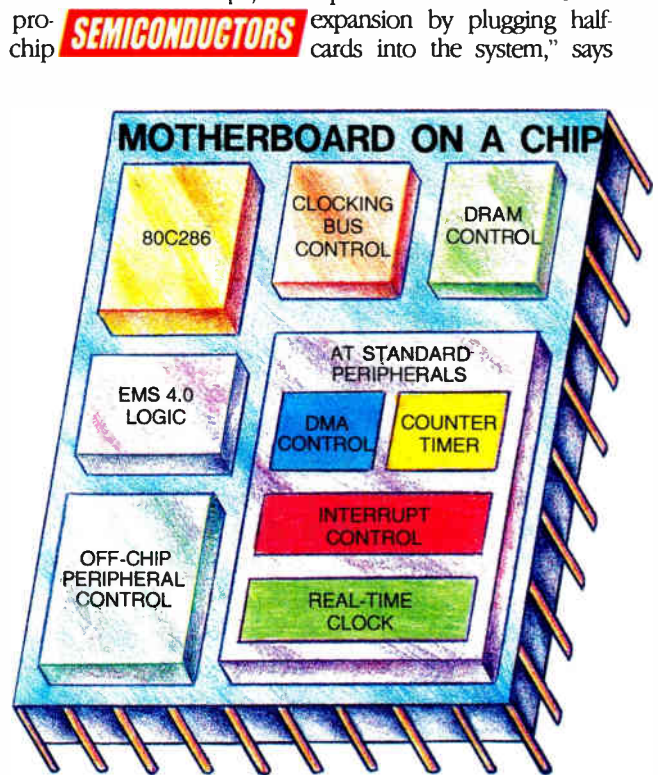
keted by companies such as Western Digital, Cirrus Logic, Chips & Technologies, and Headland Technology.

AMD is in the forefront of the trend toward one integrated processor-plus-system-logic and a handful of memory chips, says Michael Slater, editor of the *Microprocessor Report*, a prominent newsletter in the field. Intel has hinted about a chip that integrates a CGA display controller, memory controller, and input/output ports with its 80386 processor core. Also, chip-set market leader Chips & Technologies Inc. is another likely candidate for a motherboard-on-a-chip solution, says Slater.

While Intel seems to be zeroing in on a 386 solution, AMD's Webb claims the 286 architecture has plenty of life left in it. Higher clock speeds give it plenty of processing power for advanced applications, such as Microsoft Corp.'s Windows 3.0, he says. AT-class microprocessors have also broken an important software barrier that allows them to run very sophisticated applications. They now can address up to 16 Mbytes of memory, and AMD has included Extended Memory System 4.0 logic on its chips.

Other features of special interest to systems houses include power management, easy-to-configure BIOS, programmable bus clocking, and expansion-bus direct-drive capability.

AMD's solution allows for the direct control of two AT expansion cards without glue logic or buffers. "With these chips, it is possible to do a true AT expansion by plugging half-cards into the system," says



AMD's 286ZX and 286LX replace about 175 chips on the original PC AT motherboard.

Webb. Adding buffer devices can provide for more expansion slots. Programmable bus clocking means designers can mix and match a 16-MHz processor, for example, with an 8-MHz expansion bus. As power misers, both chips offer selectable clock rates. The LX also offers a CPU shut-down mode, system shut-down mode, staggered DRAM refresh, and slow-refresh DRAM support. Samples of the 16-MHz chips will be available later this year. A 20-MHz version is waiting in the wings. **E**

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**CIRCLE 184**



# EMBEDDED COMPUTERS ARE GOING MINI

## AMPRO'S DOWNSIZED, LOW-PRICED FAMILY COULD OPEN NEW MARKETS FOR EMBEDDED SYSTEMS **BY JACK SHANDLE**

**T**HE EMBEDDED SINGLE-board-computer market is almost as invisible as the products themselves. Buried deep inside point-of-sale terminals, medical instruments, automated-teller machines, and hundreds of other products, embedded systems easily outnumber their glamorous desktop cousins.

The problem that has traditionally kept manufacturers of these ubiquitous machines awake at night is market fragmentation: sales of any single application tend to number only in the thousands. And with customers demanding smaller and smaller boxes and faster and faster delivery, manufacturers have moved miniaturization and time to market higher on their priority list.

One solution to all three problems comes from Ampro Computers Inc., a Sunnyvale, Calif., company that specializes in embedded-computer boards with standard IBM Corp. Personal Computer architectures. Its CoreMod-

ule family of PC-XT and PC-AT boards measures just 3.6 by 3.8 in. That's less than half the size of the company's earlier products and well under one-fourth the size of a typical single-board computer, says Paul Rosenfeld, vice president of marketing. The industry-standard PC architecture and the use of highly integrated chips also results in attractive pricing, says Rosenfeld. The CoreModule/XT is priced at \$100 each; CoreModule/286 pricing will be about \$150.

Ampro's miniboards are likely to open new markets for embedded systems. In terms of raw chip consumption, embedded systems already outstrip PCs, says Henry Berier, vice president of research for Frost & Sullivan Inc. in New York. Potential users include makers of telecommunications gear, robotics, automobiles, and entertainment equipment. "Many industries have not yet taken full advantage of embedded computers," Berier says.

Designing a CoreModule board into a system is inherently easier than creating a CPU from scratch, but Ampro intends to make it even easier with a development kit that will enable application development on PCs, says Rosenfeld. For applications that require even greater functionality, Ampro is supplying modules that interface with VGA displays and disk drives. Since the CoreModules are built with pass-through headers,

they can be stacked on top of one another as an alternative to card cages. A complete system consisting of one CoreModule/XT, one MiniModule video board, and a MiniModule/FSS (floppy drive, serial port, SCSI interface) can be assembled into a stack measuring just 3.6 by 3.8 by 1.8 in.

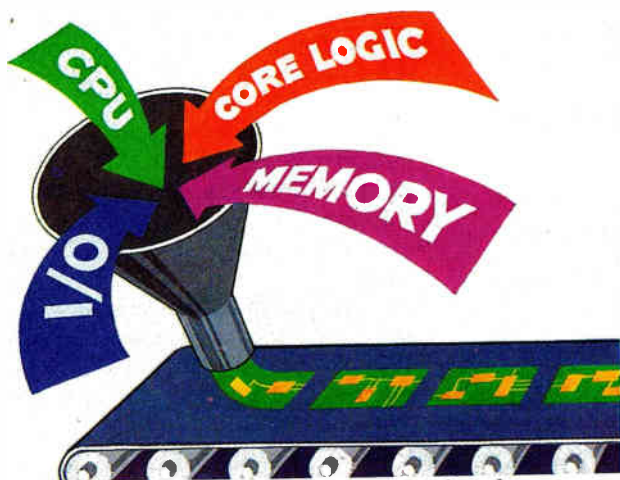
Ampro's emphasis on being a full-service CPU-board supplier has its roots in the fragmentation of the embedded systems industry. "Customers that ship embedded applications of 500 to 5,000 units a year have traditionally had a hard time," says Rosenfeld. "They are too small to get first-class service from semiconductor companies, and off-the-shelf solutions for the most part do not exist."

The strategy is expected to pay off for Ampro's customers in shorter product cycles. A customer-service orientation plus an off-the-shelf solution in an industry-standard architecture is a hard combination to beat.

The CoreModule/XT is based on the 8088-compatible NEC Corp. V20 CMOS microprocessor operating at 9.8 MHz. All the features of a PC-compatible embedded controller are on board, including direct-memory-access and interrupt controllers, and timers. On-board sockets support up to 1 Mbyte of dynamic random-access memory. The module comes equipped with a bidirectional parallel port, an RS-232-C serial port, and a real-time clock with a connector for external battery backup.

When harsh operating environments make the use of hard or floppy drives impractical, sockets on the CoreModule/XT allow on-board erasable programmable ROM or battery-backed RAM to function as a bootable, DOS-compatible solid-state disk. Software utilities can convert any disk-based PC software to solid-state disk operation. **E**

### CANNED SOLUTIONS



*Ampro's CoreModule family shrinks an embedded-computer board to 3.6 by 3.8 in.*

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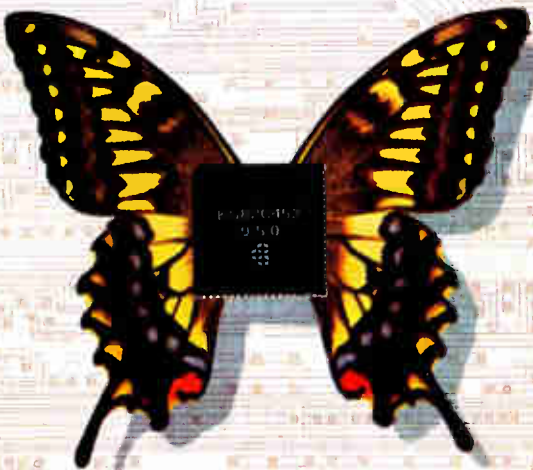
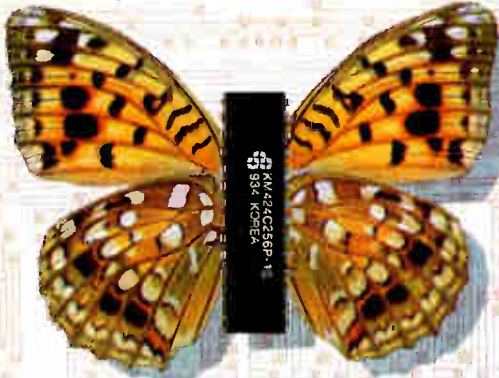
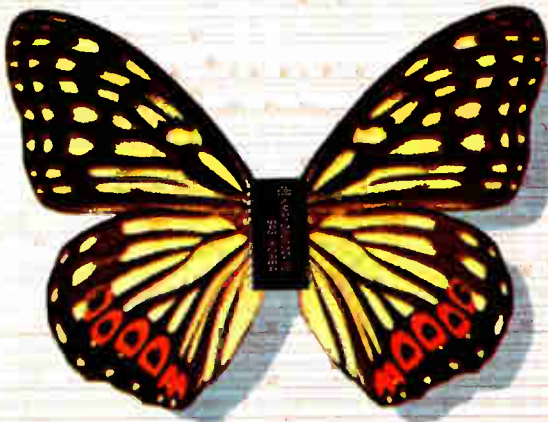
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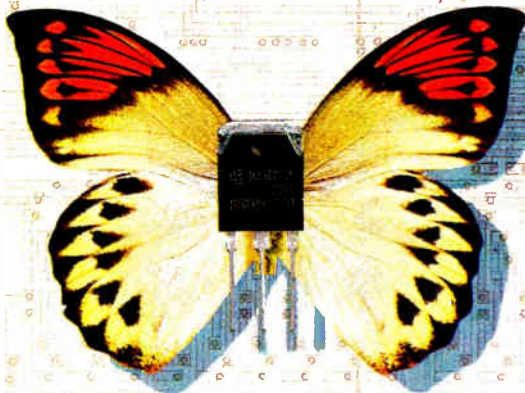
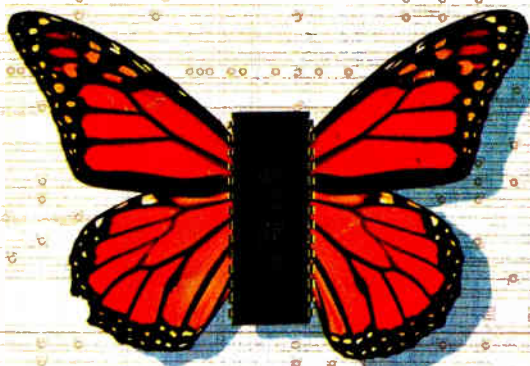
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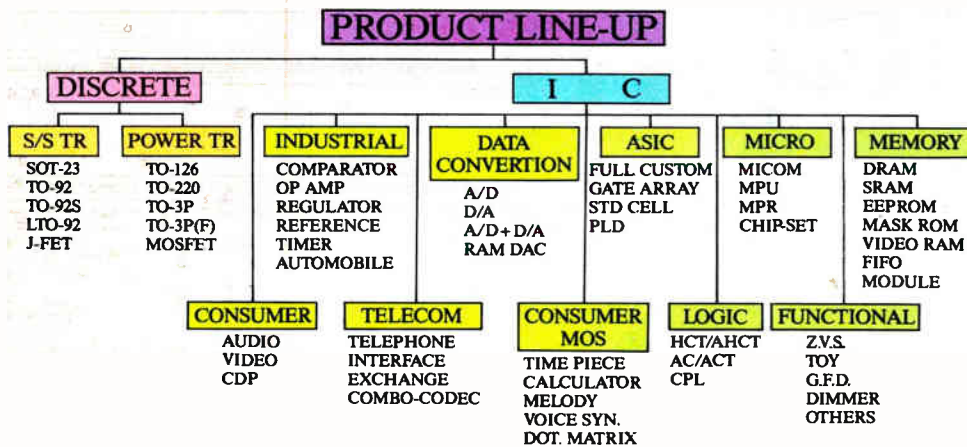


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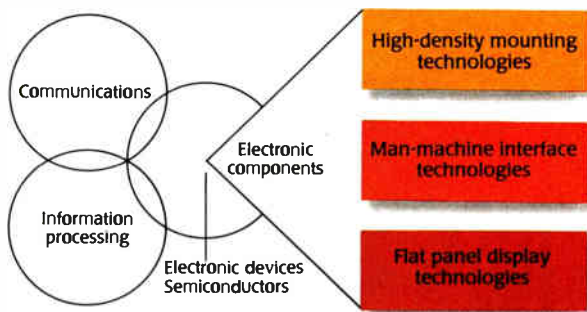
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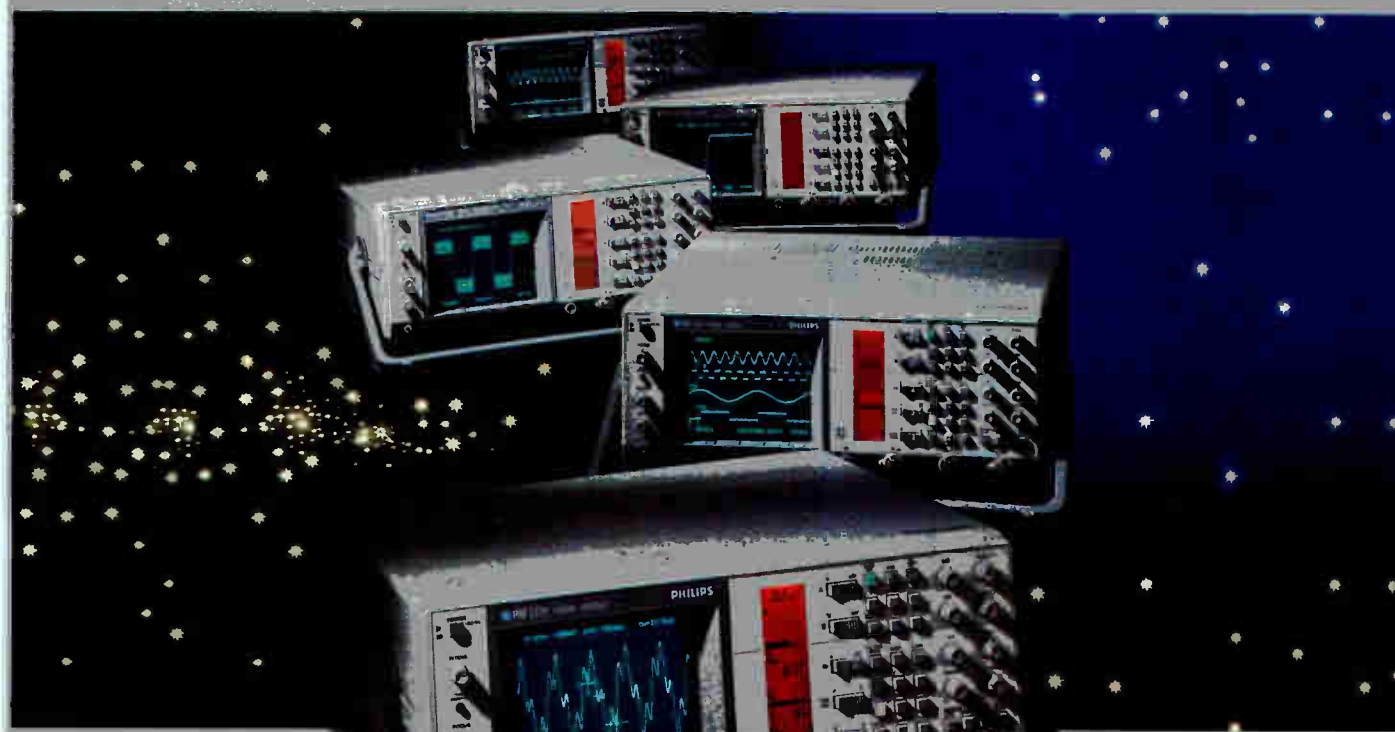
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CIRCLE 196



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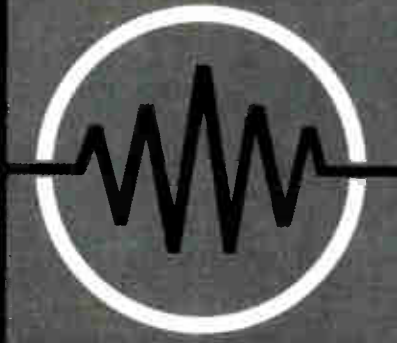


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CIRCLE 210

World Radio History

# CAN CD-ROM TAILOR A NEW IMAGE?

## AS PRICES DROP AND MULTIMEDIA GROWS UP, COMPUTER VENDORS MULL THEIR CHOICES **BY JACK SHANDLE**

**A**FTER YEARS OF WANDERING in the technological desert, CD-ROM has found the path to mainstream computing. Two persistent growth inhibitors have fallen: costs are tumbling and interoperability standards are, for the most part, in place. More importantly, the problem compact-disc read-only memory solves with its 680 Mbytes/disc storage capacity—massive data overload—has arrived at the desktop in the form of multimedia.

Since the beginning of the year, a growing number of high-profile workstation companies—including IBM, Hewlett-Packard, and Sun Microsystems—have made key commitments to CD-ROM. These vendors will increasingly rely on CD-ROM storage as their primary means of distributing the voluminous documentation that supports their workstations. In the meantime, software firms such as Mentor Graphics Corp. and Lotus Development Corp. have joined Microsoft Corp. in using CD-ROM as an integral part of their marketing strategies.

“On the face of it, the standards are in place,” says Fred Meyer, president of Meridian Data Inc., Scotts Valley, Calif. “PCs, Macs, and minis can all read ISO-standard formatted [CD-ROM] discs, and Unix systems are also coming along.”

However, with the exception of Next Computer Inc. and Apple Computer Inc., most of the big personal-computer companies have not embraced CD-ROM. Apple and Next might be considered special cases because their desktop-graphics orientation means storage-hungry applications. The PC world is much more price-sensitive. It also has to figure out where and how a CD-ROM drive will physically fit in the system.

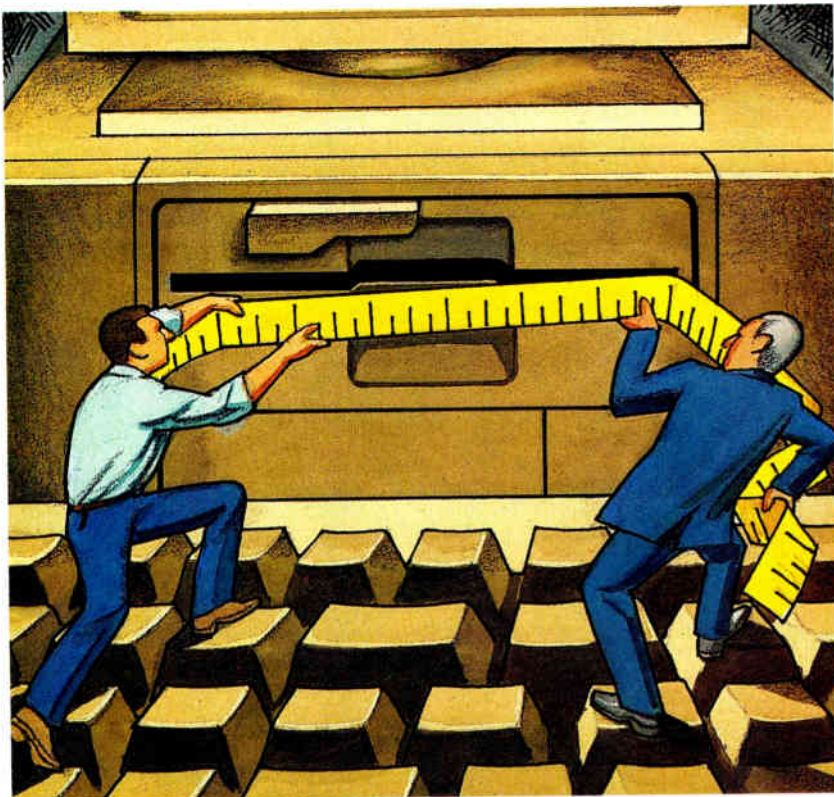
Still, most PC players are giving CD-ROM a hard look. For example, Compaq Computer Corp. of Houston is considering CD-ROM for tutorials and demonstrations of its products, says Mike Perez, director of system technology. Initially, the strategy will be to deliver CD-ROM-based tools to dealers. Compaq might

take a complex operating system for a specific combination of hard-to-configure hardware—one that might take up 14 floppy disks—and put it on a disc so the dealer can install it easily.

Since it is the same basic technology as CD-audio, CD-ROM has always had one foot in the mass market. Crossover products between the computer and consumer markets—such as Philips International NV's Compact-Disc Interactive and a soon-to-be-announced product from Commodore Business Machines Inc.—could reduce the price of drives very quickly.

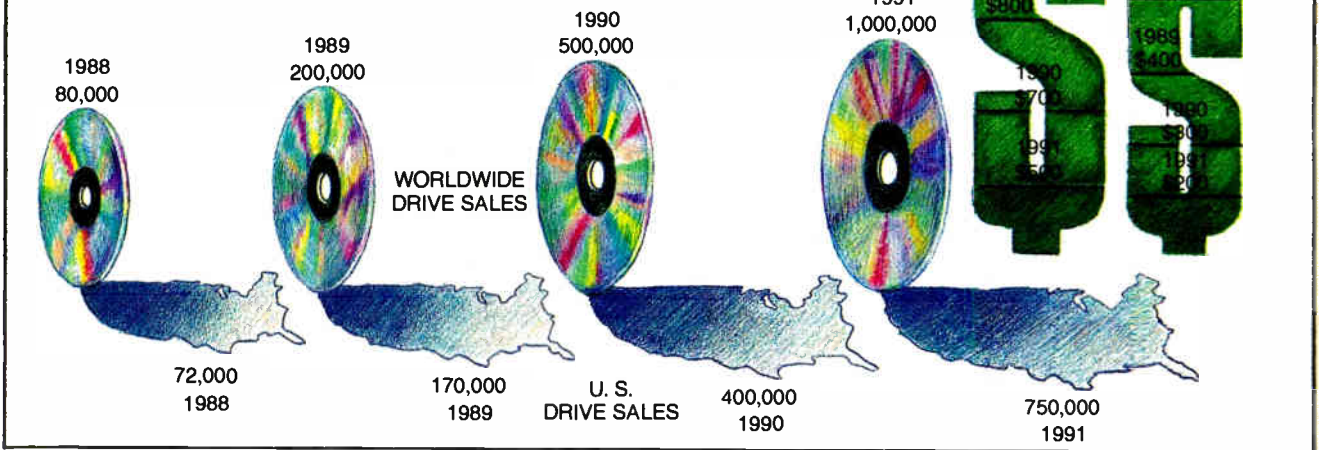
Another crossover—from text-based data to multiple data types, or multimedia—is an additional wild card. “As more media types start to be integrated on the Mac, the pressure grows for more storage capability,” says Larry Kwan, a CD-ROM specialist at Apple in Cupertino, Calif. For example, a simple animation done for an Apple sales presentation requires 15 Mbytes, the equivalent of at least 20 floppy disks. Apple uses CD-ROM internally to supply technical support to its resellers, systems integrators, and support contractors. It has also bundled some of its most popular third-party software on a CD-ROM.

Another driver is cars: in Europe, Japan, and the U.S., automakers have already started install-



## CD ROM GATHERS STEAM

The lion's share of CD-ROM drives will continue to be sold in the U. S. Meanwhile, volume will ramp up—doubling between 1990 and 1991—and OEM and consumer prices will drop steadily.



ing audio CD drives and are getting ready for a new CD application—CD-ROM-based maps and associated software for navigational systems. "That," says Meridian Data's Meyer, "will use a lot of drives."

All this activity makes for a rosy market forecast. Sony Corp. of America expects the number of drives sold worldwide to double between 1990 and 1991, says Alan Sund, marketing manager for Sony's CD-ROM Division in San Jose, Calif. The lion's share will continue to be sold in the U.S., because Europe is at least two years behind in adopting most technologies and Japanese users face higher prices for computer products than those in the other two regions. The U.S. also has a large installed base of IBM PCs and Apple Macintoshes to sell into, he says. Sony's numbers include future products that will be differentiated by performance. But they do not include drives sold for video games.

The market doubles in a single year because of horizontal growth. "There will be a greater number of titles, and people are seeing applications available that they can use—it is not a niche anymore," says Sund. Another driver will be workstations. "The major OEMs have finally tumbled to the fact that there are great productivity gains available through CD-ROM," says Ron Haglund, director of quality assurance, Toshiba Disk Product Division, Irvine, Calif. "Several workstation companies have decided to go for CD-ROM," he says. "They are looking for customization in color, artwork, and interface

features." But, Haglund contends, a broad horizontal market really does not exist yet. "People are waiting for lower-cost solutions," he says.

Price sensitivity gives birth to a possible wild card—the adoption of the technology by the second-tier companies. "If the me-too companies jump on board," says Sony's Sund, "it could impact the number dramatically. They may actively seek to push it and use it to differentiate themselves in the market." Where this phenomenon—major OEMs followed by the me-too companies—used to take years, Sund thinks the cycle has speeded up. "We are already seeing some of this activity in our drive sales," he says. "It takes months now instead of years."

The most perplexing question in estimating CD-ROM's future has to be the PC. As might be expected, early adopters have very specific data-overload problems. Major accounting firms are already sending their agents into the field with CD-ROMs packed with federal tax regulations, says Compaq's Perez, but that is a vertical application. "It would not surprise me to see whole CD-ROM systems available soon. Whether it would be embedded or not—whether it would be standard or an option—that is another question. Cost is generally prohibitive in including it on every machine," he says. The cost of drive plus controller must be \$200 to \$300 rather than the current price tag of \$500 to \$600.

Perez also expects an active community of video developers to enter CD-ROM

because Intel Corp.'s Digital Video Interactive and Philips's CD-I, which run on microprocessor-based platforms, have dropped the hardware cost from hundreds of thousands of dollars into the \$10,000-to-\$50,000 range. "But this is not mainstream use," he says. "If you want to do textual things the cost is primarily the same as the cost of the drive. But even the most rudimentary video productions require the purchase of add-on PC boards costing \$1,500 to \$2,000.

"How all this functionality is going to make it to the user's desktop is somewhat clouded," he continues. "I expect to see early adopters have multimedia by the middle of 1991 and mainstream applications that drive customers' acceptance, such as a Lotus 1-2-3, by Fall Comdex 1991."

**C**OMMODORE, MEANWHILE, could upset everybody's apple cart with a product introduction this month. Housed in a black, 19-in.-wide box that looks more like a home stereo tuner or amplifier than a PC, CD-TV combines a CD-ROM drive with an Amiga 500 motherboard. It is, in fact, designed to fit a stereo-system rack and will cost "well under \$1,000," says Lloyd Mahaffey, vice president of marketing for the West Chester, Pa., firm.

The Amiga is a very respectable PC, but Commodore is underplaying the computer aspect of CD-TV. The input device of choice is a handheld unit that looks like a hybrid between a video-game controller and the remote-control channel selector of a video cassette re-

corder. Other input devices, including mouse and keyboard, are available. All use infrared light instead of wire to communicate with the CD-TV box. At introduction, Commodore will have 25 titles, including games and home-reference-type discs. It expects to have 100 titles by Christmas.

The machine plays CD audio discs, of course, because they are a subset of CD-ROM. If one or more of the applications catches the public's imagination, the product could be a winner. But Mahaffey agrees that \$900-plus is significantly over the \$500 price point generally set as a limit for a successful consumer product. The \$200 OEM price predicted by Sony for CD-ROM drives in 1992 is a bit high for broad-based consumer use, says Mahaffey.

**W**HILE THE COST BARRIER is falling, other problems still confront CD-ROM. One is intractably set in the CD-ROM standard: the 150-Kbyte/s data-transfer rate. In performance-oriented systems, this means the additional expense of caching data on magnetic hard disk, as Next has done with its Unix workstation.

A more tractable, but still unsolved, problem is the wide variety of search-and-retrieval packages for CD-ROM—not to mention their per-disc cost. Instead of selling applications that run on standard platforms, the CD-ROM industry has tended to put the search-and-retrieval software on the same disc as the data, says Gail Bower, marketing programs manager for KnowledgeSet Corp., Mountain View, Calif.

The end user pays a royalty for each disc. So while it may cost just \$2 to replicate a disc, another \$75 to \$100 may be tacked on as a royalty for the search-and-retrieval software. This situation is largely a result of the technology's initial growth environment: highly vertical applications in which data is really what the user buys. But pricing is not completely rigid. For example, KnowledgeSet, a leading vendor of such software, licenses its products at \$75 per disc, but for applications in which the data is updated several times a year, it charges publishers \$125 a year per subscriber. In pricing analogous to shrink-wrapped software, KnowledgeSet offers a lifetime license of \$300 per workstation.

Sophisticated search-and-retrieval software based on hypertext techniques is an absolute necessity for CD-ROM, because its massive data capacity

overburdens simple word-key searches. Similarly, some sort of standardization is also needed. "The user should not be required to learn a new application every time he uses a disc from a different publisher," says Meridian's Meyer.

Given the royalties to be had, it is not surprising that every company marketing search-and-retrieval software is trying to make its product the de facto standard. There is, however, a middle ground. Search engines can be transparent to users, says Meyer, as long as companies adopt a similar user interface.

But recent court decisions have cast some doubt on whether anything like a common user interface can be quickly implemented without stirring up at least a little copyright trouble. In particular, Lotus's successful suit against Paperback Software Inc., in which the court declared that Lotus could copyright menu commands, has created an undercurrent of anxiety in the CD-ROM industry. The concern is not that a common interface will not ultimately be agreed upon, but that the intervening uncertainty could seriously retard CD-ROM market growth. "It [the Lotus decision] is not the best thing for the industry," says Meyer. "The market probably will not tolerate a plethora of complex user interfaces."

In the meantime, there is no de facto industry standard, and publishers have gone to great lengths to develop high-powered engines. Microsoft Windows has gone a long way toward resolving that problem, says Meyer, but it remains to be seen how much of the fledgling industry will embrace Windows as a common interface.

"Everybody is doing their own information-retrieval front end now, and that is part of the evolution," says Compaq's Perez. The situation will sort itself out over time. Perez thinks that eventually CD-ROM search software will be part of operating systems. Publishers will simply write to an application programmer interface. "The operating system will pick up the graphics, which is somewhat already there in Windows and Presentation Manager for OS/2. Audio will also be expected to be in the operating-system services. I wish it could happen a lot

## MEGASTORAGE

The CD-ROM market should double between 1990-91, fueled by the computer industry's growing need for its 680-Mbytes/disc storage capacity.

As prices fall, the industry eyes the technology's remaining problems, including a 150-Kbyte/s data-transfer rate that makes life difficult for high-performance systems, plus software search-and-retrieval issues.

earlier," says Perez.

Another view of the trend toward standardization is held by Doug Iles, the product development manager of Hewlett-Packard Co.'s Application Support Division, based in Mountain View, Calif. In text-and-graphics applications, the Standard Generalized Markup

Language will be used as a format to aid any search engine, and the government's Computer-Aided Logistic Support (CALs) will be another important contributor to a format, he says.

Similarly, efforts of the Air Transport Association to formalize a standard format and search engine to be used with voluminous airline maintenance manuals are ahead of most of the rest of the industry and could likewise contribute to the standard-setting process.

Despite numerous market-acceptance victories over the past year, CD-ROM will continue to confound market forecasters. In the future, however, their prognostications may prove to be too low instead of too high. Any number of new or upcoming products could make quite a difference. For example, two products Sony introduced in July could spur the growth of audio on CD-ROM for business uses.

The first is an adaptive differential pulse-code-modulation board, which compresses digital audio information into the CD-ROM XA format for much longer play time than conventional PCM. It treats a hard disk like a CD-ROM drive for development. The board's audio compression also generates a low-bit-rate data stream that permits audio interlacing—the process of weaving digital audio with graphics to create interactive multimedia applications. The second is a PC add-in card that replaces the CD-ROM interface and lets the drive play both CD-ROM and CD-ROM XA discs.

While audio compression is desirable, it is not a necessity. Hewlett-Packard proved that when it introduced its first computer-based training platform that uses CD-ROM. HP bypassed CD-ROM XA encoding, and used all off-the-shelf parts. Graphics, audio, and text are included in a course for data processing professionals responsible for operating HP3000 business computers. ■

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# SKYSTATION PUTS NEW SPIN ON A SUN

## ACCELERATOR GIVES SUPERCOMPUTER-LIKE ZIP TO SPARCSTATIONS WITHOUT CODE ALTERATION

BY LAWRENCE CURRAN

**S**EEING A BURGEONING market in reduced-instruction-set computing workstations, Sky Computers Inc. has come up with an application accelerator that couples with one of the hottest-selling RISC boxes around—the Sun Microsystems Inc. Sparcstation 1+—providing super-computer-like performance without opening the box or changing software.

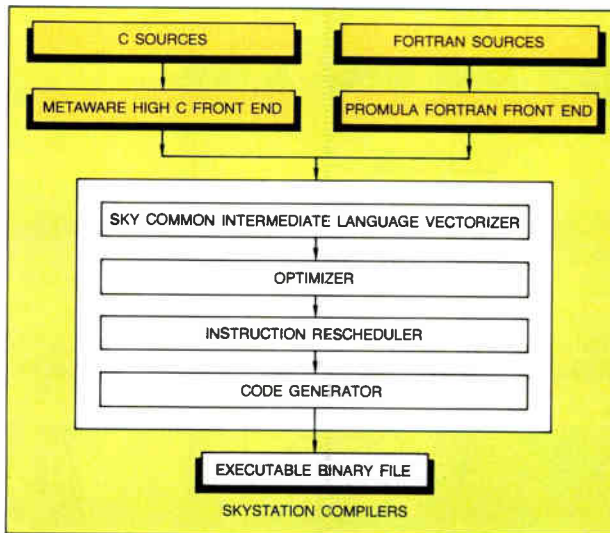
### WORKSTATIONS

The new Skystation fits either above or below a Sparcstation 1+ in a desktop "pizza box" that has the same dimensions as the Sun workstation. Connected to the Sun machine over a Small Computer Systems Interface (SCSI-2) port, it boosts the workstation's performance to 65 million instructions/s in scalar computations or 12 million floating-point instructions/s for a Linpack benchmark. The Skystation is intended for such applications as computational chemistry, fluid dynamics, signal processing, and solids modeling.

Sky Computers was probably the first company to mate Intel Corp.'s i860 and i960 RISC processors on a board-level accelerator [*Electronics*, October 1989, p. 17]. Now the Chelmsford, Mass., firm has housed that board in a box, added memory, the SCSI-2 interface, and innovative vectorizing compilers to greatly boost the Sparcstation's performance.

The Sparcstation 1+ is built around a 15.8-mips, 25-MHz Sparc chip. International Data Corp., a Framingham, Mass., market research firm, estimates that Sun will deliver about 115,000 RISC workstations this year, a large fraction of them the 1+ configuration.

The 40-MHz i860 is the Skystation's arithmetic processor, with the i960 acting as system processor to handle most input/output operations plus data and program management. This partitioning allows the i860 to concentrate on what it does best—number crunching.



### SKYSTATION'S VECTORIZING SCHEME

*Linked vectorizing/optimizing compilers turn C or Fortran program code into binary code.*

The i860 provides peak integer performance of 40 mips and peak floating-point execution of 80 megaflops single precision or 40 megaflops double precision. The arithmetic processor is directly linked to the Skystation's dynamic RAM, consisting of 2 to 256 Mbytes on one to eight daughterboards. The 2-Mbyte version sells for \$9,950.

The Sparcstation 1+'s central processing unit operates under the control of the host SunOS operating system, providing operator interface routines and peripheral device management; the i960 system processor executes a kernel that binds the Skystation to a host server process.

Since the Skystation can run entire applications, it transforms the host Sparcstation into "a desktop supercomputer," says Jeff Wilson, product manager at Sky. "You simply plug the Sparcstation SCSI-2 connector into the Skystation, and recompile and relink your Fortran-77 or C program." An entire program is loaded

into the Skystation's memory and executes on the i860; a server process executes I/O tasks, such as disk I/O, on the Sparcstation. The server process communicates with application programs over the SCSI bus.

The compilers embody one of the most important elements of Sky's added value. The Skyvec C and Skyvec F77 vectorizing and optimizing compilers can compile any ANSI-standard Fortran or C program code, without modification, into binary code that runs on a

Skystation. Wilson says that no additional programming or changes to a customer's source code are required, as long as the program's system calls are appropriate for the target system.

Skyvec C is an enhanced version of the High C optimizing compiler from MetaWare Inc., Santa Cruz, Calif. Sky has added the ability to vectorize code so that the compiled code can take advantage of constructs in the source code that can be vectorized. Skyvec F77 stems from the combined efforts of Sky, MetaWare, and Promula Development Corp., the Columbus, Ohio, developer of the Promula Fortran compiler.

The compilers have a common back end consisting of a vectorizer, optimizer, instruction scheduler, and code generator. The vectorizer converts vectorizable operations in the source code into calls to highly optimized vector subroutines that make maximum use of the Skystation's pipeline architecture, substantially speeding code execution. **E**

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## QA IN SOFTWARE? MINC SAYS YES

**BY JACK SHANDLE**

**T**HE FOUNDERS OF MINC Inc. started out with a peculiar idea about software: quality assurance should be built in from the ground up. "QA is going to be done either by the manufacturer or by the customer," says

president Wayne Gutschick. "We think it's smarter for us to do it."

Putting that theory—which is about as common in the software industry as teeth in a hen—into practice has paid off handsomely for the Colorado

Springs, Colo., company over the past four years. The users' list of Minc's design-synthesis software for programmable logic devices and programmable gate arrays reads like a Who's Who of the electronics industry: IBM, Hewlett Packard, Digital Equipment, AT&T Bell Labs, Compaq, and Data General, to name a few. Many important computer-aided design companies have integrated Minc software into their packages. These include Mentor Graphics, Valid Logic, Dasix, Intergraph, and Teradyne. In Japan, Minc software runs on the NEC 9801 workstation.

"We shipped our first product—PLDesigner—in March 1988 [*Electronics*, Feb. 4, 1988, p. 136] and we became profitable in July 1988," says Gutschick. Minc has enjoyed a steady stream of profits ever since. As a privately held corporation, it does not divulge financial data, but Gutschick claims it keeps the equivalent of four



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to six months' expenses as cash in the bank for contingencies. "We could finance our next expansion through retained earnings," he says.

The founders inherited their devotion to quality from a common employer. All five—Gutschick, chairman Gene Warrington, and vice presidents Kevin Bush, Mehrdad Banki, and Bill McDermith—worked for Hewlett-Packard Co. before forming Minc. The idea, according to Gutschick, was to engineer and manufacture software under the same philosophy that HP uses for instruments.

Tests are developed for each software module and the module's code itself must be written with hooks so that it can be supported, modified, and adapted. One set of software generates all of Minc's products as well as the product variations for specific corporate partners that integrate Minc's software into their CAD packages. That way, a bug that is fixed once remains fixed in all the variants.

Applying hardware-manufacturing quality-assurance techniques was a natural for Warrington, who had been in charge of HP's printed-circuit-board manufacturing operations in Colorado before founding Minc. But it was not easy. Minc could not find a broad enough defect reporting and tracking system, so it created its own. "Each defect is given a weight," says Warrington; "the goal is to cut defects in half with every release." Each problem is referred to someone from engineering, marketing, or administration who must file a "found-and-fixed report" within a specified time.

Minc's customer-support program leverages the quality-assurance process. Besides making for contented customers, aggressive support actually reduces the demands on Minc's staff. "We can cut down a lot on our customer support if we are sure the software is properly installed," says Bush, who is vice president of engineering. Minc phones the customer two weeks after the product—or product revision—is shipped. If the customer has not gotten around to installing the software, he is persistently called back until it is installed and working properly. Similarly,



**Minc's Gutschick: doing it the HP way.**

Minc takes it upon itself to pester customers into installing revisions. This cuts down considerably on the number of calls reporting problems that have already been fixed, says Bush.

Customers are treated as individuals. "Software people have to have things explained in one way and hardware people in another way," says Bush. And, "engineers are well known for not

reading the manual." Rather than buck that character trait, Minc permits a customer with a problem to send his design to Minc's customer-support organization by fax or modem for help that can reach all the way down to the circuit level.

With three years of success under its belt, Minc is getting ready for new ventures. "Are we looking to be acquired or merged? No," says Gutschick. "But if we see some appropriate technology we are looking at acquisitions." For a software company with a zero-defects philosophy, that kind of acquisition may be hard to find. **E**

**RFT SEL NACHRICHTENELEKTRONIK**

## APITZ HEADS EAST-WEST COMBINE THAT MUST BE REORGANIZED ALONG FREE-MARKET LINES

# A NEW CAPITALIST

**BY JOHN GOSCH**

**I**T IS POSSIBLE THAT NO manager has ever faced the challenge thrust on Jürgen Apitz. He must turn a group of former state-owned and ramshackle production units controlled by the communist regime of what used to be East Germany into a capitalist-style, profitable company that can compete on world markets.

Apitz is chairman of the management board of RFT SEL Nachrichtenelektronik GmbH in Berlin. A communications equipment maker, it is one of the first—and so far biggest—electronics joint ventures emerging out of the newly united Germanys. And like the task its chief executive faces, the new company is an unusual one as it brings together two organizations that were once diametrically opposed in economic philosophy.

One is a national trust institution representing the interests of previous East German companies that were part of the state-controlled communications equipment combine that had 37,000 workers. The other is Standard Elektrik Lorenz AG, the subsidiary based in Stuttgart, Germany, of France's Alcatel NV, Europe's biggest telecommunications company. Each has a \$42 million stake in the new outfit.

The new company's prime activity

will be manufacturing the System 12 switch and marketing it not only in the communications-starved East German regions "but throughout East Europe and elsewhere," Apitz says. For SEL, then, the new company is a base from which to penetrate additional markets with its System 12.

Raising productivity is among Apitz's prime goals. "We must cut back the work force to adapt ourselves to the requirements of the new business environment and become a productive and efficient company," he says. That means slashing the number of workers from 6,000 at mid-1990 to 4,000 by year's end. "At that level we should be able to reach our targets." These are \$250 million in sales this year and "well above that in 1991."

Capitalist words like profits, effectiveness, marketing, and cost accounting come easy to Apitz. "I had clear conceptions of these things, knowing that a company, if it's to be successful, must be organized and run accordingly," Apitz says. "But I had no chance to implement my ideas. Now I do."

Apitz has no illusions. "Sure, SEL is betting on me," he says. But that's no job guarantee. "I must show that I can efficiently run a company operating in a market-driven economy." **E**

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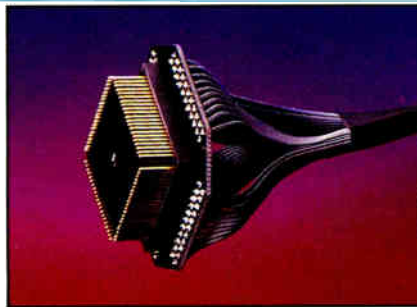
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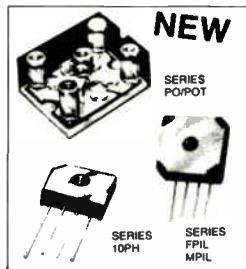


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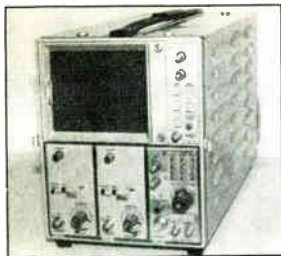
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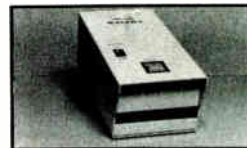
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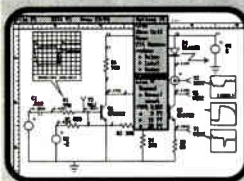
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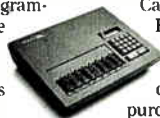
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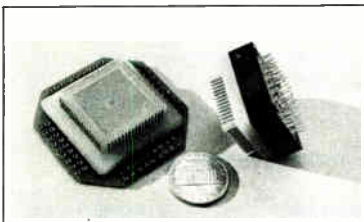
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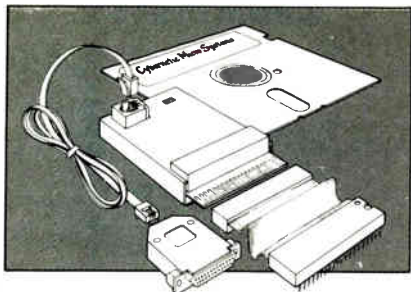
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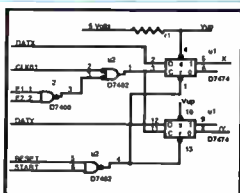
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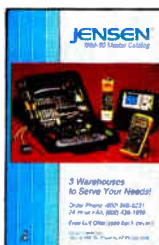
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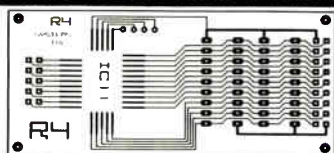
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## INDUSTRY BUILDS MUSCLE DESPITE RECESSION TALK

**H**EADLINES ABOUT IMPENDING RECESSION may be sending anxious quivers through planning committees of corporate America. Fearing the worst, the stock market has penalized share prices mightily since July, and electronics issues have fared much worse than the average stock in the recent downturn.

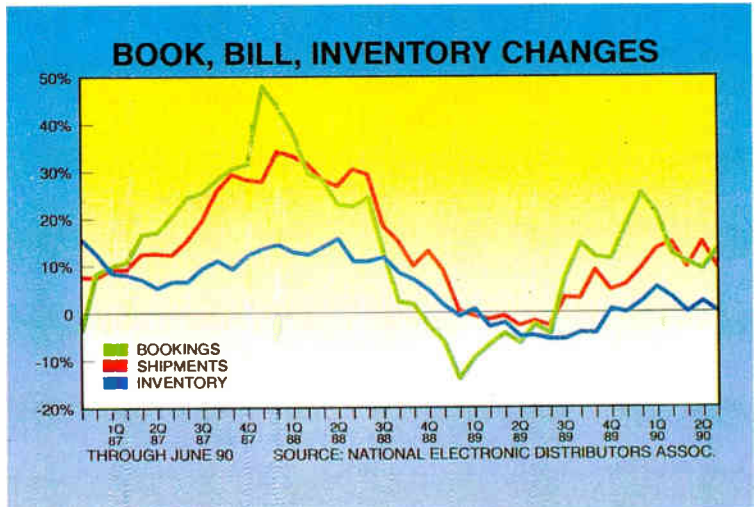
However, trends in orders, inventories, and backlogs all remain encouraging. Order momentum is continuing to build in computer and components markets, while the already strong communications equipment market is holding its own. In particular, the computer market has finally rejoined the overall trend of continuous inventory improvement that began in 1985.

Remember 1981-82? Then, countercyclical effects of increasing defense spending and the emerging personal-computer market more than offset the drain created by overall economic conditions. Conversely, the general economy was sailing along merrily in 1985, a time most electronics executives would prefer to forget.

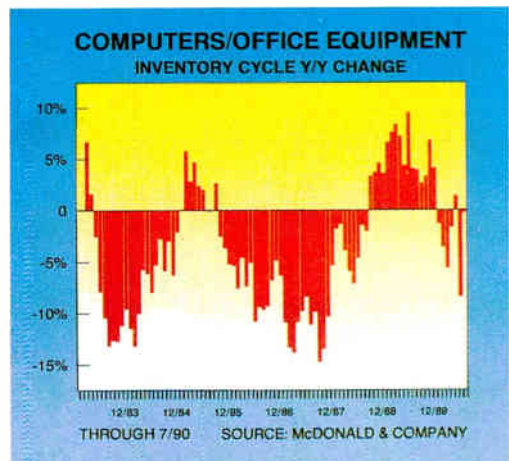
Most trends point to the beginning of a major new growth cycle in electronics. New growth markets, strong current order patterns, and a weaker dollar all offer evidence that the electronics industry may well weather a general economic recession. Take automotive electronics: it has blossomed to almost the same size as defense electronics 10 years ago. Also, a new wave of portable data devices and has the potential to significantly surpass the size of the pure desktop market. ISDN, networking, and cellular radio are adding further fuel to the fire. Even defense orders are strengthening.

The electronics industry may have slowed down a bit, but it's much further from a midlife crisis than some would believe. **E**

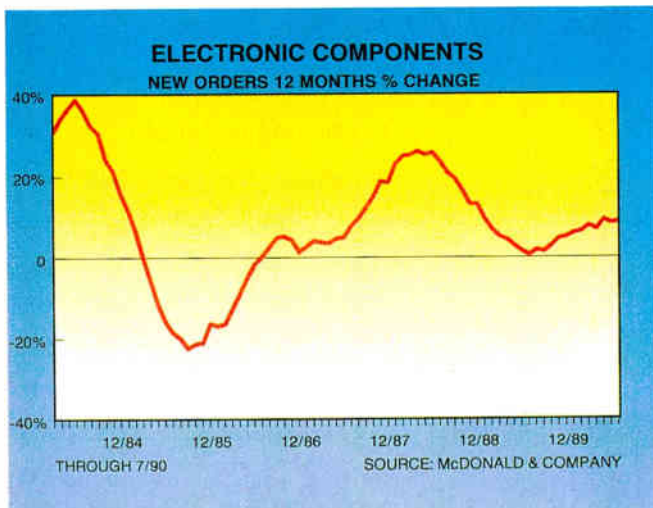
By Mark Parr, Montgomery Securities Inc., Cleveland (216-443-2379)



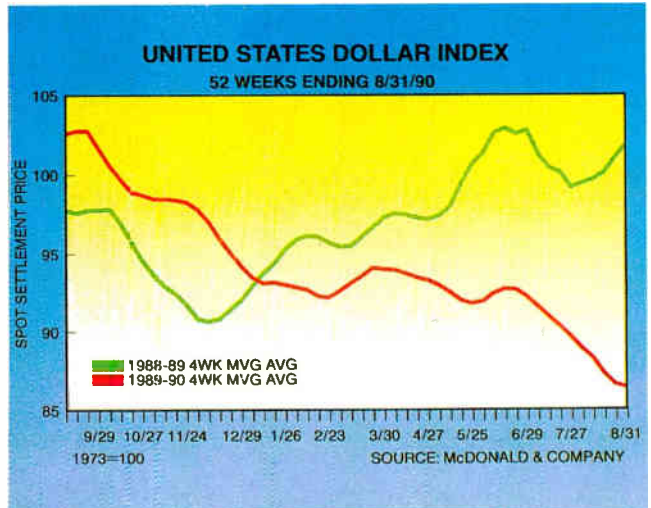
Despite talk of recession, the picture in billings, bookings, and inventory remains healthy.



In the computer markets, order momentum is strong and continuing to build.



Components orders continue the steady climb that began more than a year ago.



The weakening dollar could help electronics weather a general recession.

## Advertiser's Index

Abbott Transistor Laboratories, Inc.....30	Epson Semiconductor GmbH.....47**	Needham's Electronics .....92
Advanced Microcomputer Systems, Inc.....91	Executives on the Go.....48A-48P	Netherlands Foreign Investment .....47*
Aldec.....17	Fenner Industrial Controls.....2	NKK Switches .....72*
Amp Corp.....24-25	Ferranti Venus.....42	Nohau Corp.....90
Ampro.....5	Floyd Bell, Inc.....93	Orbit Semiconductor.....10-11
Analog Devices.....37,39,41,43	Fujitsu APD.....75	Ortel Corporation .....3
Anritsu.....22-23	Fujitsu Ltd.....54-55**	Outlook Technology.....76
ASM Lithography.....78	Genrad.....16	Performance Semiconductor Corp.....29
Avex Electronics.....50*	Hewlett Packard.....44-45*	Philips Test & Measurement ....50**,59**
Cermetek Microelectronics, Inc.....93	Ikos.....Cov 2,1	Photo Research .....53
Chicago Laser System, Inc.....72**	Integrated Device Technology.....56	Pico Electronics.....15,27
Clearpoint.....20	Intel Corp.....12*,68	Programmed Test Sources .....40
Contact East.....91	Intusoft.....92	Project Unlimited, Inc.....93
Cybernetic Micro Systems.....93	Itac Systems.....2	Pulizzi Engineering .....92
Cypress Semiconductor.....Cov 4	Jensen Tools Inc.....93	R4 Systems, Inc.....93
Data Delay Devices, Inc.....38*	Karl Liester.....38*	Recortec, Inc.....93
Data I/O Corp.....92	L-COM.....90	Robotrol Corp.....90
Datawrap Inc.....91	Le Croy.....14	Rolyn Optics .....91
EDI Corporation.....92	Mental Automation.....93	Samsung Electronics.....44-45**
EIOM.....81	Ming Engineering.....92	Siemens Components, Inc.....71*
Electronic Devices.....91	Motorola Computer Group-MCD.....60-61	Silicon & Software Systems.....86
EMS.....92	Munich Trade Fairs International.....88	Silicon Composers, Inc.....90
Emulation Technology.....91	NCR.....8-9	Sonnenschein Lithium .....38**
	NEC Corporation.....18-19	Standard Telephone.....12**

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Silicon & Software Systems.....86
Silicon Composers, Inc.....90
Sonnenschein Lithium .....38**
Standard Telephone.....12**
STC Components .....90
STI/Datronic Corp.....92
Tele Quartz GmbH.....62
Tesoft Corp.....91
Texas Instruments.....32 a-b,32-33
Toshiba America Electronic Components, Inc.....54-55*
TRW Electronic System.....59*
United Microelectronics Corp.....67
Utah Economic Development Corp.....36
Victor.....65
Viewlogic Systems, Inc.....85
Wickmann Werke AG.....96
Wintek Corp.....91
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Zenith Data Systems.....Cov 3
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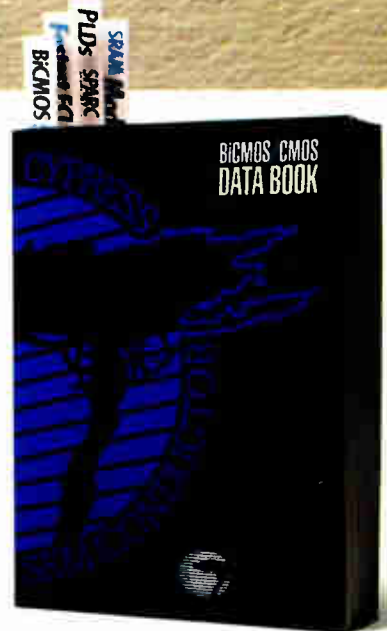
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