A PENTON PUBLICATION

SEPTEMBER 1991

Electronics

FIRST MAGAZINE OF GLOBAL ELECTRONICS MANAGEMENT

CAMPAIGN '92

THE POLITICS OF TECHNOLOGY

How the parties are tackling industrial policy—or failing to

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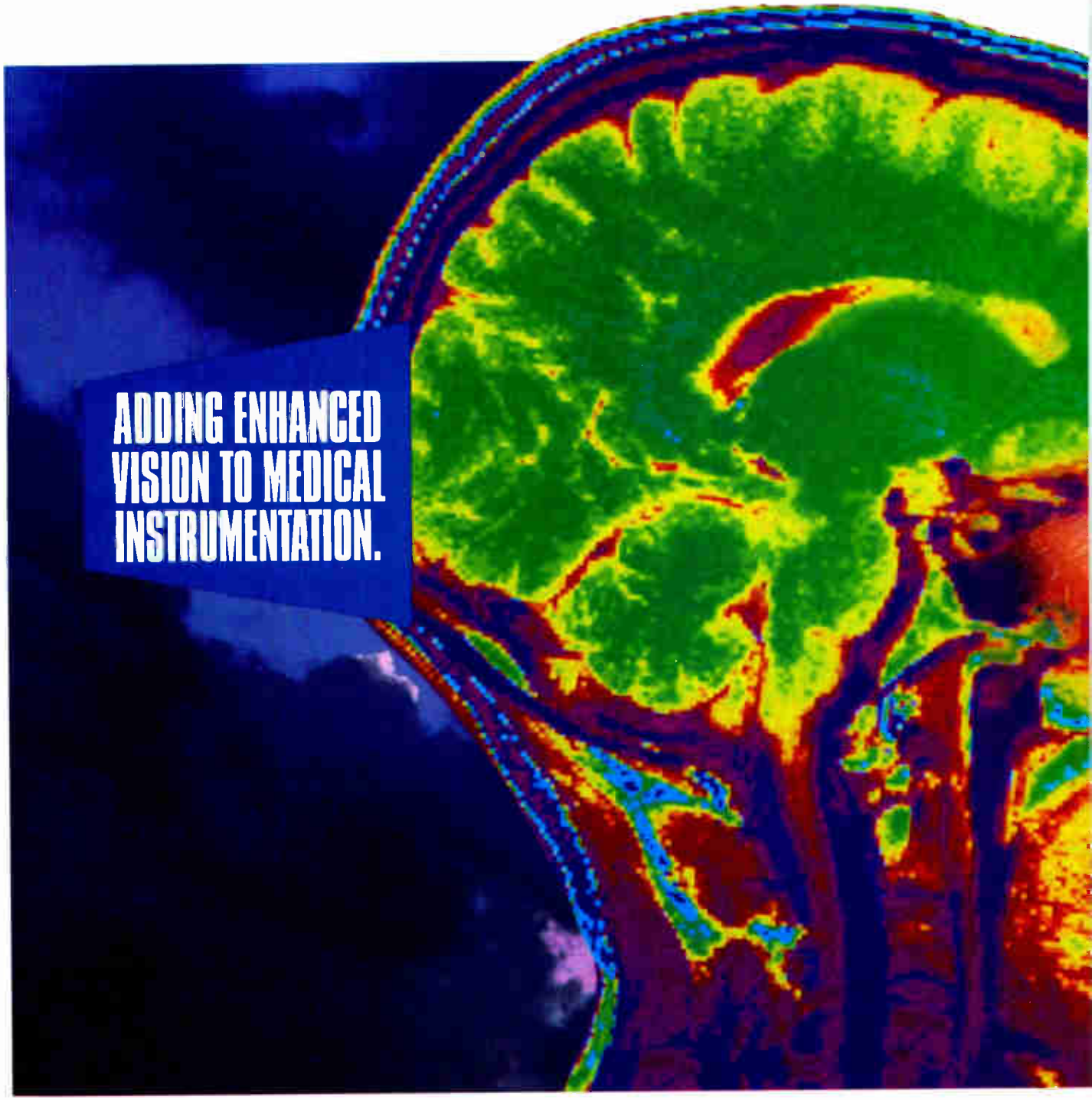

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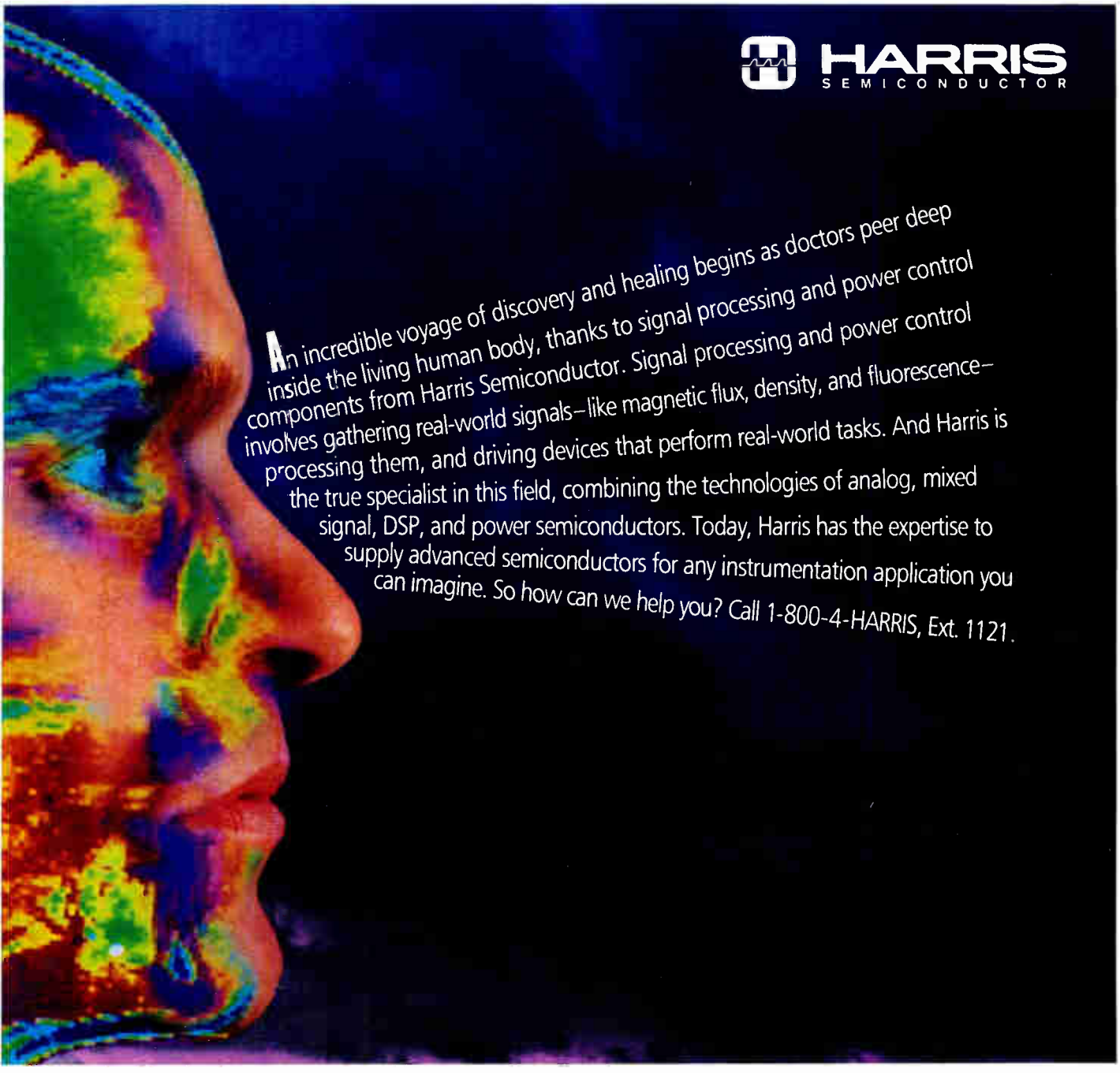

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Electronics

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September 1991 Volume 64, Number 9
Electronics (ISSN 0883-4989) is published monthly by Penton Publishing, Inc., 1100 Superior Ave., Cleveland, OH 44114-2543. 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 44114-2543): (216) 696-7000.

Subscriptions free to qualified managers. All others: $60 for one year in the U.S.; $70 in Canada; $136 in all other countries. For subscriber change of address and subscription inquiries, call 216-696-7000.

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MR. SMITH GOES TO WASHINGTON

From the birth of the industry, electronics company leaders have wrapped themselves in the garb of the rugged individualist: Bill Hewlett and David Packard; David Sarnoff of RCA fame; Arthur Collins, who made the best radios in the world; and early tube pioneer Lee deForrest. These men believed that any problem could be engineered away, given the right resources, and it was with this problem-solving paradigm that they approached the U.S. government in seeking help for their industry. "Electronics companies worked as scrappy outsiders, descending on Washington with a cause, achieving their goal, and then returning home afterwards," says Ken Hagerty, who runs the consulting company Public Affairs Services Inc. in the nation's capital. For example, the late John Fluke Sr., founder of the John Fluke Mfg. Co. in Everett, Wash., originated the idea of an investment tax credit with the American Electronics Association. Silicon Valley executive Ed Zschau took the idea to Washington, where he succeeded in turning it into the Investment Incentive Act of 1978.

These executives viewed Washington as a nice place to visit but no place to live. "High-tech executives don't have the temperament for becoming a special-interest group," Hagerty contends. This is partly because the industry, except for telecommunications, is largely unregulated. Regulated industries invest in the political process. They all have lobbyists continually educating Congress and the White House about industry needs. "And these special-interest groups are better at bringing home the bacon than scrappy executives who come with a cause and then leave," Hagerty says.

At no time in the evolution of the electronics industry is the need for education more important than now. The U.S. industry is engaged in a fierce competitive struggle against companies whose national governments have targeted high technology as a means of achieving economic advantage in world markets. If the U.S. is to remain in its preeminent position, industry executives are going to have to roll up their sleeves and become politically active. In Silicon Valley, Ed Zschau represents this new thinking. Zschau ran for, and won, the California 12th Congressional District seat, where he served for two years. After an unsuccessful bid to unseat Sen. Alan Cranston, he returned to San Jose, Calif., where he is president of Censtor Corp.

Zschau believes that the industry must be involved in the political process long term. It needs to realize that the elegant logic of the physical world, with its mathematically rigid laws, does not apply in Washington. Good reasons do not make good politics. Laws are made by men and women, and there are no rigorous standards by which to gauge their acts. What is done today can be undone tomorrow. Unlike the physical world, the political world requires constant fine-tuning—and the industry needs to get with it. ❑

Jonah McLeod

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EDITOR

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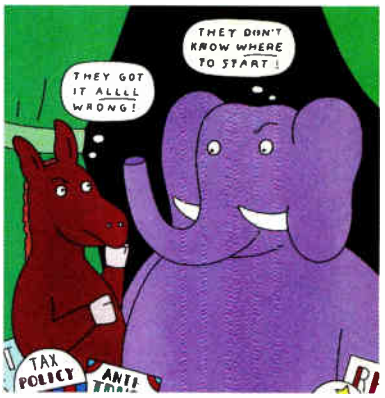

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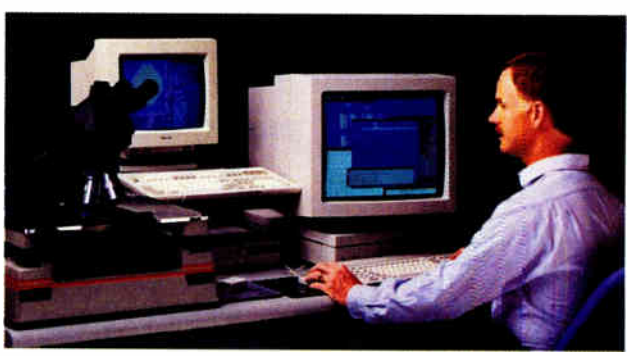

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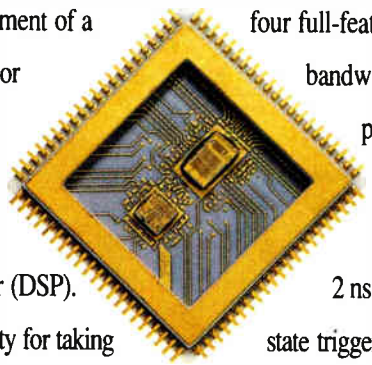

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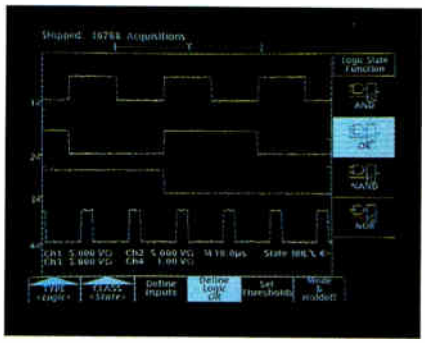

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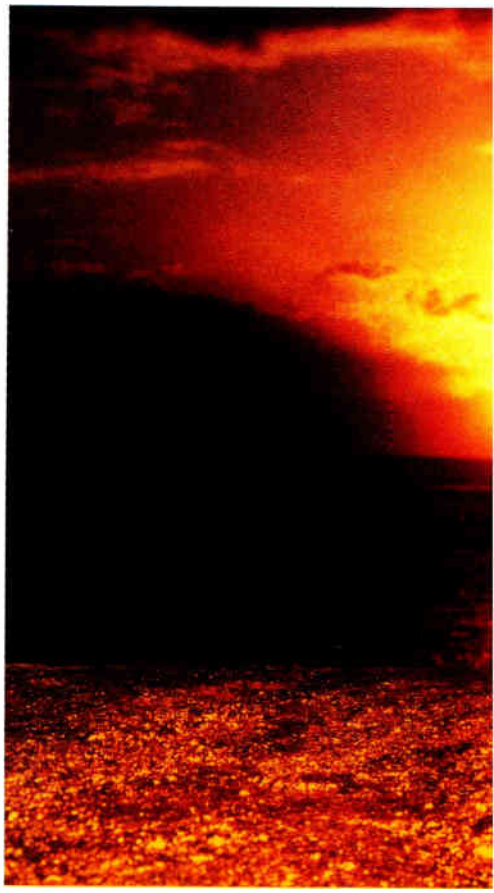

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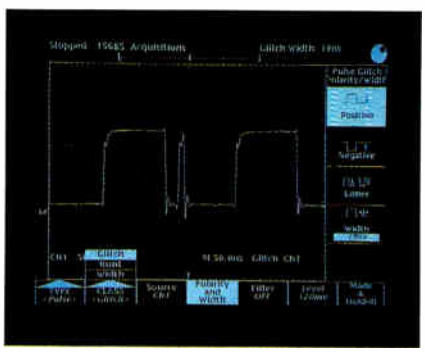
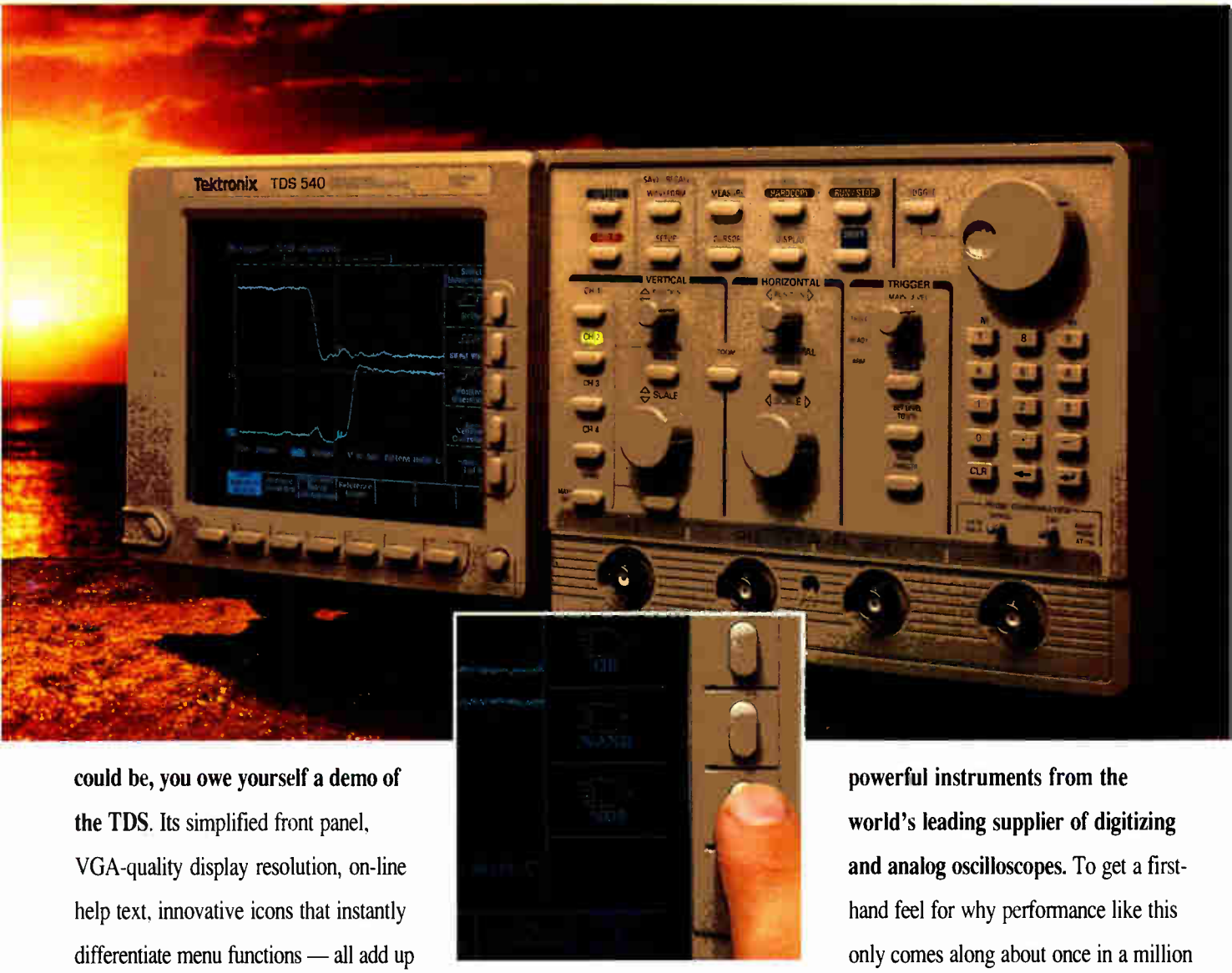


million oscilloscopes one like this.



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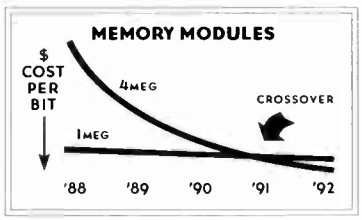

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LETTER FROM

MADRID

SPAIN INVESTS HEAVILY IN COMPUTERS AND AN ISDN PHONE SYSTEM

A LAND OF UNLIMITED ENERGY

BY ANDREW ROSENBAUM

It's 4 a.m. on an ordinary weekday in Madrid, and on the highways leading into Spain's capital traffic is jammed. That's just one manifestation of the enormous fund of energy that the Spanish seem to enjoy, one that other countries can't match.

Spanish energy is reflected in the nation's economy. The country simply hasn't stopped moving ahead since 1986, the year that Spain became a member of the European Community. It has enjoyed explosive economic growth, with a gross national product that jumps 6% to 10% a year. Even the government's efforts to cool down what it perceives as an overheated economy have come to nothing, blasted away by the fury of such energy.

Many say that much of the heat was generated, but pent up, throughout the years that the dictator General Francisco Franco ruled the country with an iron fist, but did little to stimulate the economy or develop the infrastructure. Now, the democratic monarchy running Spain is making up for lost time, particularly by investing sizable sums to improve the telecommunications network and information-technology facilities for the bureaucracy. For example, the government is converting the entire telephone system to ISDN, the eagerly awaited integrated services digital network. More than half will be done by the end of 1991, and the transformation should be complete within five years.

"The areas in which service is already greatly improved," says Pedro Lain, deputy managing director of AT&T España, "are those of the so-called Golden Triangle—Madrid, Barcelona, and Valencia. These are the big economic hubs. But reforming an entire system so quickly is a gigantic project; it's like building [a huge ocean liner]." AT&T is supplying Spain's national telecom provider, Telefonica de España, with intelligent networking, switches, and software. Line demand is higher every year, according to analysts.

Private telecom providers are also doing well. Local-area-network sales are just beginning to take off, but the country's outdated telecommunications regulations, requiring private companies to use Telefonica's lines and switches, is slowing growth for wide-area networks.

"The EC is pressing the Spanish government to change this basic telecommunications legislation," says AT&T's Lain. Many observers believe the government will soon have to comply, opening value-added telecom services. One byproduct of the booming telecom sales is a concurrent increase in the Spanish demand for test and measurement equipment.

On the semiconductor front, the Spanish market is nothing to write home about. That is the case even though AT&T Co., taking advantage of low labor costs, manufactures application-specific ICs in Spain for export to European customers. "There is little consumer electronics manufacturing, and just a fledgling computer industry," explains one IBM Corp. executive.

But computers are a different story. Although manufacture of the machines is just beginning, the Spanish have been buying them in ever-increasing num-

IT'S A GREAT PLACE TO WORK (BUT NOT TO SLEEP)

One group that really has reaped the benefit of all the industrial activity that is going on in Spain is Spanish engineers. They are well paid, and tend to move rapidly from one company to another. "There is definitely a shortage," says Carlos Vivas, a manager with Hewlett-Packard España. "We're hiring them in the first year of master's training."

Not surprisingly in light of the ISDN thrust, Vivas says that telecommunications engineers in particular are raking it in. "They float from one company to another, wherever they can get the best deal," he says. All in all, it would appear, Spain is not a bad place to be involved in electronics.

But before you start hunting for your passport, consider that it's common for an engineer to work a 9 a.m.-to-8 p.m. shift, dine from 10 p.m. to midnight, and wrap up the day with friends in the downtown *tapas* bars until dawn. Then it's back in the office a few hours later at 9 o' clock sharp. Says one weary woman executive who worked for an American company in Spain: "I just couldn't bear having business dinners. They just go on and on."—*A.R.*

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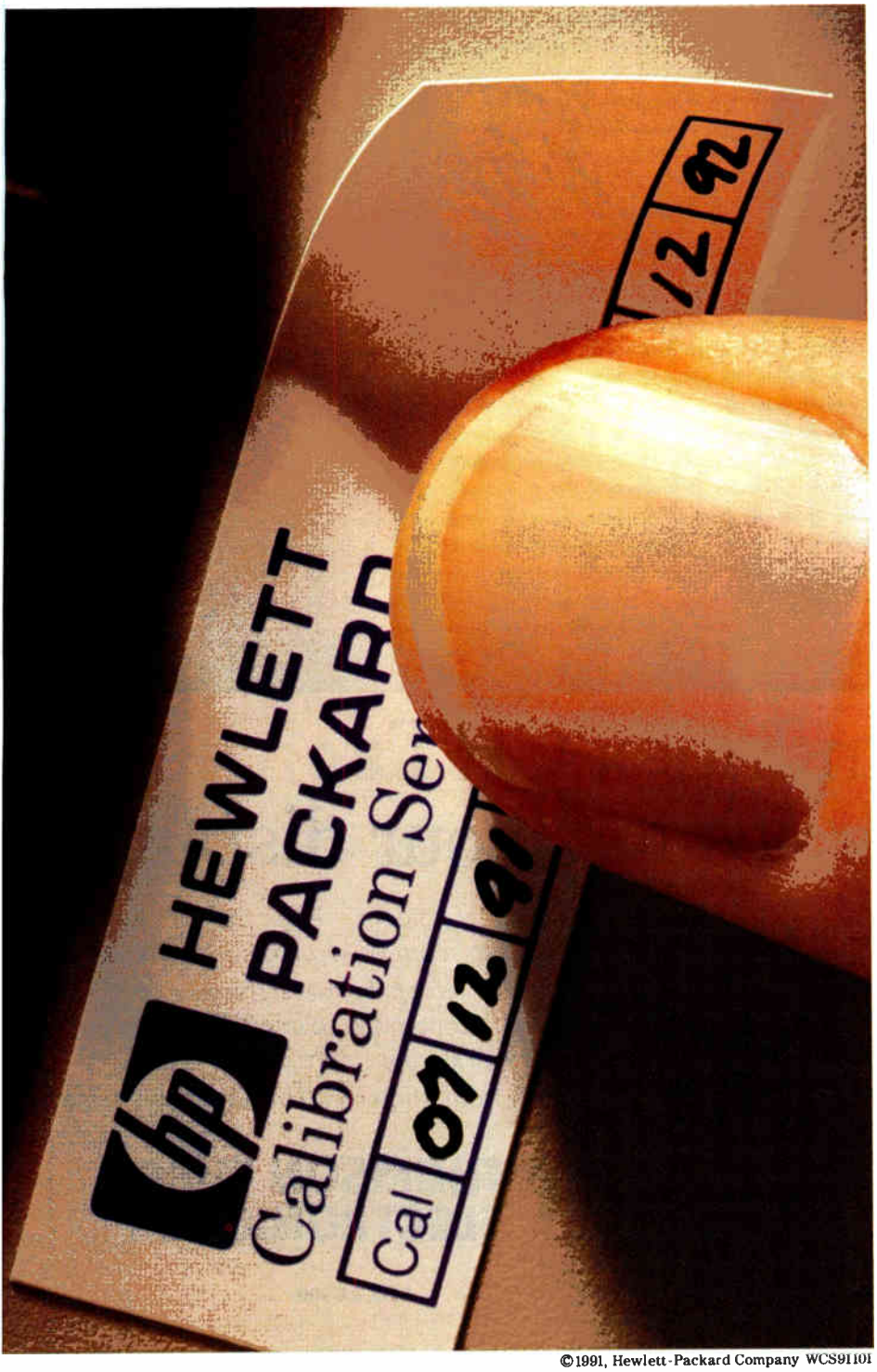

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bers. The big companies tend to do their buying from IBM, which still has the largest market share in the country. But PCs and workstations from a wide variety of makers are selling like the proverbial hotcakes.

Spain has few companies that would make the Fortune 500 list, but there are about a half million small companies with less than 100 employees each. They represent significant sales opportunities as they migrate from office systems to PC networks. One stimulus for such a move is the decision to adopt a Unix standard. In fact, the government has chosen to move to Unix for all of its public procurement, so now many Spanish companies are following the example.

NOW, IT SEEMS, THE DEMOCRATIC MONARCHY THAT SUCCEEDED FRANCO IS MAKING UP FOR LOST TIME

"Government procurement accounts for about 10% of information-technology sales in Spain," says Manuel Lazaro, vice director of information technology for the Ministry of Industry.

"Spain went from old-style office automation directly to networked PCs," adds Carlos Vivas, a manager with Hewlett-Packard España.

Another driving force behind the groundswell in PC purchasing is computer-aided design and manufacturing. Small textile companies are flourishing in Spain, and they are making increasing use of CAD, demanding increasingly better systems. "These companies used to use cheaper PCs," explains Dataquest Inc. analyst François Rioux. "In fact, a few years ago, Amstrad sold almost as many machines in Spain as IBM."

But the continuing demand for better quality in the textiles they produce has forced the companies to invest heavily in more sophisticated computer equipment, Rioux says.

"Interestingly enough," says Rioux, "Spain is buying proportionally more [Intel 80486-based computers] than any other country in Europe. They go from lower levels right up to the top." Benefiting from the trend in addition to Hewlett-Packard and IBM is Ing. C. Olivetti & Co. SpA, the big Italian computer manufacturer.

Among domestic companies, one Spanish expert in marketing has been particularly aggressive in slicing a piece of the PC pie for itself. The department store owner El Corte Ingles, Spain's largest company, has its own computer manufacturing arm, the Barcelona-based Investronica. El Corte Ingles bought Investronica five years ago, when Investronica was a failing computer-distribution operation. The marketing experts turned it into a PC manufacturer, directly focused on CAD/CAM.

"Because El Corte Ingles is in the clothing business, it was well-placed to supply the needs of other manufacturers," says Jaime la Figuera, a manager with Investronica in Madrid. Investronica would not supply sales or shipment figures, but analysts estimate that it does several hundred million dollars worth of business annually.

The real problem the Spanish market faces is the absence of locally produced software. Almost 95% of the programs used are brought in from the outside. "This is a real market of opportunity in Spain," adds Rioux. ❑

Money-back guarantee

To the editor: I enjoyed your article "Does your company pass or fail service?" (May, p. 48). The subject is near and dear to my heart as the self-proclaimed rebel of revolutionizing customer service. Socket Express was founded and continues to be successful based upon the fact that customer service is first, quality and price assumed, with a money-back guarantee.

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Edward Farley, president
Socket Express Inc.
New Brunswick, N.J.

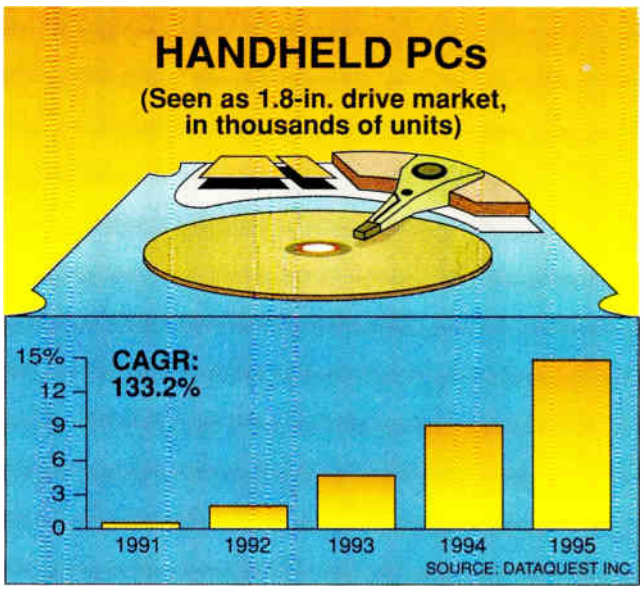
MEET THE CHIPS BEHIND THE DRIVES

ICs are the lifeblood of computer technology, and now a new breed of chips is spawning a whole new class of disk drives—the petite, fast-growing 1.8-in. units. Physically, the new drives are about half the size of the 2.5-in. units that are just coming out in large volumes. Dataquest Inc. in San Jose, Calif., believes 1.8-in. drives will rack up an astounding 133% compound annual growth rate by 1995. Integral Peripherals Inc. in Boulder, Colo., is the first to ship 1.8-in. units (see p. 20).

These tiny drives are built around such chips as the Z8 microcontroller from Zilog, the HDC from National Semiconductor, and support devices from Oak Technology. Zilog Inc.'s Z86C94 combines the Campbell, Calif., company's Z8 8-bit microcontroller with a 16-bit DSP and analog-to-digital and digital-to-analog converters. Priced under $10, it packs all the compute clout needed for a critical task: controlling the disk head.

Any slight mechanical wobble can throw a read/write head off track without a closed-loop servo system to monitor head position and detect drift. These computations would overwhelm the drive's microcontroller; hence the addition of the DSP.

With the microcontroller almost totally dedicated to servo handling, another chip must provide disk control. Oak Technology of Sunnyvale, Calif., offers the OTI018, which performs the task of moving data from disk to host computer via PC AT bus. ❑



The upcoming handheld and pen-based PCs need tiny disk drives, sparking hot market growth.

ALL-FIBER PHONE SERVICE GETS CLOSER—AND EASIER TO IMPLEMENT

Now that the ban preventing Bell operating companies from becoming information-services providers has been lifted (see p. 48), look for the BOCs to push much harder on installing fiber-optic cable in the local-subscriber service loop. Delivering still images, graphics, and even video will mean significantly higher revenues—and profits—for the Bell companies. But they need fiber to support the high bit rates these services demand.

A likely transmission standard is the Synchronous Optical Network, or Sonet. Agile computer and communications companies are liable to share in the bounty by providing products with Sonet interfaces over the next few years. And while it used to be that designing a 622-MHz subsystem such as a Sonet interface was the bailiwick of only a gifted few, a Canadian company has quite suddenly evened the playing field.

Pacific Microelectronics Centre Ltd., Burnaby, B.C., has implemented a plug-and-play Sonet interface on a 182-pin multichip module. The SLIM-12 contains two GaAs ICs, two ECL ICs, and four CMOS ICs that handle the Sonet protocol. ❑

DISPLAY MAKERS FIND AN R&D ALLY IN MCC

Armed with a $7.5 million federal grant, a small new consortium of flat-panel display makers is linking up with a large, well-established one. The "precompetitive research" project of the Advanced Display Manufacturers of America will be administered by the Microelectronics and Computer Technology Corp., Austin, Texas. ADMA, which has recently been embroiled in a dicey trade dispute [*Electronics*, August 1991, p. 16], was awarded the money last spring from the new U.S. Advanced Technology Program.

The link with ADMA marks the first time MCC will manage the work of a third-party consortium, says Bill Stotesberry of MCC. The aim is to "increase [MCC's] relationship with small, innovative companies," he says. From ADMA's side, "The best long-term solution is to get an organization with the credibility and infrastructure of MCC [involved]," says Jim Hurd, CEO at Planar Systems Inc. in Beaverton, Ore. ❑

OS/2: WHAT A LONG STRANGE TRIP IT'S BEEN

In the wake of a dispute with IBM Corp. over which version of the OS/2 operating system will win the desktop, Microsoft Corp. appears to be abandoning its version, OS/2 3.0. The Redmond, Wash., software giant probably will not market a product with that name, leaving IBM to forge ahead with OS/2 2.0. Microsoft is betting the farm on Windows 3.0, perhaps even folding MS-DOS into it [*Electronics*, August 1991, p. 44].

Microsoft says it "will continue to provide a migration path" for OS/2 customers, but since "IBM is not committed to OS/2 3.0, we don't want to develop a migration kit without their support," because it may not run all OS/2 applications unchanged. ❑

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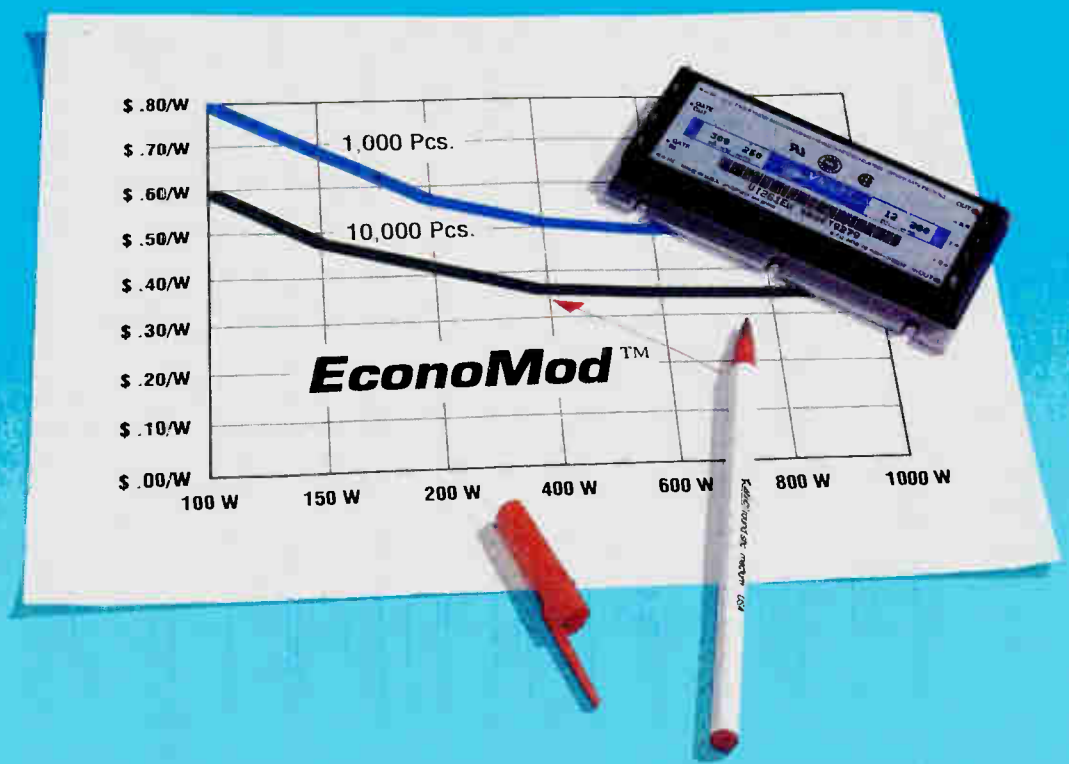

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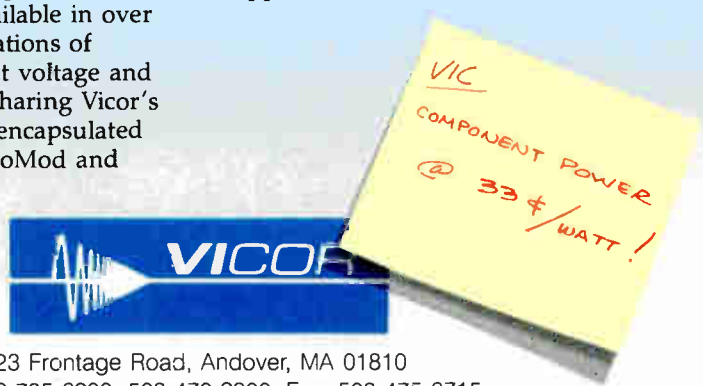

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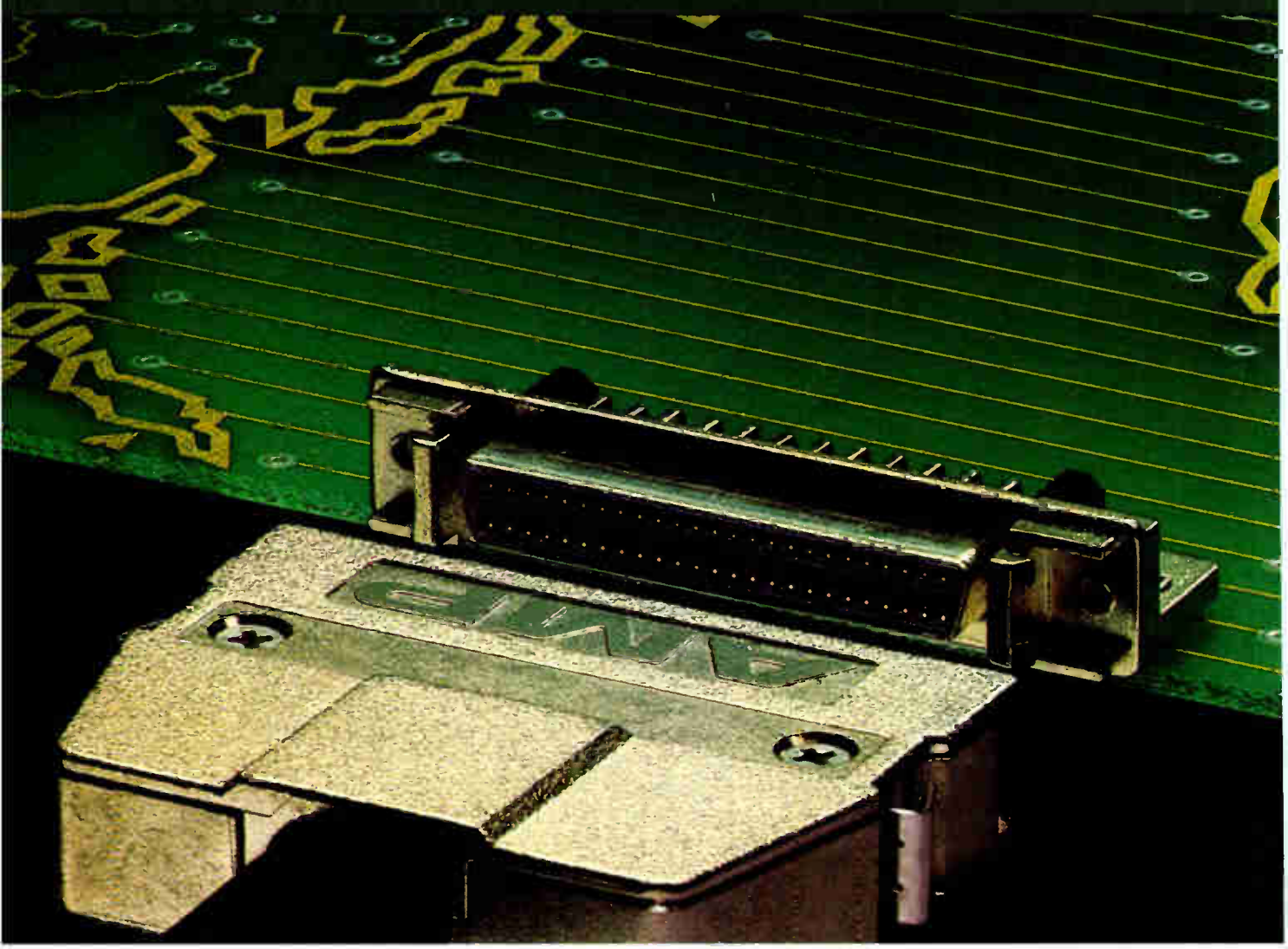

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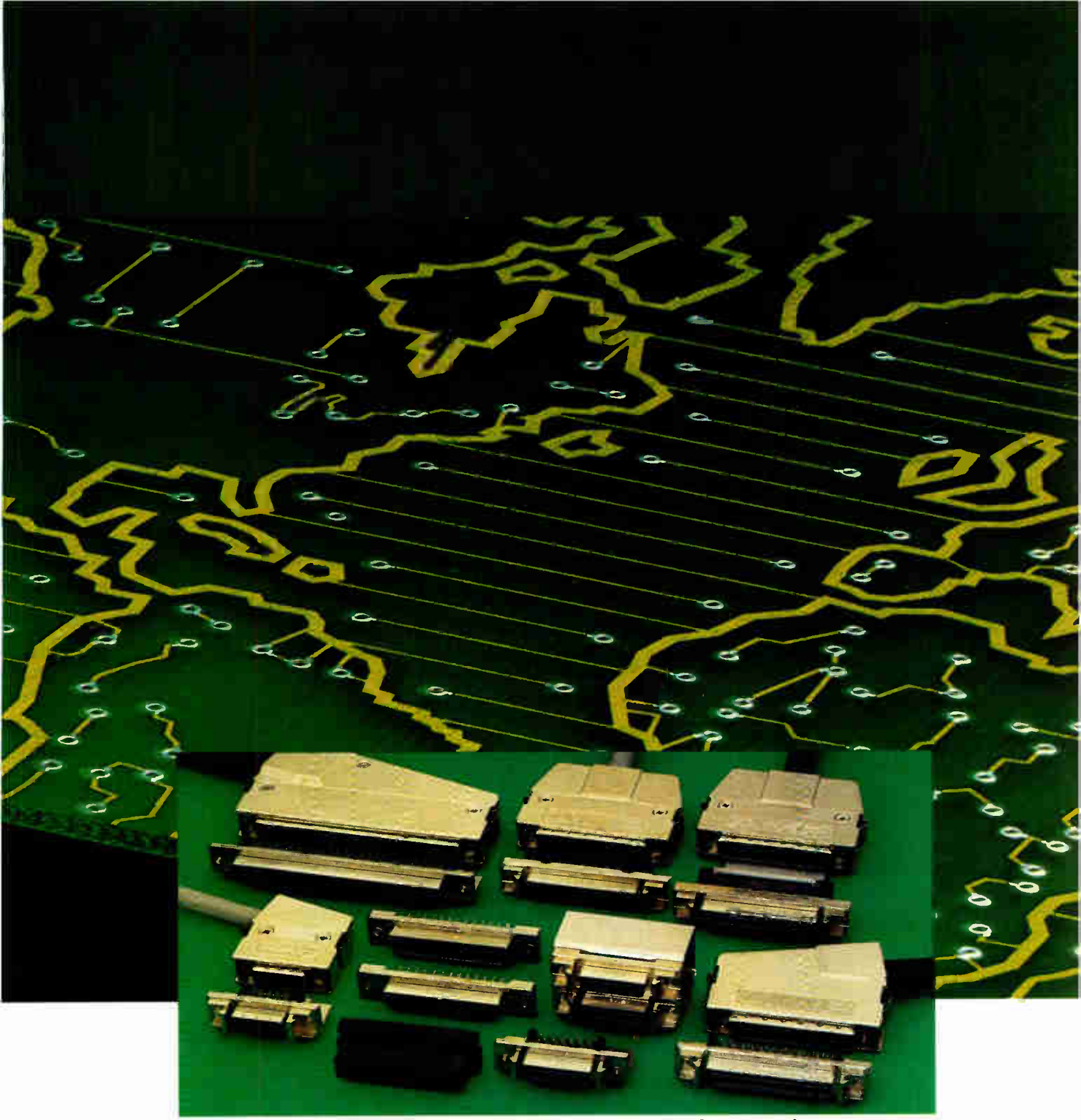

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CIRCLE 203

TO WATCH

THE 1.8-IN. HARD DRIVES HAVE LANDED

Integral Peripherals Inc.'s 1.8-in. hard drives look like a good bet to usher in a new generation of subminiature computer and communications products.

The Boulder, Colo., company's 20- and 40-Mbyte models need one-fourth the volume of a low-profile 3.5-in. drive. They deliver significant systems-design advantages, including low profile, ruggedness, and low power.

By designing the system so drive electronics can be separated from the head/disk assembly, Integral lets OEMs put the disk controller on the motherboard and place the head/disk assembly adjacent to it. This results in a maximum height of 10 mm for the 20-Mbyte Mustang model 1820 and 12 mm for the 40 Mbyte Stingray model 1842.

The 1.8-in. hard drives from Integral are small enough for palmtops and rugged enough for some industrial uses.

The drives consume less than 1 W overall. A sleep mode allows them to be "spun down" to a speed where they consume .015 W. Since the read/write heads do not touch the media during spin down, there is no danger of wear or data loss. The drives recover from sleep mode in about 1 s.

The drives, which can withstand 200-G shock force in nonoperating mode, will be available in volume in the fourth quarter. ❑

AT&T'S SOLID-STATE RELAYS INCLUDE LOGIC

The days of using electromechanical relays in a host of communications and computer equipment may be numbered now that AT&T Microelectronics has fielded its new LH1500 line of solid-state relays.

The relays, which are available in all common configurations, provide input/output isolation of 3,750 V. They boast high reliability and can also integrate the DMOS switch, plus a photo detector and logic on a single chip. ❑

SIGNETICS DROPS POWER NEEDS FOR CELLULAR

Portable communications equipment such as cellular phones can shrink even more using a new generation of fm receivers from Signetics Division of North American Philips.

Packaged in the 20-pin SSOP format, the NE606 and NE607 take up one-third the space of conventional systems in SOL packages, says the Sunnyvale, Calif., company. The devices each represent a one-chip solution in fm-mixer/IF systems. They reduce power consumption from the 5.8 mA in competing solutions to 3.4 mA, and they lower voltage requirements to 3 V.

Both chips include a variety of fm-mixer/IF functions, including a mixer/oscillator, two operational amplifiers, IF amplifiers, a limiter amplifier, a voltage regulator, and a quadrature detector. The NE607 adds a receive-signal-strength indicator, which plays an essential role in locking the IF frequency. It can also be used with the limiter output pin to act as a frequency-shift-keying demodulator.

Available in SSOP, DIP, and SOL packages, the NE606 is priced at $3.57 each in 100-unit quantities; the NE607 is priced at $3.68. ❑

LENS IMPROVES THERMAL IMAGES

Low-cost thermal imaging is taking a decisive step toward handling smaller packages, including multichip modules.

Compix Inc. has enhanced its PC-based System 6000 with a 7.7X magnification lens that delivers 2-mil resolution, compared with the 17-mil resolution of the Tigard, Ore., company's basic infrared camera [*Electronics*, July 1990, p. 21].

The thermal image of the board or device that appears on the PC's monitor can be color-coded with up to 256 colors representing temperatures between 17 and 150°C. It takes approximately 30 s to capture an image.

The basic package still costs $18,500. Adding the 7.7X lens raises the price to $28,500. Retrofitting the lens costs $13,000 or less. ❑

DATA GENERAL'S LATEST AVIION SERVERS HANDLE 75 TRANSACTIONS/S

The most powerful entries among several new models in Data General Corp.'s Avion workstation server line are said by the company to provide performance that's 35% better than a competing server from IBM Corp.

The reduced-instruction-set-computing Aviion 5225/6225 servers from the Westboro, Mass., company are intended for high-end database-processing applications. The machines deliver 75 transactions/s and serve as many as 414 users.

A configuration offering 64 Mbytes of main memory, 1 Gbyte of SCSI hard-disk storage, and 525 Mbytes of tape capacity sells for $43,500, and is available 45 days after ordering. ❑

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CIRCLE 183

FACE

OFF

TAKING ORGANIZED ACTION...

The U.S. has been reluctant to develop and implement policies for specific manufacturing industries in part because of appropriate concern about the exaggeration of mistakes that occurs when actions are taken collectively. But in part this reluctance has been based on a misconception about the nature of markets. Just as in sports the best results arise from a balance of competition and cooperation—competition between teams and cooperation among teammates—so too do markets require such a balance. Maintaining the right balance of competition and cooperation in the NFL is complicated enough. Within the contemporary U.S. domestic economy it's a constantly changing and difficult challenge, and with respect to the world economy now growing rapidly around us, it's more difficult still.

MAUREEN STEINBRUNER

More than the rhetoric of recent years would suggest, though, participants in the complex global economy need effective government in order to function. Sometimes that will mean more government, sometimes less. The right mix depends on the technology, organization, and structure of the specific industries or subsectors in question. Manufacturing is a critical arena in which changes in the global competitive environment call for more attention to how we are doing as a nation. Unfortunately, during the past 20 years government has largely fiddled while whole segments of key manufacturing industries have, metaphorically, burned to the ground.

As is well known, the consumer electronics, auto, steel, and semiconductor industries have all been through hard times, with consumer electronics pretty much vanishing from the domestic manufacturing scene. Under the peculiar but popular theory that it is best when a democratic government does not govern, organized action to address the problems of these industries in trouble either has come very late, or has been ambivalently and inconsistently applied.

Given the external competition, some U.S. industries ultimately will not survive and, in an efficiency sense, should not. The determination of which industries are in this category—and which are not—is a dynamic process subject to what we do as a nation in their behalf. If we do it well—witness the history of computers, aircraft, or biotechnology, all of which got a significant early boost via government-funded research—the nation gains.

Industry policy does not necessarily mean protection, the relaxing of social standards, price collusion, or any of the other negative results that appear when an interest group gets its unimpeded way, though it can mean all of these. Given the right process, the public interest can be represented effectively—not perfectly, but effectively—in determining a course of collective action to advance a key part of our economic infrastructure.

The argument over whether other countries have industry policies that are effective is just plain silly. Of course they do. These policies work best, it appears, when they are prospective (that is, developmental or rehabilitative, rather than status quo-oriented); when they incorporate good feedback mechanisms; when they do not impede the essential workings of decentralization and competition; and, most importantly, when they take account of the interests of the nation as a whole, and not just those of the people who control the resources of that industry.

It is clear that looking for government help after the horse is out of the barn is not the best way to go. Most private business leaders want nothing to do with the government until they are well into the soup, at which point it is usually too late to do anything constructive except rescue the survivors, if there are any, and bury the dead.—*Maureen S. Steinbruner, executive vice president, Center for National Policy, Washington*

...OR SEEKING A PANACEA?

Many of America's high-tech industries are whining about the status of their competitive position vis-a-vis Japan and others. They feel that the government has not done enough to boost their pool of available capital by providing subsidies. As a result, some Washington policymakers are promoting a "new" way to deal with the "problem" and calling it "managed trade."

Most of these policymakers claim to be free-trade advocates at heart. They argue, however, that U.S. trading partners do not play by the same free-market rules, and thus, the government should actively manage trade via various government-business partnerships and import restrictions. What advocates of such policies do not realize is that the problem with U.S. competitiveness lies not with our trading partners, but right here at home.

BRYAN T. JOHNSON

Managed trade and industrial policies include quotas and other limits on imports, demands for guaranteed shares of sales in another country's market, demands that other countries institute economic policies that favor imports, government subsidies for selected industries, export subsidies, and national industrial planning. Yet these policies are far from being a panacea for U.S. trade woes.

Managed-trade advocates argue that Japan and other Asian countries have built their economic empires on government planning. Nothing could be further from the truth. Various industries in the Far East are indeed successful—the question is how much success has resulted from government policies, and how much from progrowth fiscal and monetary policies, and sound private-sector competitive strategies.

The success of "Japan Inc." has more to do with sound macroeconomic policy than with government "managers." Japan's economic growth has occurred in spite of government meddling in the economy—not because of it. In fact, where the government has actively engaged in the economy, the results have been mostly negative. These policies impose costs on the Japanese economy that have chipped away at the standard of living, giving the average American a much more affluent lifestyle than the average Japanese. The average per-capita GDP, using purchasing-power parity from 1985 to 1988, was $19,850 in the U.S. and $13,650 in Japan. This measurement indicates that the average American has a substantially higher quality of life than his Japanese counterpart, about $6,200 higher.

Managed trade and industrial policies simply let governments swallow up capital from the private sector and redistribute it to government-targeted industries. Not only is it questionable whether governments can pick "winners," but more often the political nature of such decisions results in the picking of losers. So how are competitive industries produced? The heart of the answer lies in the condition of a country's macroeconomic environment.

For competitive industries to thrive, a macroeconomic environment must be competitive. To achieve this, the U.S. should avoid a new layer of government policy and focus on removing the shackles of government regulations that have for too long made American businesses lazy and unproductive. The focus should be lowering the capital-gains tax, allowing U.S. banks to expand branches over state lines and to engage in both commercial and investment banking, reducing U.S. trade barriers to allow more competition, and reforming the antitrust laws to allow for joint reseach and production ventures.

Any attempts to use the government to "manage" the economy will result in reduced living standards for Americans, and negligible if any positive effects on U.S. competitiveness.—*Bryan T. Johnson, policy analyst in international economic affairs, the Heritage Foundation, Washington*

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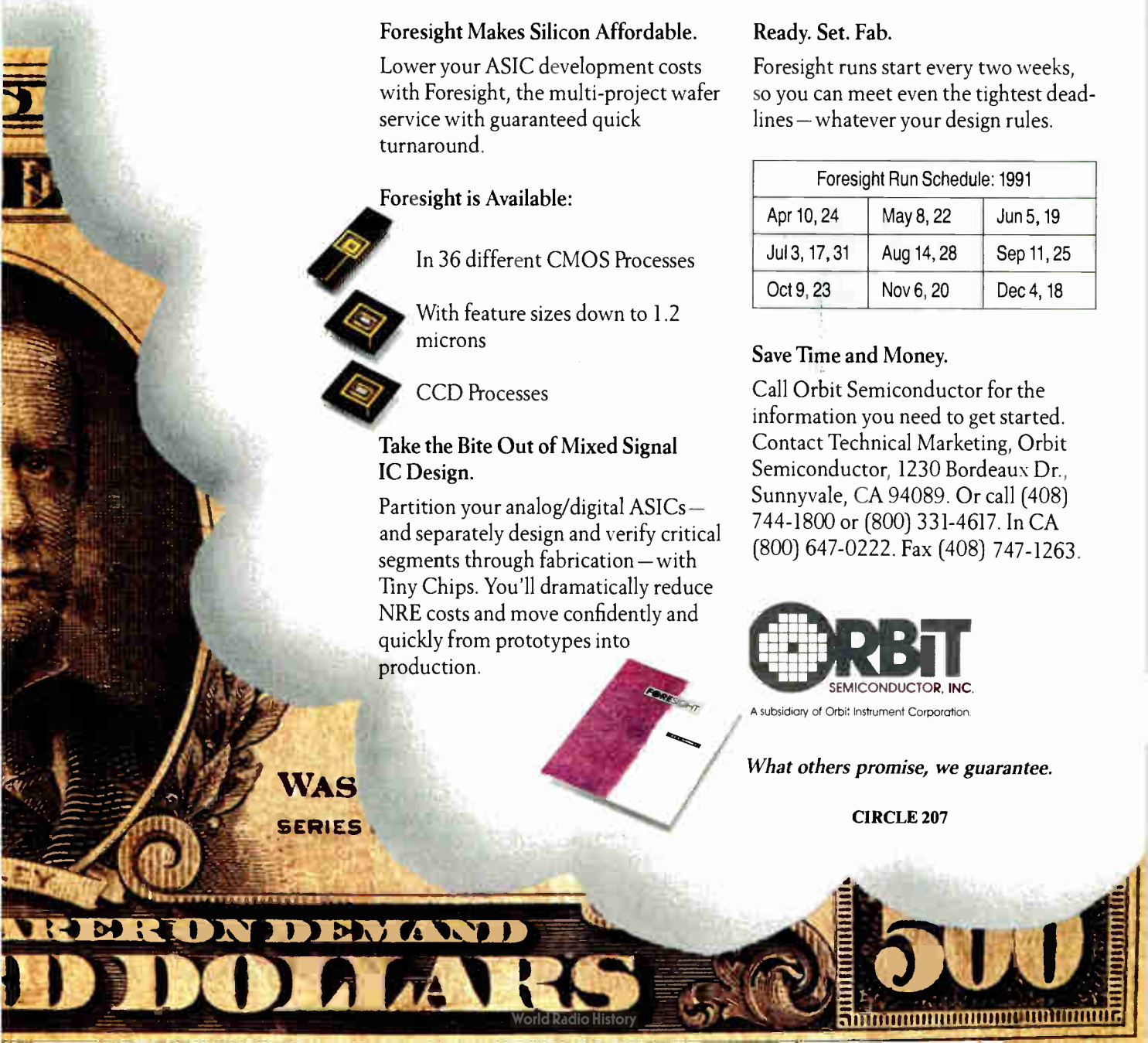

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CIRCLE 217

GIANT HP AND LITTLE STAC CROSS SWORDS OVER A DATA-SQUEEZING STANDARD FOR DAT

THE COMPRESSION WARS

BY JONAH MCLEOD

STANDARDS

A row is developing in one corner of the data-storage market. It revolves around setting a standard, and the importance of who wins is likely to grow along with the market.

It all started because computer makers and users have been quick to seize on digital audio tape, or DAT, as ideal for storing very large amounts of archived data in a very small package. The normal capacity is 2 gigabytes; add some data compression and it can be increased fourfold.

And there's the rub. Just how that compression will be applied has sparked a fierce battle to set the standard for DAT's compression algorithms. The contenders are Hewlett-Packard Co., the multibillion-dollar Palo Alto, Calif., Goliath, and a Carlsbad, Calif., David called Stac Electronics.

HP and Japan's Sony Corp. defined the digital data storage (DDS) format for DAT and the two formed the Digital Data Storage Manufacturers Group to license it. The format has been submitted to the American National Standards Institute's X3B5 committee for consideration as a standard, and it appears to be a shoo-in.

However, the original format was submitted without a definition for the compression algorithm, and that's where Stac comes in. Stac is a supplier of compression algorithms for disk and tape drives, and its algorithms have been widely accepted on both products. Already at least two of HP's competitors in the DDS market are shipping drives using Stac's Stacker compression chips. This understandably led Stac to believe it was well ahead in the game.

That impression was reinforced by Stac's perception that HP was having difficulty implementing its DAT data compressor, DCLZ, in silicon. (LZ stands for Lempel and Ziv, researchers at the former Sperry Univac who defined subclasses of algorithms.) But in April, at a meeting of the DDSM Forum, HP introduced revision C of its DCLZ chip—named Mystic—and suggested that it be adopted as a standard.

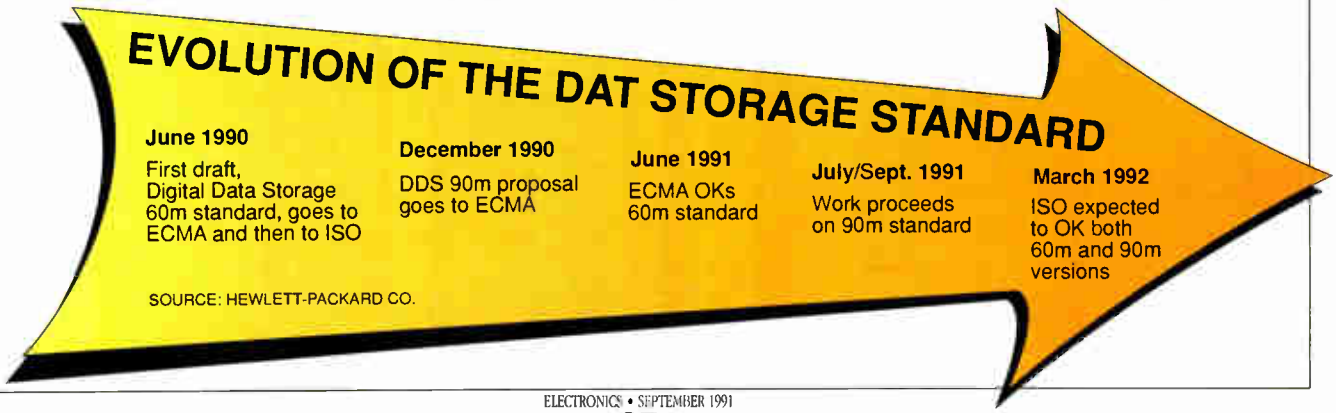
That was tantamount to moving the goalposts in the middle of the game, in the view of Garry Clow, president of Stac. Now the two firms are vying to see which one will set the standard for compression algorithms on DAT tape. HP claims it invented the market for DAT-based digital data storage and holds the lion's share. The company shipped 41.2% of the 48,543 units sold in 1990, according to Marshall Barton, OEM market development manager for HP's DAT operation. But none of those drives included data compression, an omission that must be repaired for HP to deepen its market penetration. And a standard is vital because DAT users want to be able to swap tapes. Since HP created DDS in the first place, the company believes that gives it the prerogative to provide the compression algorithm. However, Stac contends that the market has already widely adopted its algorithm, a solution Stac claims is less expensive and provides better compression than HP's.

Clow says there are more than 2 million users of the Stac algorithm, which is sold under the brand name Stacker LZ. It is used as the compression algorithm on most quarter-inch cartridge (QIC) tape drives. There are a million users in this category, another million using Stacker LZ for diskette backup, and an additional 50,000 Stacker implementations on DOS and Macintosh hard drives.

HP, meanwhile, has been shipping the algorithm on half-inch open-reel drives for a few years. Total volume, however, is on the order of a few thousand units. When HP announced it would offer a development of the algorithm as the compression standard for DDS, almost all the DDS manufacturers indicated they would support it. However, a couple of them bucked the trend. One, WangDAT of Costa Mesa, Calif., has been shipping Stac compression for six months; another, Gigatrend of Carlsbad, Calif., is also staying with Stac compression.

Stac contends that its algorithm has the performance edge. The company cites results published last month by the National Software Testing Laboratories, which show Stac's algorithm producing more than 20% better compression than the HP implementation on program, graphics, and data file types.

This performance advantage—combined with the fact that Stac has shipped millions of units, including silicon de-



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TERADYNE

CIRCLE 194

vices, that implement its algorithm—should have put Stac in the driver's seat in defining the DDS compression standard. But that hasn't happened, says Clow. He claims HP is using its marketing might and its control of the DDS Manufacturers Group to push its standard ahead of Stac's commercially available alternative.

HP pooh-poohs the performance differences between the two algorithms as determined by the National Software Testing Labs. "Stac has mistaken the results," Barton says. "NSTL carried out its benchmark tests on the earlier compression algorithm we used for our quarter-inch drives, HPLZ. What we are proposing is a revised version, optimized for use with DDS drives." This is known as DCLZ, and according to independent testing that HP commissioned, it beats Stac's chip on all counts. It compresses binary files by 1.5 to 1, word-processor text by 2.4 to 1, and commercial database files by 21.1 to 1, claims Barton.

"The compression ratio is not in itself indicative of a drive's performance," he says. "Data throughput rate is often more important than the compression ratio alone, where high sustainable throughput is necessary to keep the I/O overhead at a minimum."

Barton points out that both Stac and Mystic chip specifications stipulate a burst rate of 5 Mbytes/s, but "this can be sustained for 32 Kbytes with Stac and 100 Kbytes with the HP DCLZ chip." Stac's 32 Kbytes, he says, "is the high end of the specification and is only possible with large amounts of [random-access memory]. The advantage of DCLZ is that larger amounts of data can be sent for it to compress 'at its leisure' while freeing up the bus for other activity." The chip also has features that Barton claims make development of firmware more tractable. By contrast, he says, "[Stac's] development potential is severely restricted."

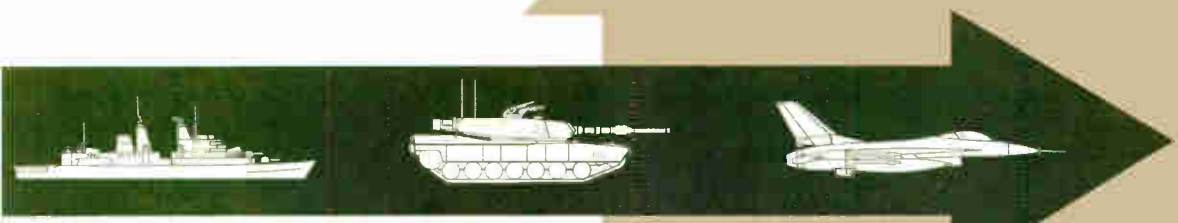
Despite three revisions, Barton says, the Mystic DCLZ chip is now a stable, finished product and has been shipping in volume since April. "It sells for $25 to $30 apiece depending on quantity," he says.

Whatever the technical merits of the two chips, for end users and drive manufacturers alike, the clinching factor is going to be HP's "cast-iron guarantee" to indemnify all buyers of its Mystic chip against claims for further royalties by the owners of any patents relating to the Lempel-Zev-Welch compression algorithm. The LZW version was developed and patented by Terry Welch at Sperry; the original LZ algorithm used by Stac was not patented. Barton comments that the guarantee extends to any semiconductor firm second-sourcing the chip. "And that includes Stac Electronics," he says.

The industry, meanwhile, seems to be climbing aboard the HP bandwagon. The DDSM forum at its spring meeting "took the opportunity to endorse the DCLZ compression algorithm," says Michael W. Harris, marketing director of Ardat Inc., Costa Mesa, and a leading forum member. Manufacturers backing the standard included Archive, Sony, Wangtech, and WangDAT, which is supporting both standards. "Based on the July delivery schedule of the [newest revision of the] HP-Mystic chip, DDSM group members expect to be able to deliver DDC-DC units to the market by September," Harris says. ❑

Additional reporting by Peter Fletcher

Vicor Knows the INs and OUTs of Military Power Systems



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CIRCLE 180

THE COMPANY'S LOSS OF PROFITS AND PEOPLE APPEARS TO BE CAREFULLY ORCHESTRATED

DEC'S CULTURE SHIFTS

BY LAWRENCE CURRAN

COMPUTERS

Is Digital Equipment Corp. changing its culture by shrinking its work force to a level that it believes is required to do business in the 1990s? Some computer industry analysts believe that is the case, pointing to a new corporate inclination to dowsize even as it grows through acquisition.

The evidence: perhaps buoyed by increased revenues in a slow market, the Maynard, Mass., computer giant took a huge $1.1 billion charge—a charge that might accommodate far more than the maximum of 10,000 layoffs the company has indicated could take place. Plus, last year it acquired the Kienzle Division of Mannesmann AG in Villingen, Germany, now called Digital-Kienzle. That operation contributed to revenue, and DEC hopes to gain even more strength if its planned purchase of the Information Systems Division of Philips Electronics NV in the Netherlands takes place Oct. 1, as expected.

Against this background, the company swallowed hard and reported the first annual loss in its 33-year history. The $1.1 billion charge in its fiscal 1991 fourth quarter resulted in a quarterly loss of $871.3 million and $617.4 million for the year. But revenue grew 17% in the fourth quarter—from $3.37 billion to $3.94 billion. Revenue growth for the year was 7.5%—from $12.9 billion to $13.9 billion.

In announcing the financial results, founder and president Kenneth Olsen, long adamantly opposed to layoffs, may have signaled a grudging but realistic change in philosophy. He cited the need for a leaner operation because of the ever-increasing efficiencies computer manufacturers realize from technology improvements, especially in semiconductors. Translation: DEC's ongoing move to augment proprietary product lines with microprocessor-based open systems has drastically cut margins as well as the need for people.

DEC has eliminated some 9,000 employees in the last 18 months via early retirement, attrition, and some layoffs. While some analysts estimate the $1.1 billion charge will cover the costs of cutting another 10,000, at least one says the money could accommodate double that number. Tom Willmott, vice president at the Aberdeen Group, a Boston-based market researcher, says he was "enormously surprised at the magnitude of the charge."

Willmott points out that Wang Laboratories Inc., the Lowell, Mass., computer firm, recently set aside $250 million to cover the layoffs of 4,000 employees. He thinks DEC has buried additional money in the charge for retraining of select employees, and to provide some large severance packages "for senior executives who are part of the problem and not part of the solution. DEC has built up an enormous bureaucracy in its matrix management structure," he says.

Terry Shannon, until recently director of the DEC Advisory Service at International Data Corp., the Framingham, Mass., market-research firm, says he isn't concerned about the charge against earnings. He figures that DEC decided to take a big hit in what was a relatively slow year, despite the revenue growth.

"Last year wasn't one of DEC's banner years," Shannon says. "They probably figured 'why not take our lumps now and get set up for fiscal 1992?'" He says this is the second year in a row DEC "has bit the bullet; this was a Magnum bullet, they still have more money in the bank than I do," he quips.

For his part, DEC spokesman Dallas Kirk says of the downsizing: "The hard part is that we don't know if it's too much or too little. We've taken a very hard look at the next few years and took our best shot at it [the $1.1 billion] for the next one to two years. But if we have to do it again, we will."

Sober acknowledgements like those of Olsen and Kirk, along with the apparent desire for targeted acquisitions, suggest some major shifts are taking place at the company. Aberdeen's Willmott sees DEC becoming much more of a software and services company.

Willmott points out that DEC's push into software and services is paying off, contributing $500 million more in revenues in 1991 than in 1990. "But they didn't have the right mix of people for a software and services company. They can cut almost 35% of their traditional work force. That's a big shock, but it's a reality," Willmott says. "The fact that they took such a large charge indicates that they recognize the need for a new employee mix as their mission changes for the '90s," he concludes.

IDC's Shannon also recognizes DEC's push into software, pointing out that the company "is damn serious about Unix," the operating system that has become synonymous with open systems. Shannon says the Advanced Computing Environment consortium's initiative, which encompasses personal computers and workstations using MS-DOS, OS/2, and Unix, could be a boon.

That's because the company's Ultrix version of Unix is the basis for the ACE unified Unix, marketed by the Santa Cruz Operation, Santa Cruz, Calif., as Open Desktop [*Electronics*, May 1991, p. 27]. If the ACE initiative succeeds, "every one of those boxes out the door [of every ACE member company] is a candidate for Ultrix," he says.

Further, Shannon expects DEC to come up with an Ultrix variant, now code-named OZIX, to be used with high-end computers for commercial applications, which DEC "regards as an untapped Ultrix-product market."

Unix also plays a part in the recent acquisitions by DEC, which heretofore has grown almost exclusively internally. Both the Mannesman and Philips computer product lines have Unix operating systems, and both buys give DEC better reach into Europe.

DEC's Kirk says the main attractions for the Philips purchase, at a cost of $250 million to $300 million, were the customer bases in retail banking and in other small-to-medium-size businesses, as well as the application-software support for the banking systems. Philips's focus has been on front-end banking, such as automatic-teller systems. DEC has been active in the back-office part of banking, so a marriage between the two seems like a natural," says Kirk. ❑

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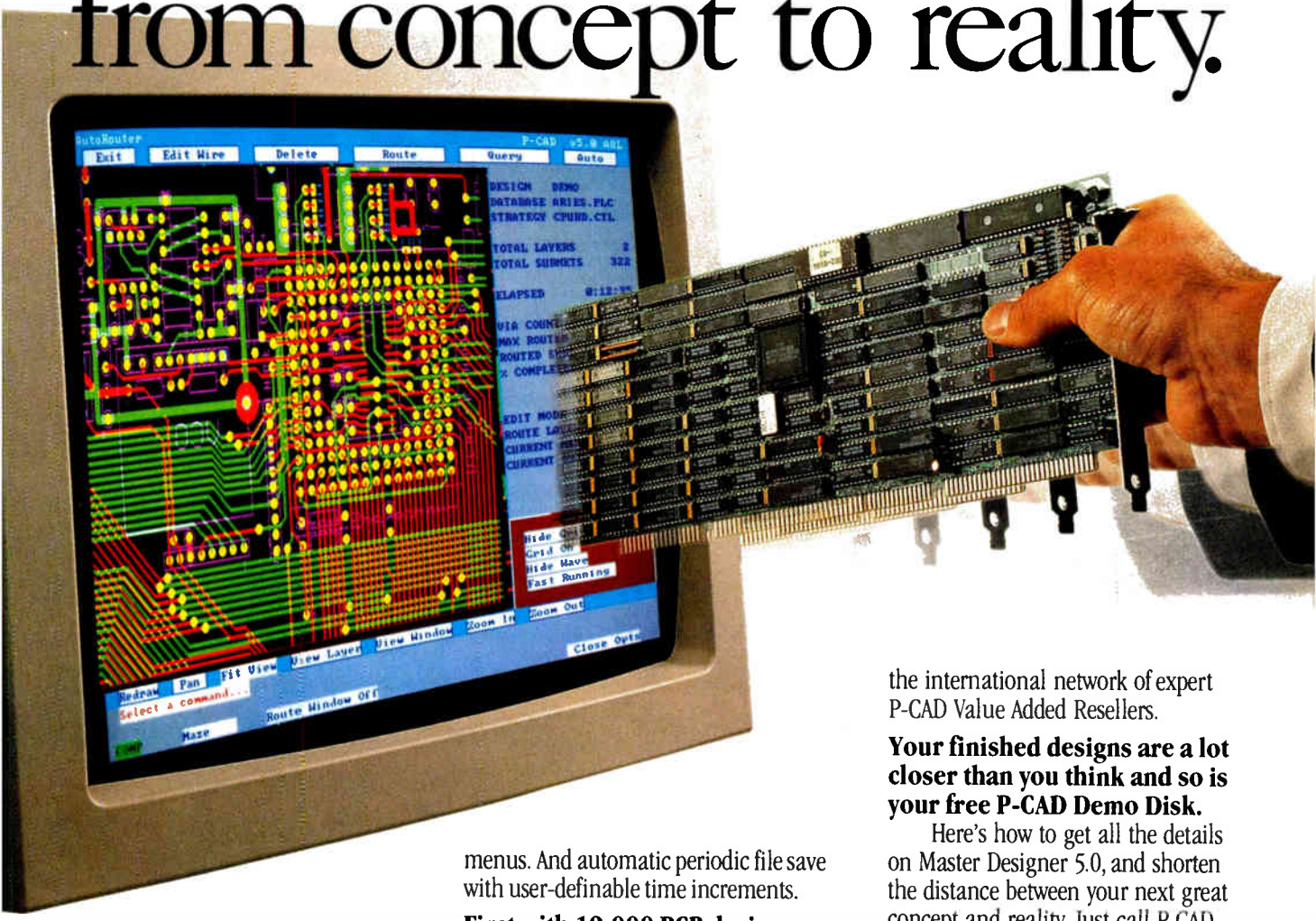

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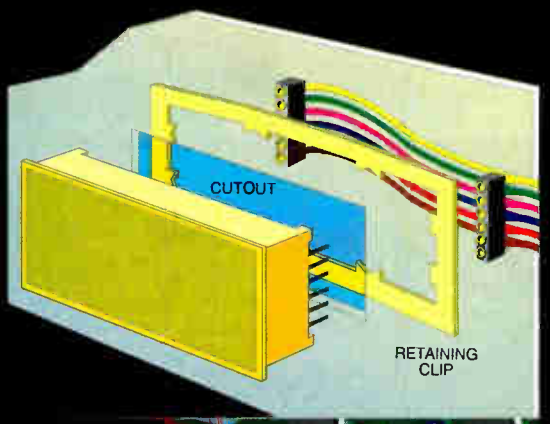

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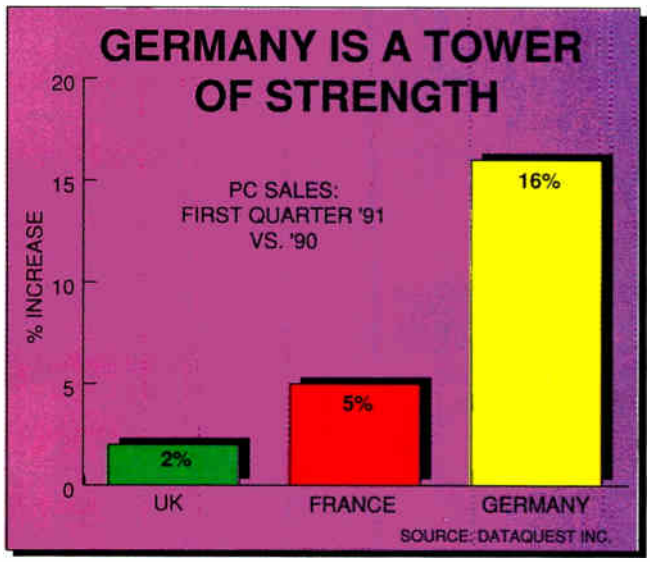
CIRCLE 203

DID SOMEBODY SAY SLUMP?

There may be a worldwide slump in PC sales—but not in Germany. According to an analysis by the U.S.-based market-research company Dataquest Inc., the global crisis in the personal computer business has not affected the German market for such systems—or at least it hasn't as yet.

During the first quarter of this year, nearly 378,000 PCs were sold in Germany, which is 16% more than during the same period last year. This increase was far higher than the rises recorded for the UK and France, where the quarter-to-quarter increases checked in at only 2% and 5%, respectively.



German PC sales are showing surprising strength in this year of global doldrums, rising 16% in the first quarter.

But the future looks less rosy. Dataquest forecasts slower PC sales in Europe overall, and that should affect Germany as well. Though the European market increased around 12% last year, the rise in 1991 will be only half that—on the order of 6%.

Still, Dataquest is not overly pessimistic, given its prediction for 1994 of 10.3 million PCs sold in Europe—about 8 million for professional and business use and 2.3 million for home and consumer applications. Providing a big sales push will be the increasingly popular laptop and notebook systems. ❑

PHILIPS'S NEW AUDIO TECHNOLOGY IS READY

The Philips Consumer Electronics Division has confirmed that Matsushita Electric Industrial Co. Ltd. will function as a colicensor of the Digital Compact Cassette audio technology the two companies jointly developed. And now that the two firms—not to mention much of the music-publishing industry—have set system specifications, the Dutch and Japanese companies are ready to start licensing the technology. Philips, based in Eindhoven, the Netherlands, has an ambitious goal for DCC: it wants to see the technology become as popular as the ubiquitous analog compact cassette.

Philips's first DCC product range will be introduced during the first half of next year, the company says. Prerecorded digital cassettes should be on the market at the same time. The system is backwards-compatible; that is, customers can play back their current analog tape collections on DCC players. The DCC technique uses precision adaptive sub-band coding, which achieves sound recording with a dynamic range of up to 18 bits. ❑

UK STARTUP FIRES UP INTEL'S 860XP SUPERCHIP FOR VIRTUAL REALITY

An English parallel-processing startup, Division Ltd. of Chipping Sodbury, claims to be among the first computer makers to design the latest version of Intel Corp.'s i860XP superchip into its products. The company specializes in so-called virtual reality machines, which generate real-time dynamic 3-d images that are viewed through miniature color LCDs closely fitted over a user's eyes. Use of a data glove that allows simulated electronic objects to be handled creates the illusion that the user is inside the graphic scene and interacting with it.

"The i860XP will provide the extra edge we need for our parallel processor," says Division's chief executive, Charles Grimsdale. Each Intel chip will be used with a Transputer parallel processor made by Inmos Ltd. "The i860XP has all the floating-point processing power we need for rendering complex objects in real time, while the Transputer is ideal for its communications capabilities," Grimsdale says. ❑

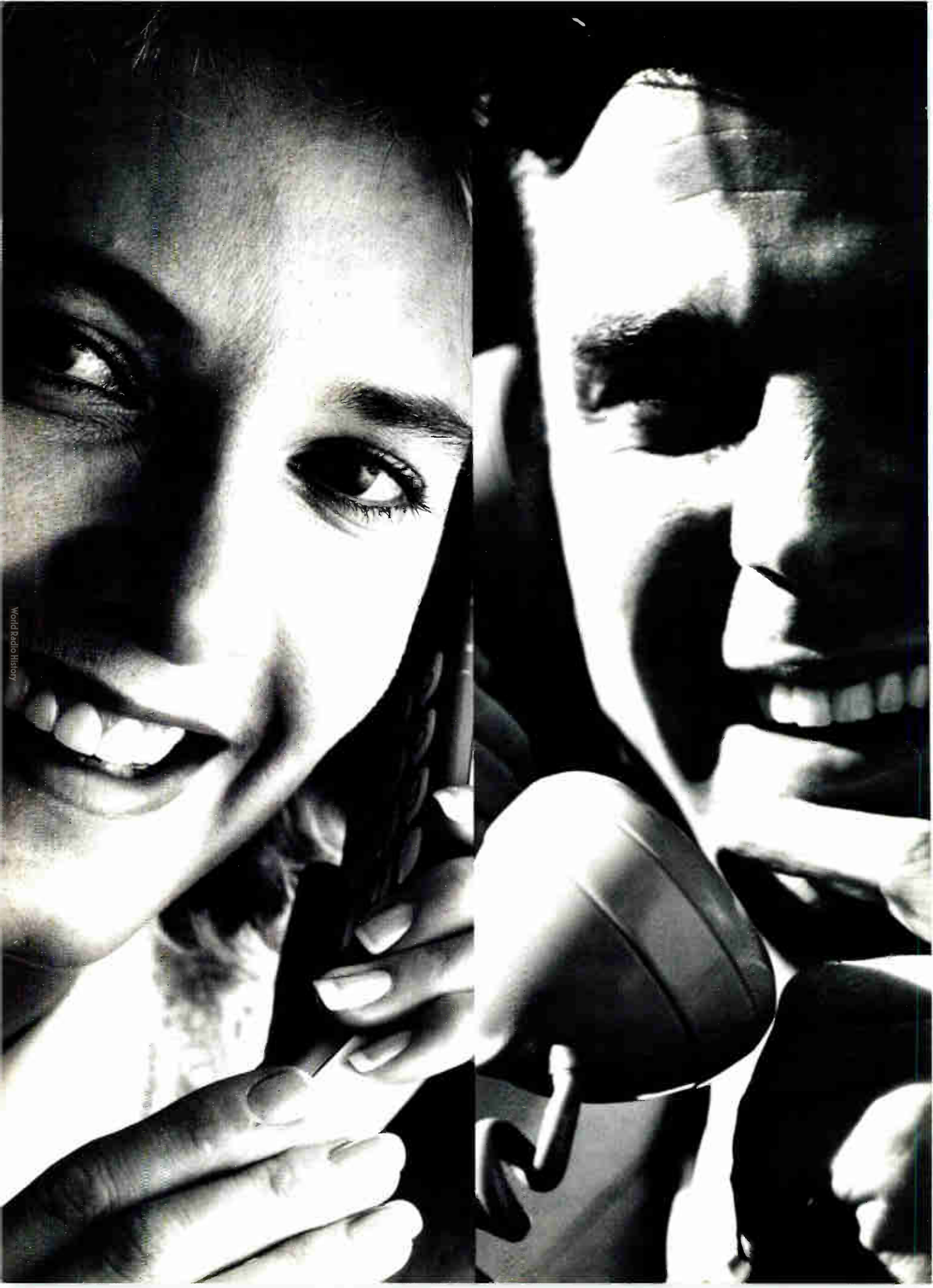
HOW TO SUCCEED IN BUSINESS BY SELLING OFF THE BUSINESS

Even as mobile-communications startups in the UK are beginning to wonder how they might make more money, old hand Racal Telecom plc has been teaching them some tricks.

In less than a year and a half, the company managed to turn a 400% profit by selling a half share in its manufacturing subsidiary, Orbitel Mobile Communications Ltd.

Racal started the manufacturing company in 1987 in a 50-50 partnership with Plessey Co. plc to design, develop, and produce digital cellular telephone equipment. When Plessey was taken over in a hostile bid by Siemens AG of Germany and the British GEC plc, Racal invoked its right of first refusal on the half of Orbitel it didn't already own. So in mid-1989, GEC-Siemens in effect got Plessey's money back—all $14.3 million of it.

But in the final act, as just-published company results show, Racal sold that half share to the Swedish telecom vendor L.M. Ericsson last January. The sale price: $76.5 million. ❑



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CIRCLE 181

SANYO WANTS PARTNERS TO HELP DEVELOP AN INNOVATIVE PORTFOLIO OF LASER DIODES

LOOKING FOR GOOD IDEAS

BY JACK SHANDLE

OPTOELECTRONICS

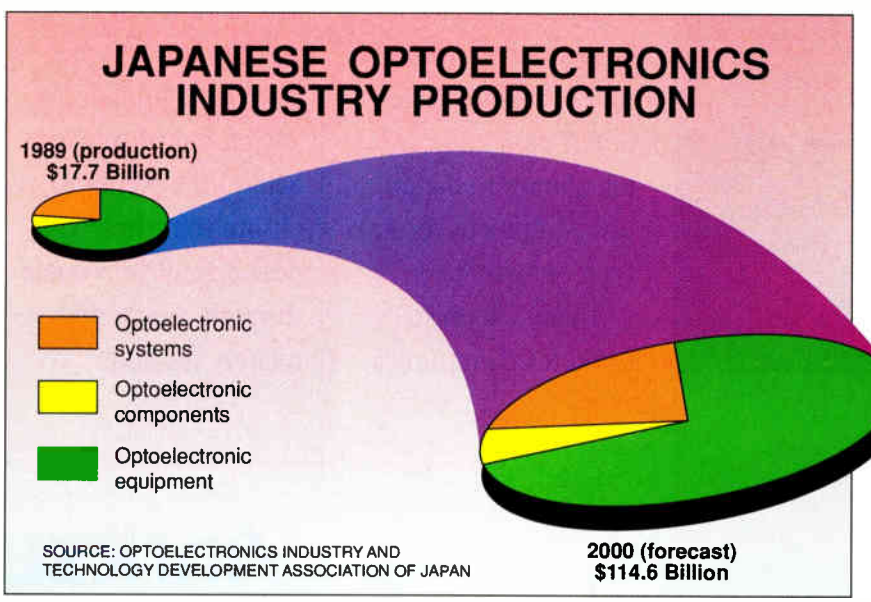
What happens when a Japanese company develops new core technologies but lacks the knack of imagining entirely new systems based on their advanced capabilites? If the company is Sanyo Electric Co., it looks for U.S. partners. In fact, Akifumi Goto's primary mission in the U.S. is to find innovative companies willing to form alliances with an $11 billion manufacturing giant. "Our partners do not have to be large, they just have to have good ideas," says Goto, who is executive vice president of Sanyo Semiconductor Corp. in Allendale, N.J.

The most exciting technologies to emerge from Sanyo's research and development center in Osaka are optoelectronic components, particularly its portfolio of laser diodes. The center has developed four leading-edge technologies, says Takeo Yamaguchi, manager of the lab's optoelectronics arm: visible-light laser diodes; four-beam laser diodes; high-power laser diodes; and surface-emitting laser diodes.

The visible-light devices boast a wavelength of 631-nm—the shortest ever—and optical output of 2 mW. Their small size and low power will provide stiff competition for the 632.8-nm gas lasers now used in bar-code readers, for example. Another visible-light unit, the 635-nm, 33-mW diode, can be used in erasable optical disc drives to provide much higher data densities than the 780- and 830-nm devices now in use. One possible application would be as a video disc for high-definition TV.

But displacing devices in existing applications is only half the story. "A U.S. company could have a good idea and not even be thinking in terms of using laser diodes," says Goto. "We are looking for innovative ideas." Image processing is one area where the new technologies could make a big impact.

Although the technological future is unknown, Japan is excited about optoelectronics. An industry group there has estimated total Japanese production—systems, equipment, and components—at $114.6 billion by the end of this decade. That is up radically from $17.7 billion actual production in 1989.



Allying with U.S. companies is not new to Sanyo. Several years ago, it teamed up with a large computer maker to develop a hard-disk controller using Sanyo's advanced hybrid-chip technology. The resulting chip is a very successful product that is still being used seven years later. Short-term development projects usually result in short-lived products, which is not Sanyo's goal. "We like to have a small number of long-term relationships rather than a large number of customers doing off-the-shelf sales," says Goto. As a result, 10 U.S. companies account for 83% of Sanyo's U.S. chip sales. Sanyo wants exclusive-product customers to pay for tooling costs, however.

With Sanyo's laser diodes, exclusivity might be a particularly attractive business option for a U.S. company with an innovative use for Sanyo's four-beam, 830-nm laser diode. Each element of the device has 100 mW optical output, and with the incorporation of integrated silicon photodiodes, each can be controlled independently, says Yamaguchi. Two possible uses are an optical-disc drive using the four beams independently to read and write faster; and a drive that features real-time recording and erasing.

Meanwhile, Sanyo's high-power laser diodes suggest a whole new menu of applications. One of them might be free-space communications, says Yamaguchi. Two devices, both boasting 100-mW outputs, have been developed. One has an 830-nm wavelength and would be used where high speed is a concern. The other has an 870-nm wavelength and would be used where smaller size and high efficiency are the primary criteria.

Perhaps the fourth generic technology—Sanyo's surface-emitting laser diode—has an even more exciting future. Since it has been fabricated in a two-dimensional, 3-by-3 array, the 780-nm device could form the core technology of an optical computer sometime in the future. The technology challenges here would include creating an operating system. Representative devices in some of the four core technologies are already in production or soon will be. The high-power laser diodes are in mass production now. ❑

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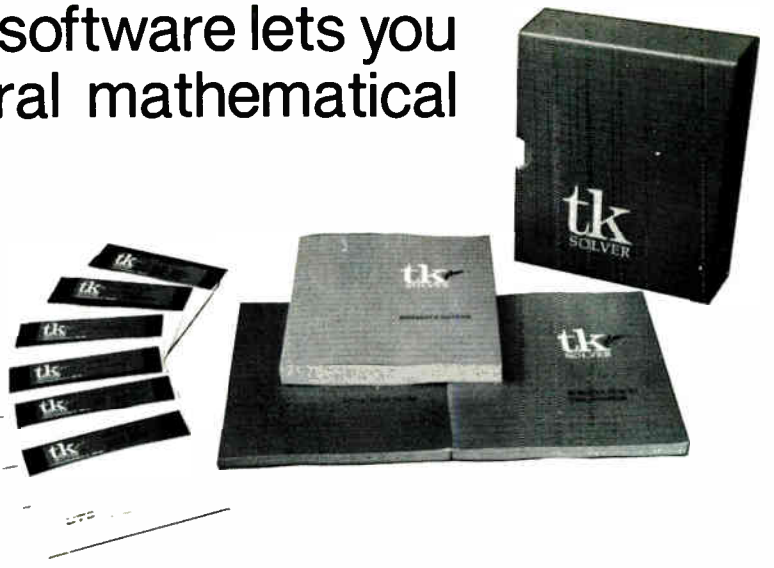

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COVER STORY

CAMPAIGN

This article was reported and written by Lawrence Curran, Jacqueline Damian, Jonah McLeod, Jack Shandle, Samuel Weber, and Howard Wolff.

The electronics industry's stake in the 1992 presidential election is perhaps its biggest of any election in the second half of this century. With the very framework of the industry being reshaped by relentless pressure from overseas as well as by faults in the domestic funding structure, anxious executives and entrepreneurs are looking harder than ever at the candidates and their answers to the tough questions.

Will the U.S. adopt an industrial policy designed to guard its high technology from further ravages of foreign competitors? Will anything be done to reduce capital-gains taxes and make investment in young, aggressive high-technology companies more attractive? Will the government adopt a more protective trade policy—"level the playing field," as the cliche puts it? And will there be a loosening of antitrust restrictions that inhibit cooperative manufacturing?

On the matter of industrial policy, which ranks right up there with broccoli on the White House's no-no list, congressional Republicans are seeking a politically palatable compromise even as the Democrats take the high ground on the issue (story opposite). Regarding taxes, Democrats are leading a congressional effort to give a capital-gains break to long-term investors in high-risk, high-technology industries—like electronics (p. 42). In trade, the debate is over whether to adopt a broad strategic initiative (p.44).

Then there's antitrust. As the industry turns increasingly to partnerships as a means of dealing with the staggering costs of research and manufacturing—and countering the built-in financing advantages enjoyed by their foreign rivals—the hovering specter of the Sherman Antitrust Act casts its shadow.

The penalty for running afoul of that law is not trivial. Say a company, aggrieved at being excluded from any agreement, files a suit under Sherman. If it is upheld, that company—or, for that matter, a customer—can collect three times the actual damages. Not many startups looking to edge into the market with innovative technology would survive such a blow.

Enter the National Cooperative Production Act, which the Bush Administration has proposed and is now before the Congress. Its two key provisions: government-sanctioned cooperative ventures would be exempt from the triple-damages sledgehammer of the Sherman act, and various court decisions that have eased the limits on joint-production agreements over the years would be written into law.

The stumbling block remaining is whether to include foreign companies under the new law's umbrella. The House version would exclude coproduction deals with more than 30% foreign ownership. However, the Administration, pushing hard to have trading partners drop their bars to U.S. companies, is threatening to veto the measure if that exclusion stands.

But perhaps the cold truth of reality was provided in July when leaders of the Electronic Industries Association and the American Electronics Association testified before the House Ways and Means Committee on U.S. competitiveness. Recalls Mark Rosenker, the EIA's vice president for public affairs, "The reception was, 'Hey, we've got a deficit right now. What do you want us to cut out to fund your program?' " ❑

'92 THE HOT BUTTONS FOR THE INDUSTRY ARE INDUSTRIAL POLICY, TAXES, TRADE, AND ANTITRUST RELIEF

A HIGH-TECH GAMBIT

BUSH SAYS NO TO U.S. TECHNOLOGY AID, SO DEMOCRATS ARE MAKING THE MOST OF IT

Electronics industry hopes for government support of strategic technologies come down to this: the presidential wing of the Republican Party fiercely refuses to countenance anything bearing even a whiff of industrial policy, while the Grand Old Party's congressional members search for some way to lend support in a form acceptable to the Administration. And the Democrats, with their overwhelming majorities in both houses, have planted their flag on the issue and are doing their best to make the Bush government squirm.

This can't be a surprise. Even though "the GOP basically starts out pro-business, it lacks an understanding of the role the U.S. government must play in today's international economy," says Kenneth Hagerty, senior vice president in Washington, D.C., of Franson, Hagerty & Associates Inc., a corporate financial, marketing, and policy communications firm. He has been a lobbyist for the electronics industry with the American Electronics Association and elsewhere. Hagerty's point: laissez-faire policies are especially ineffective when dealing with Asian governments that have adopted highly effective industrial policies on strategic technologies.

Those governments begin with the premise that they want to create and maintain a broad industrial base, says Clyde Prestowitz, former U.S. Trade Representative and now president of the Economic Strategy Institute in Washington. Japan focuses on so-called carrier industries that target a whole range of components, such as consumer electronics or semiconductors. "It is a lot easier to have a high-growth economy if you focus on digital tape, semiconductors, and laptops," he says.

"The U.S. focuses on the consumer," Prestowitz says, "reasoning that by putting money in consumers' hands and maintaining a market, the market will decide which products are best and which industries survive. The key for the U.S. is, do we care what we make?"

Many other nations do, and they have established priorities. So the question facing the Republican Administration is, can a high-tech industry left to its own devices compete against such fortified competitors without some form of government assistance?

"Republicans were smacked upside the head with the new reality of the modern international market when Toshiba Machine Co. was caught selling precision machinery used to build propeller blades for nuclear submarines," says a key Senate staffer. "As Craig Fields said, you don't mind Japan being your sole supplier, but you don't want to get into a position where they can sell to the other guy first." Fields, a supporter of high-tech initiatives, was eased out of his Pentagon job. The way the staffer sees it, "The Toshiba incident got conservatives really concerned and a feeling that defense had to nurture a strong commercial base started to grow."

Robert Costello, undersecretary of defense for procurement in the Reagan Administration and currently a senior fellow at the Hudson Institute, believes the government must be proactive. "Strategic technologies need some form of government aid," he says. His list includes semiconductor manufacturing, high-definition TV, supercomputing, and superconductivity.

Costello believes the U.S. should act as a catalyst, supplying up to 50% of needed funding. He favors consortia as a way to foster key technology, and would like to see the government use its influence as a customer. "The government is going to be a major buyer of advanced technologies, and the power of the influential buyer can force the infrastructure to be put in place," he says.

As the Republicans wrestle with their political conscience, the Democrats are making the most of the political opportunity afforded as they find themselves leading the red, white, and blue crusade to save America's high-tech supremacy.

Sen. Albert Gore (D., Tenn.) enunciates the party's position. "High-technology industries, including electronics, are essential to the economic strength of our nation. If our ability to make ad-

vanced products continues to decline, we risk losing control over our national defense, and we certainly will lose high-paid manufacturing jobs. While overseas governments are helping their companies win the global economic race, ours sits on the sidelines."

So Democrats in the Congress have been moving aggressively to develop legislation aimed at fostering strategic technology. For example, an idea that surfaced at a congressional hearing, with the blessing of Democratic senators, is part of the AEA's proposal for supporting HDTV: $1 billion in loan guarantees.

"The Bush people went bonkers," the Senate staffer says. "They admit they are more ideological about the evils of industrial policy than the Reagan Administration. They cite the wide margin of victory over Mike Dukakis [in 1988] repudiating a platform of helping industry be more competitive." The result is that Republicans are hoist with their own petard, coming across as foot-dragging naysayers too tied down by ideological dogma to cope with the new economic reality.

Democratic senators are trying to paint the Administration into a corner. One, Jeff Bingaman (D., N.M.), sponsored legislation requiring the White House to prepare a Critical Technologies Report. The report, written by the White House Office of Science and Technology Policy and signed by director D. Allan Bromley, listed 22 strategic technologies that need some form of government support. It appeared on Sept. 26, 1990, so as of that date the U.S. had something of a technology policy, but virtually no funding to implement it.

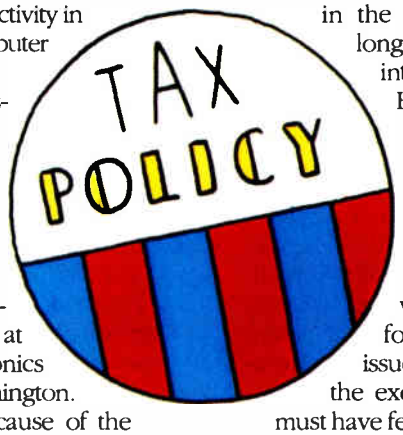
In June, Senators Bingaman, Gore, Ernest J. Hollings (D., N.C.), and Sam Nunn (D., Ga.) introduced legislation that, among other things, would require the White House to prepare interagency plans for each of the strategic technologies. The measures focus on manufacturing, and the senators are waiting for the industry to supply initiatives.

"This Administration will never make technology a priority on its own. They don't care if *Electronics* readers and their companies live or die," the Washington source contends. "If the chip industry, for example, comes in and says (as it did with Sematech), 'We'll put down our hard-earned money,' the Administration will go along. Maybe it won't like it, but it will accept it." ❑

CAPITAL-GAINS RELIEF

DEMOCRATS BACK A BREAK FOR LONG-TERM INVESTORS IN HIGH-TECH COMPANIES

In the wake of last year's defeat of a Bush Administration bill that would have provided an across-the-board reduction in the capital-gains tax rate, momentum is building on the Democratic side of the aisle to take a different tack. Party leaders seek capital-gains tax relief that's targeted toward long-term investors in high-risk, high-technology companies—a move that could spur new activity in electronics and computer company startups.



The Bush Administration has proposed the same bill this year, "but there has been no serious effort on the Hill to enact it," says Ed Hatcher, senior manager for tax policy at the American Electronics Association in Washington. "That's probably because of the lack of enthusiasm for a broad-based bill last year," Hatcher adds. The AEA also champions a targeted approach to capital-gains-tax reduction.

One vocal Democrat is former U.S. senator Paul Tsongas of Massachusetts, the first announced Democratic presidential candidate, who supports a targeted capital-gains tax plan. Tsongas has served on the boards of Wang Laboratories Inc. in Lowell, Mass., and M/A-COM Inc. in Burlington, Mass. Speaking from that perspective, he says that the current capital-gains tax debate "would only happen in a political environment far removed from the pressures faced by American companies."

Tsongas maintains that the nation doesn't need an across-the-board capital-gains reduction, "as President Bush fought so desperately for last year. We need to limit capital-gains incentives to long-term investments in corporate America. Invest in a U.S. company, hold that stock rather than speculate, and you get a lower capital-gains tax rate."

Tsongas also favors special recognition for startups, saying "it makes obvious sense to give an added incentive to such new enterprises. The growth of the American industrial base has always come from small and emerging companies. There should be differentials here large enough to attract serious investment in those new ventures."

Another Massachusetts Democrat, Rep. Edward Markey, has put teeth in the concept of targeted long-term investments by introducing a bill in the House that includes a 40% capital-gains exclusion for investors in small, high-risk, high-technology companies, as long as they hold their investments for at least four years. Only newly issued stock qualifies for the exclusion; the company must have fewer than 200 employees; it must either be a startup or have a five-year record of research-intensive business; and research and development spending must be at least 18% of total expenditures.

The Markey bill hasn't been called up for debate by the House Ways and Means Committee, and a spokesman on Markey's staff doesn't expect any action on it this year. Nor has there been any activity on a similar bill introduced in the Senate by John Kerry (D., Mass.). "There may be some movement next year," says the Markey staffer.

Markey says that by injecting new capital into high-tech startups, the Venture Capital Investment Act of 1991 "will give us the jump start we need to get back in the global technology race. This is a critical time for our country to invest in the risk-takers and entrepreneurs who build real companies and create new jobs," says Markey, chairman of the House Telecommunications and Finance Subcommittee.

"My plan would not reward the

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stock churners and money manipulators who shift from one short-term investment to another, realizing handsome profits for themselves at the expense of America's economic future. Rather, it will create the kind of small businesses that create jobs while laying the foundation for a more competitive economy for the 21st century."

Markey says the Bush Administration's current capital-gains provision would provide an immediate across-the-board windfall for current investments held for just one year. Markey's proposal is aimed squarely at investment that will generate new capital.

Back on the Senate side, Albert Gore (D., Tenn.) also backs a policy that encourages long-term investments. Gore, who is regarded as a possible presidential candidate, says "It is of utmost importance for our tax code to encourage capital formation."

Gore says he favors a long-term capital-gains-tax reduction "to encourage investment in growth companies rather than across-the-board cuts that encourage paper transactions. The longer the investor holds onto the asset, the greater his capital-gains tax cut." ❑

AT ODDS ON TRADE

BUSH CRITICS FAVOR BROAD ECONOMIC POLICY RATHER THAN PATCHWORK SOLUTIONS

In trade policy, as in the other aspects of technology policy, many Bush Administration critics are calling for a broad strategic initiative. "We tend to look for a silver bullet—one thing that is going to solve the problem," says Robert Costello, former undersecretary for procurement at the Department of Defense. "But there is no silver bullet," he says, "and if there were it would probably destroy us in the process."

Costello, now a senior fellow at the Hudson Institute, contends that another part of the problem is that the U.S. approaches trade from a static and outdated perspective. "The U.S. Trade Representative is a lawyer who staffs the Trade Representative's Office with lawyers," he says. "They tend to get into turf battles like how to break into the Japanese market. Why doesn't the trade representative figure out some ways to bring manufacturing back to the U.S.?" Consumer-electronics manufacturing can be enticed back to U.S. shores, Costello says, where it will be likely to purchase components locally.

This opportunity has presented itself because Japanese companies have decided to adopt surface-mount technology. This means they must retool their production facilities with highly automated, highly expensive capital equipment. "Why not put it in the U.S.?" Costello asks. "There is practically no labor cost, so why not put it in your largest market? It would save them shipping. They would reduce their overall costs. And if they don't do something, the protectionist sentiment in the U.S. will rise to an intolerable level." Such a proposal requires innovative thinking in the U.S., and although an initiative is under way, the U.S. Trade Representative is not involved, he says.

Clyde Prestowitz, a former U.S. Trade Representative who now directs the Economic Strategy Institute in Washington, also argues for an integrated approach. "You can't solve this problem with a trade policy," he says. "But if you were putting together a trade policy as part of a broad economic strategy, you should base it on reciprocity." Recognizing that other nations have coherent programs to promote specific high-tech industries for export, American policymakers should be ready to make appropriate responses to protect the domestic market from predatory practices.

But instances of U.S. responses along this vein have been spotty. Prestowitz characterizes the recently negotiated Semiconductor Trade Agreement with Japan, for example, as "an affirmative action program" that lacks punitive measures. Implementing it will require continual pressure from the U.S. side, which is difficult, he says. The agreement would stand a better chance of achieving its goal of raising the U.S. share of the Japanese market to 20% if it included a process that lead to reciprocal actions. "MITI [Japan's Ministry of International Trade and Industry], the Commerce Department, and industry should be sitting down on a regular basis to evaluate progress," Prestowitz says. "If there is no movement, the U.S. should take some action. But there is none of that in the agreement."

Some efforts toward a broadly stated policy of reciprocity are being made. On March 7, Rep. Edward Markey (D., Mass.) introduced his Fair Trade in Services Act, which authorizes retaliatory action by several U.S. regulatory bodies. The bill limits its scope to telecommunications and financial services, the areas for which Markey's subcommittee has oversight. It first defines a process to assess if a foreign nation is practicing discrimination against U.S. firms operating there. If the foreign nation is found to be discriminating, negotiations may follow—but this part of the process can also be waived if negotiations appear fruitless. Sanctions are imposed against persons and companies of that nation.

For example, the Securities and Exchange Commission could bar the acquisition of any registered broker-dealer or investment by a foreign company. And the Federal Communications Commission could deny licenses, authorization, and equipment certifications.

"President Bush has stated that our trade policy is to open markets worldwide," says Markey. "While I share the goal, the fact is that we have lost valuable time and must run even faster to achieve the elusive goal. I find myself increasingly concerned about the open discrimination and unnecessary trade barriers faced by U.S. providers of financial services and telecommunications equipment and services. This bill provides the kind of tough regulatory sanctions needed to convince our trading partners that America is serious about opening up foreign telecommunications and securities markets." ❑

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EUROPE LOOKS TO 1995 FOR HDTV'S DEBUT

CHIPS, TV SETS, AND STUDIO PRODUCTION GEAR ARE ARRIVING NOW FOR TRIALS DURING THE '92 OLYMPICS

BY JOHN GOSCH

In Europe, high-definition TV is coming out of the lab and into everyday life, with set makers, semiconductor companies, studio-equipment manufacturers, broadcasters, and TV producers setting the stage for the general introduction of HDTV in 1995. By then, the infrastructure will be in place and the first HDTV receivers will turn up in shop windows for consumers to buy.

Eureka 95, a six-year, $600 million pan-European HDTV research effort, is well into its second phase, which is to last till the end of 1992. After that, the industry will gear up for volume production of the equipment for the new system, which is compatible with current TV technology. Project members are busy building first-generation gear—receivers, video-disc players, professional cameras, and so on—conforming to the proposed 1,250-line, 50-Hz European HDTV standard. Some of that equipment is already on the market.

"Although we haven't yet delivered as much equipment as the Japanese, we are on an equal footing as far as system quality is concerned and even ahead when it comes to transmission quality," says Eureka chief Peter Bögels. In receivers, the immediate objective is to produce more than 1,000 prototypes by the end of next year for public demonstrations during the 1992 Olympics. With a 16:9 aspect ratio, the sets show pictures with 1,440 pixels for each of the 1,250 lines. They are being built by Philips of the Netherlands, France's Thomson, and Finland's Nokia.

Meanwhile, trials of HDTV broadcasts are being held in many countries—Germany, the Netherlands, Finland, the UK, France, and elsewhere—using the HD-MAC (for high-definition multiplexed analog components) transmission system. The truly large-scale trials commence next year during the Winter Games in Albertville, France, and the Summer Games in Barcelona, Spain. On the 1,000 so-called Olympic receivers that will be installed at public demonstration centers throughout Europe, viewers will watch eight to 10 hours of sports and cultural programs a day.

Among chip makers, the ITT Semiconductors Group in Freiburg, Germany, has been assigned by Eureka to develop 50% of the signal-processing circuitry in the HDTV receiver, says Sönke Mehrgardt, the group's technical director. ITT has samples of an HD-MAC decoder, the single-chip HDMA2290, which integrates more than 200,000 transistors.

HDTV GETS REAL

Philips is one of three firms developing prototype HDTV sets for 1992.

Production equipment is furthest along. Broadcast Television Systems GmbH (BTS) in Darmstadt, Germany, a joint venture of Philips and Germany's Robert Bosch GmbH, has developed a range of gear that includes a multistandard camera, the KCH1000, which is designed for studio or outside broadcast applications. It provides state-of-the-art HDTV picture quality under any shooting conditions and is adaptable to all proposed HDTV scanning systems.

Also from BTS comes an HDTV videotape recorder. The BCH1000, for 1-in. tape, consists of an analog recording section and a digital-signal-processing part all housed in a 19-in. rack. The recorder uses a segmented scan recording process with four channels in parallel—two for carrying the 20-MHz luminance components and one each for the two 10-MHz color-difference components.

From the Dutch giant Philips Electronics comes an HD-MAC optical video-disc player based on the company's VP4000 family of interactive Laservision disc devices. The player, together with an HD-MAC DSP, delivers stable HDTV pictures as well as compatible MAC TV pictures in the 16:9 format.

The production equipment makers are continuously upgrading their hardware in preparation for second-generation systems. For example, Philips is now readying a charge-coupled device for the BTS camera, the first frame-transfer CCD for an HDTV camera. France's Thomson SA, too, is developing CCDs, and both companies are working on components for large-screen direct-view tubes. ❑

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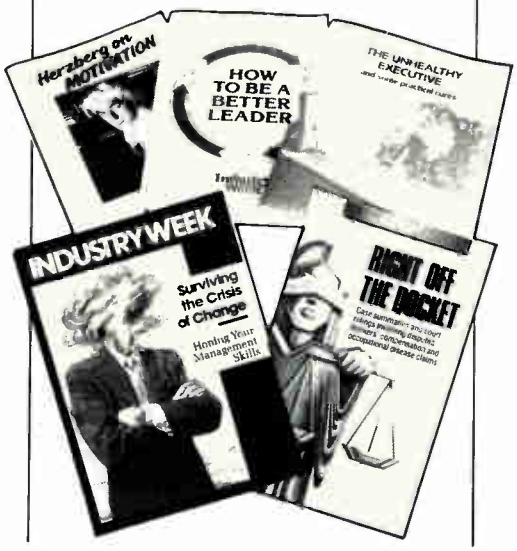

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FREE THE BELLS: PANACEA OR PAIN?

UNDOING THE TERMS OF THE AT&T DIVESTITURE WILL REVERBERATE THROUGH THE ENTIRE ELECTRONICS INDUSTRY

BY JACK SHANDLE

COMMUNICATIONS

The political struggle to let the Bell operating companies do two things now prohibited by the terms of the 1984 AT&T divestiture—manufacture equipment and provide information services—is getting hotter. By this time next year, it should be clear just how far the Congress and the courts are willing to go in gutting the Modified Final Judgment that defined the terms of the 1984 split.

The outcome of the complex web of political commitments, special-interest lobbying, and legislative maneuvering will have an impact felt through the entire electronics industry. Partnering with a Bell operating company may become a new means of raising research-and-development capital for some electronics companies. Other companies may find themselves in the unhappy situation of competing with a BOC manufacturing subsidiary when they try to sell to a BOC. They may complain—as some opponents are already doing—that the BOCs will use money earned from their regulated business to subsidize their unregulated manufacturing arms.

Because global competitiveness has become a Congressional preoccupation, several issues in that debate are deeply embroiled in the fight, with both sides saying their positions will make the U.S. more competitive. These include restrictions on imported components, partnering with foreign companies, off-shore manufacturing, bolstering R&D spending, and the idea that spurred the AT&T Co. divestiture in the first place—an even playing field for domestic competition.

A more complex environment for a quick, tidy, and effective resolution to these highly controversial issues could hardly be imagined. All three branches of the federal government—the president, the Congress, and the courts—are involved, and the two restricted business activities—information services and manufacturing—are following different paths through this maze of federal policymaking. BOC entry into information services, which includes everything from electronic Yellow Pages to multimedia videotext—will be decided by the courts. If the courts give a thumbs up, the Congress will probably step in with special regulations. And regulatory bodies, after a comatose decade of the Reagan Administration, seem likely to enter a new period of activism in the 1990s, according to expert Washington watchers.

Manufacturing, on the other hand, seems to be Congress's bailiwick. The bill sponsored by Sen. Ernest Hollings (D., S.C.) that passed the Senate in June alters the Modified Final Judgment by allowing the "baby Bells" to engage in manufacturing. It also imposes restrictions and limitations on Bell manufacturing subsidiaries. But it says not a word about information services. Yet political observers are almost unanimous in their opinion that any bill passed by the House of Representatives will address both information services and manufacturing.

In the House, Congressman Edward Markey (D., Mass.), chairman of the House telecommunications subcommittee, introduced a bill on Aug. 5 that will probably become the core legislation in that chamber. As expected, it addresses information services. Importantly, how-

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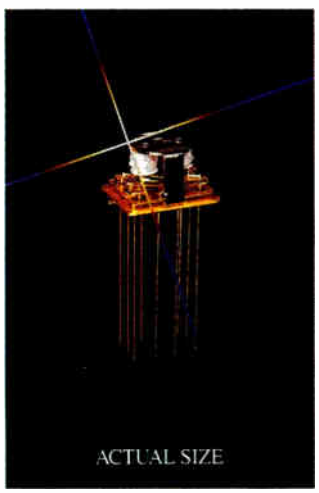

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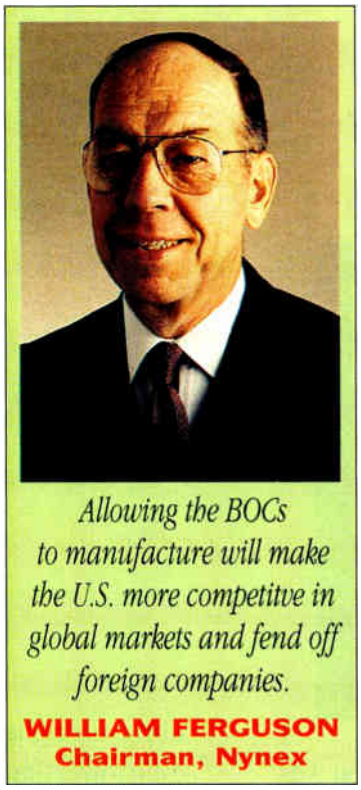
CIRCLE 196

ever, it does not cancel the Modified Final Judgment and grant the Bells entry into information-services lines of business. The thumbs up or down must come from the judiciary. If the courts strike down the Modified Final Judgment's restriction against information services, the Markey bill provides specific safeguards that are for the most part implemented by requiring the BOCs to form subsidiaries and then regulating the subsidiaries. On the manufacturing issue, the Markey bill lines up substantially with the Hollings bill.

To further complicate matters, the bills introduced in the House are being jointed referred to two committees. Markey's telecommunications subcommittee is holding hearings under the authority of the Committee on Energy and Commerce. Meanwhile, the Judiciary Committee chaired by Rep. Jack Brooks (D., Texas) is holding hearings because the bills clearly impact federal antitrust policy. Capitol Hill sources say there is little doubt that Markey will be able to get a bill out of his committee. But in his Aug. 1 remarks opening the Judiciary Committee hearings, Brooks appeared reluctant to tamper with the Modified Final Judgment that defines the AT&T divestiture.



Allowing the BOCs to manufacture will make the U.S. more competitive in global markets and fend off foreign companies.

WILLIAM FERGUSON
Chairman, Nynex

This is not to say there will be a stalemate in Congress. Despite the absence of a Senate debate on information services, the Senate might "strike a deal to accept a few safeguards," says a Capitol Hill source. "By that time, everybody involved might want to pass a bill that does something. They may feel that is better than to have no bill at all." But if such a bill passes both houses of Congress, it could face a White House veto if it contains—as it most likely will—provisions that violate the president's free-trade philosophy.

On the judicial side, U.S. Judge Harold Greene administers the Modified Final Judgment. On July 25, he ostensibly lifted the restriction on the Bells creating and providing information services. Part of his ruling, however, restrained the Bells from actually getting started until the U.S. Court of Appeals decides on the appeal to his order. This process will last for at least a year, says Albert Kramer, attorney for the North American Telecommunications Association (NATA), an ardent opponent of Bell operating company entry into information services and manufacturing.

Despite his decision, Greene is far from being an advocate of allowing the BOCs into information services. In fact, he has rebuffed the Bells more than once. Rather, he was acting on an order from the Court of Appeals (the BOCs had appealed one of Greene's earlier decisions) that required him to apply a standard that would show that BOC entry in the business would lessen competition. Greene could not make a finding with certainty and threw the case back to the Court of Appeals.

Perhaps the most important effect of Judge Greene's decision will not be in the courts but its impact on the legislation that is winding its way through Congress. "The decision complicates everybody's legislative strategy," says Kramer.

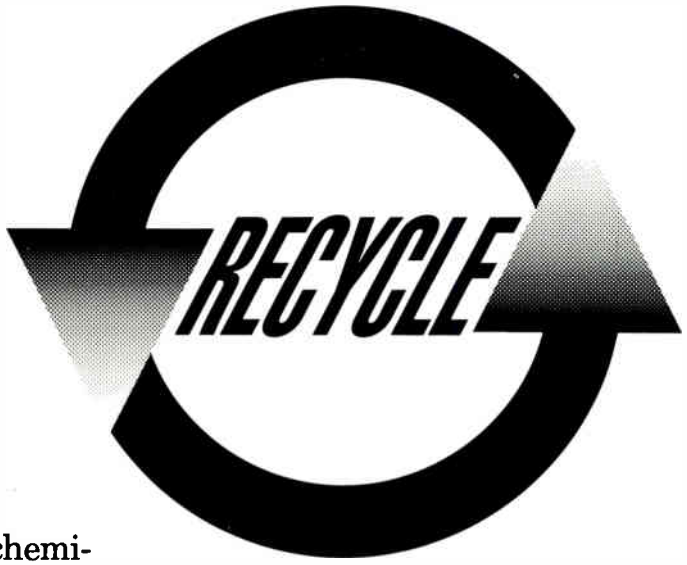
The spotlight is clearly on Congress. Political logistics aside, the Hollings bill has come under criticism from opponents such as AT&T, NATA, the Telecommunications Industry Association, and the Consumer Federation of America. They contend the BOCs will return to the same anti-competitive practices in designing and manufacturing equipment that AT&T engaged in prior to the divestiture, and that the safeguards in the Hollings bill are inadequate. As proof that divestiture has worked, Kramer points to "the array of product features and services that people have available to them today, which is broader than it has ever been." One reason to keep the BOCs out of manufacturing, he says, evolves from the fact that they determine the network services of the future. This gives them an unfair advantage in developing and designing products that will take advantage of the new services. Another reason is the potential for cross subsidization—that is, having rate payers support their research and development expenses in their phone bills.

The Hollings bill attempts to address these problems by requiring the BOCs to create separate manufacturing subsidiaries and to divulge research on future network services. Kramer and other opponents see loopholes in this approach. The technology of central-office switches is virtually the same as technology customer-premises equipment—the product lines that the BOCs cannot manufacture now. This similarity allows the BOCs to transfer the central-office-switch R&D charged to the rate payers to the manufacturing subsidiary, says Kramer. And recent experience with AT&T and Northern Telecom Corp., for example, makes it clear that the so-called network-disclosure requirements are not enough to keep the latest technical information flowing to smaller companies, he says. For example, the digital Centrex service known as Electronic Business Service is available only through Northern Telecom DMS-100 switches and is specifically designed for a Northern Telecom product known as the Meridian Business Set. Although some interconnection information has been released, other manufacturers have been unable to use it to develop a connection the Electronic Business Service.

In response, William Ferguson, chairman of the largest regional Bell holding company, Nynex Corp., White Plains, N.Y., which includes BOCs such as New York Bell and New England Bell, contends that the BOCs will have plenty of competition and suggests that keeping them out of manufacturing could put the U.S. at a competitive disadvantage globally.

"Since divestiture, a number of large, foreign-based companies have moved quickly into the market. These companies present formidable competition for the Bell companies," Ferguson says. Not surprisingly, Ferguson believes the Federal Communications Commission will

PENTON CONTINUES COMMITMENT TO RECYCLING



Penton Publishing's Camera Department started recycling chemicals from film wastewater 25 years ago... long before the ecologically-smart idea was widely recognized.

For almost as many years, the Penton Press Division has been recycling scrap paper, obsolete inventory, and printing press waste materials. In 1991, Penton Press will recycle some 5500 tons of paper, 9 tons of aluminum plates, and 3 tons of scrap film negatives. Furthermore, the Press Division has invested $500,000 in air pollution control equipment.

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be a zealous enough watchdog to prevent cross-subsidization.

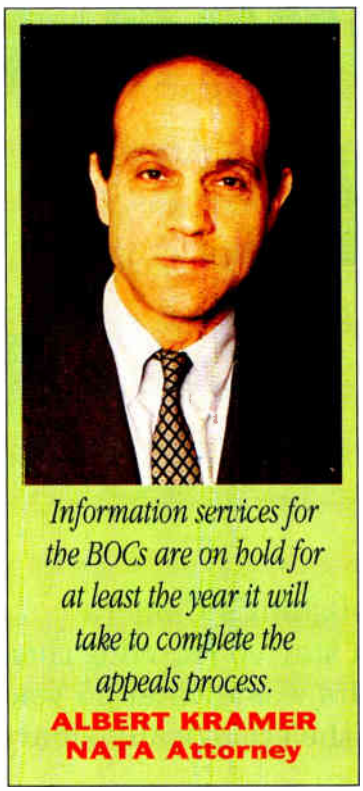
Despite criticism from NATA, the BOCs have attracted some support from medium-sized companies. Centigram Communications Co., San Jose, Calif., is one of 53 companies that formed an ad hoc coalition supporting "free-the-Bells" legislation. George Sollman, president of Centigram, says that "telecommunications manufacturing is incredibly cash-intensive, and small manufacturers have limited resources. The combination of foreign investment and restrictions on BOCs means that decisions on the nation's telecommunications policies and priorities are increasingly being set outside U.S. borders." In short, firms like Centigram stand to benefit by partnering with the cash-rich BOCs for R&D support. In testimony before Markey's subcommittee, Sollman chided the Telecommunications Industry Association for representing that its members are nearly unanimous in opposing the legislation. "I believe a substantial majority of all small manufacturers favor this legislation as good for their long-term interests," he said.

Perhaps the biggest controversy over the Hollings bill is its requirement that the products manufactured by the BOCs have less than 40% foreign components. The provision has drawn fire from the Bush Administration, which has threatened a veto on the grounds that guaranteeing markets to domestic component suppliers runs counter to the administration's free-trade policy.

On the other hand, critics such as Kramer think that it guarantees too little. The formula, he says, requires that the cost of foreign components should not exceed 40% of the sales revenue of the product. Balancing costs on one hand against revenue on the other makes that less-than-40% goal rather easy to reach, he says. Components costs are quickly outweighed by other costs such as assembly, patents, and even advertising.

Interestingly, domestic content has gotten more attention than another provision which allows no exceptions to the Bells doing all their manufacturing in the U.S. Foreign affiliates of the BOCs must manufacture in the U.S. as well. The domestic content and U.S. manufacturing requirements are extremely important elements of the Senate bill, says a Senate staffer, because they were negotiated between the Bells and the communications workers. If they are loosened or deleted to please the president, the unions will be unhappy. If they are strengthened, the Bells will be unhappy. Republican Senator John Danforth of Missouri will be the key player in brokering a deal with the White House.

Both the Hollings and Markey bills vest regulatory authority in the FCC. In particular, the Markey bill grants the FCC—as opposed to state regulators—primary authority over enhanced services offerings. The bill requires that at least 20% of the subsidiary's board of directors be independent of the BOC and any other BOC subsidiary. It requires separate books for the subsidiary and keeps the division auditable by prohibiting joint ventures, common employees, and other cost-sharing arrangements with the BOC.



Information services for the BOCs are on hold for at least the year it will take to complete the appeals process.
ALBERT KRAMER
NATA Attorney

To prevent cross subsidies, the Markey bill requires that the allocation of investments in central-office equipment, for example, should be calculated so that the telephone service subscribers and consumers assume the lowest possible cost. It also attempts to protect consumers by prohibiting any arrangements in which creditors of a failed subsidiary would have any claim on the assets of the BOC. The portions of the Markey bill that allow the baby Bells to manufacture customer-premises equipment follow the Hollings bill fairly closely, especially in the provisions for limiting foreign components and requiring U.S.-based manufacturing.

Opponents of any bill that would put the BOCs in the manufacturing business contend that regulations cannot plug all the loopholes. Such limitations, rules, and regulations were tried for a decade prior to the AT&T divestiture, says Robert Allen, the present chairman of the board of AT&T. "Yet despite concerted efforts and piles of regulations, no administrative remedy, no rules, no structural safeguard, no regulatory oversight could overcome the problem of local monopolies having self-dealing arrangements with captive suppliers."

Nevertheless, Congressional observers say that momentum is building toward the passage of some sort of bill. The big reason, besides politics, is global competitiveness and an interest in supporting U.S. technology. If the bills become law, the key player will be the FCC and its enforcement policies. The times are changing in regulatory agencies from an attitude of slack enforcement during the Reagan Administration, says Carol Tucker Foreman of the Washington-based public-policy consulting firm Foreman and Heidepriem.

Foreman, whose book, *Regulating the Future: The Creative Balance,* will be published this month by the Center for National Policy Press, has concluded that the 1990s will be a period of regulatory activity. "Our experience with deregulation during the 1980s has made Americans demand that the water should be clean, the food safe, and when we put out money in a savings and loan, we should be able to get it out," she says. There are signs that the Bush Administration will be more activist. "If Congress passes a law to deal with the Bells," she says, "I believe the FCC will carry it out in a different, more vigorous way than during the 1980s."

Admittedly, this era of regulatory activism could run counter to a trend toward organizing the nation's resources to be more competitive globally. That's where the creative balance comes in. "Clearly, we live in an international economy and being competitive internationally is a very important goal—a priority goal—but it should not be the only goal of the American government," says Foreman. "Competing goals include the adequacy and pricing of domestic phone service." ❑

HOW TO JUMP-START A FLAGGING MARKET

ATE SUPPLIERS ARE CUTTING COSTS, BOOSTING FUNCTIONALITY, AND DOING SOME SOUL-SEARCHING

BY JONAH McLEOD

As the last step in the manufacture of integrated circuits and printed-circuit boards, test often gets short shrift. Board and IC vendors complain of testing's exorbitant cost—but demand systems with the kind of accuracy, performance, and features that only come at a high price. This paradox has resulted in a long spell of lean years for automatic test equipment, says Carolyn Rodgers, senior technology analyst at Hambrecht & Quist Inc. in San Francisco. But while analysts expect the low growth to continue into 1992, the dearth of purchases means pent-up demand, says G. Dan Hutcheson, president of VLSI Research Inc. in San Jose, Calif. He sees a surge in 1993 and 1994.

ATE

In the meantime, though, the ATE industry has learned some important lessons from the lean years. The tight market has created efficient suppliers that have cut test costs for their customers by offering more bang for the buck. Today's testers handle more units at one time. Some are modular, letting users buy only as much functionality as they need. And the equipment now comes with better maintenance services and support pricing.

Hutcheson believes the cost issue is really a perception issue, resulting from the disparity between real cost and a customer's ideas about pricing. Says Reh Qureshi, head of the test technology group at National Semiconductor Corp. in Santa Clara, Calif., "ATE systems are a lot more expensive today, but the cost per pin is coming down. You're getting more for your money than at any time in the past."

IC vendors have consistently spent less on ATE than on new process equipment, says Hutcheson. "There is tremendous disparity between ATE and wafer-fab [equipment] in terms of market growth," he says. "Over the past 10 years, IC makers' spending on wafer fab grew 17%, but spending on ATE grew only 10%." In 1984, when spending on ATE peaked, Hutcheson says IC makers spent 5.3% of their capital budget on linear test gear, 3.5% on logic, and 4.4% on memory. By contrast, in 1990 the figures were 3.2% on linear/mixed-signal test, 1.9% on logic, and 1.7% on memory.

COPING WITH COSTS

IMS miniaturized ATE technology to create the Logic Master ATS; it's a fifth to a tenth the price of competing testers.

This suggests IC makers are largely using older technology to test new, more complex semiconductor devices, and ASIC maker LSI Logic Corp. is an example. Bill Nelson, director of worldwide operation at the Milpitas, Calif., company, says the firm begins production test on new, high-end systems and then transfers over to older test gear already in place on the factory floor. LSI Logic uses Credence Systems Corp.'s new 100-MHz Vista Series high-end testers at the early stage and switches to the Fremont, Calif., test maker's older 20-MHz equipment later.

But Hutcheson believes ATE's long wait will soon be over. "Large IC companies have not had a major ATE buy in five years," he says, "and the existing equipment is just not up to the next generation of ultra-high-scale integrated circuits." VLSI Research predicts 11% growth to $1.35 billion in 1992, followed by a 35% leap to $2 billion in 1994. This year, mixed-signal ATE has the highest growth rate at 20%, with logic testers at 8% and memory at 13%.

Jim Prestridge, vice president of Teradyne Inc.'s Semiconductor Test Group in Agoura Hills, Calif., sees memory sales picking up worldwide as manu-

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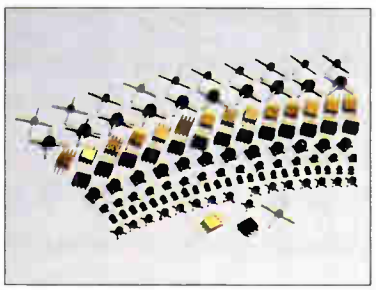

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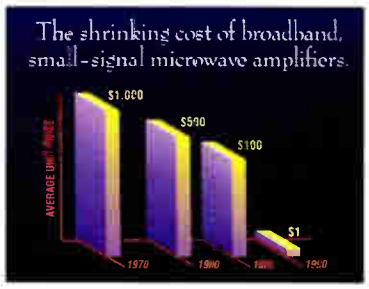

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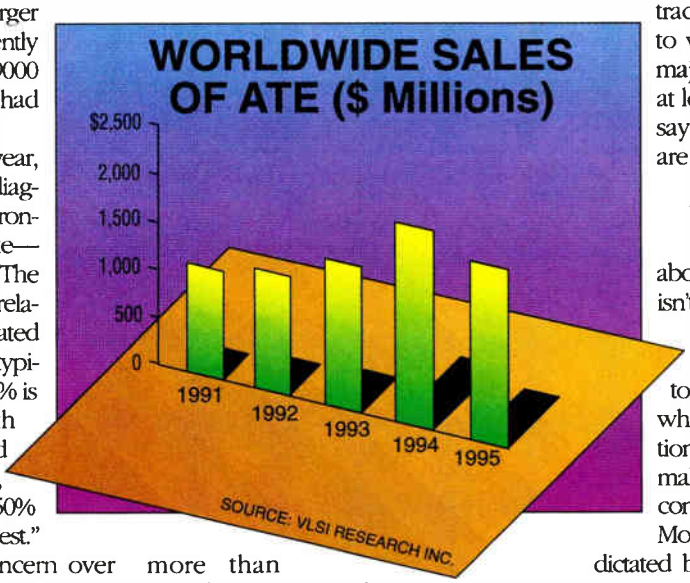
facturers buy capacity to test 16-Mbit DRAMs. Like Hutcheson, Rodgers of Hambrecht & Quist also points to mixed-signal testing as a lively niche, and this trend will benefit LTX Corp. The Westwood, Mass., company's synchromaster, though late to market, offers a lower-cost solution that could give Teradyne's A500 a run for its money. More powerful than the LTX solution—but pricier—the A500 has the lion's share of the market, with around 200 systems installed.

Meanwhile, as the logic-tester market begins to pick up steam, one company likely to benefit is Schlumberger Technologies. Intel Corp. recently chose the San Jose firm's ITS9000 to replace the LTX testers it had been using.

Another bright spot this year, says Hutcheson, is design diagnostics—ASIC verifiers, electron-beam probers, and the like—which he sees growing 15%. The keen interest stems from the relatively high cost of test associated with ASICs. "Of the cost of a typical memory device, 10% to 20% is related to test," says Keith Barnes, president of Integrated Measurement Systems Inc., Beaverton, Ore. "By contrast, 50% of an ASIC's cost is tied up in test."



To accommodate the concern over price tags, ATE vendors are taking measures to cut costs. Prices won't drop below the $3 million to $7 million range, but thanks to innovative design, test will account for less of the total chip cost. One measure is to apply technology to the problem. A second is to test devices in parallel, a technique widely used on memory testers and finding its way into board test. Another is to modularize test systems so the customer buys only the required capacity. ATE has long suffered from a mainframe mentality in the age of the personal computer, says analyst Rodgers. What's needed is an ATE "PC" to replace yesterday's megasystem.

New ATE technology is tackling one old problem: the high cost of pin electronics. For example, ASIC verifiers must build high performance into a low-cost box simply because the customer cannot afford the equipment otherwise. Sold to engineering departments, not into production, the units must sell for $100,000 or less and yet pack 100 MHz of timing, 400-ns resolutions, and large pin counts. IMS responded with its Logic Master series and Hewlett-Packard Co. with its HP80000. Both offer 100-MHz operation, subnanosecond accuracies, and up to 100 pins—all at $3,000 per pin. At the International Test Conference in Nashville in October, IMS will announce a new system with up to 400 pins, +/-100-ps resolution, and 200-MHz clock speeds. The price tag is $2,600 to $3,200 per pin.

Besides ASIC verifiers, memory testers were ahead of other ATE in clever cost-cutting by simply testing more than one chip at a time. They now handle 32 DRAMs in parallel, says Craig Foster, vice president of marketing at Megatest Corp. in San Jose. Foster says manufacturers are looking at applying parallel test techniques to complex logic chips, but are stymied by the need to drive the large numbers of pins on today's complex logic ICs simultaneously. As an alternative, Megatest's Polaris offers multiple test heads. "A two-headed machine provides a 30% savings over two separate testers," Foster says.

Board testers, meanwhile, have also adopted the multiple-tester approach. However, instead of building expensive testers, John Fluke Mfg. Co. in Everett, Wash., starts with a highly programmable, low-cost system—the $75,000 Fluke Sigma Series—that can be replicated in a manufacturing operation. Such small, low-cost systems provide an alternative for board makers building their own testers using discrete instruments, says Dave Katri, vice president and general manager of the manufacturing R&D group at Fluke. The company estimates that captive test development represents a $1 billion market, of which 25% is realistically up for grabs.

Some in-house groups are using the VXI bus, says Tom Coughlin, director of marketing at GenRad Inc. in Concord, Mass. Instruments based on the bus "provide a low-cost hardware platform," he says, "and ATE provides the test generation, fault diagnostics, and fault isolation." But the attraction of the Fluke solution is that it means internal development groups can be cut in size. Fluke provides hardware upgrades and contracts outside software developers to write the test programs. "Most major electronics companies have at least one evaluation unit," Katri says. "We believe multiple orders are soon to come."

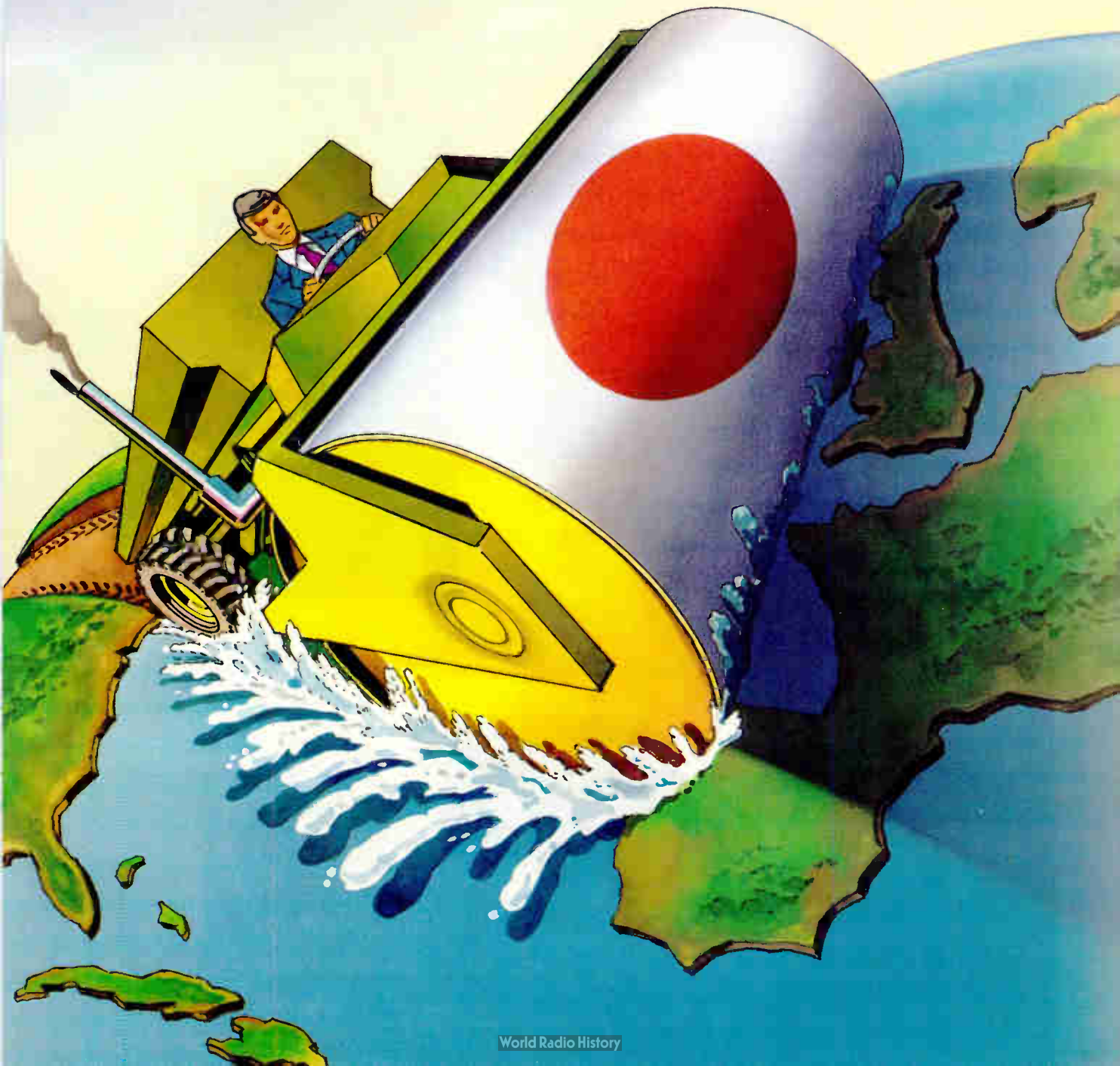
Besides cost, another criticism commonly voiced about ATE is that the equipment isn't modular, says analyst Rodgers. These days, though, modularity is an ATE buzzword. "Customers are not willing to pay for what they do not need," says National's Qureshi, so suppliers are making test systems that can be configured to a customer's needs. Modularity and reusability are also dictated by high development costs. "A new test system costs $30 million to $50 million to develop," says Teradyne's Prestridge. ATE vendors must leverage high R&D spending effectively. While Prestridge sees a single architecture as impractical, his company is developing common hardware and software to spread R&D over a wider base of designs.

Another bone of contention is maintenance. "In the U.S., maintenance is charged as a percentage of purchase price," says Nelson at LSI Logic. "The more you buy, the more maintenance you pay for—so the incentive for reliability is less. Manufacturers should build quality systems and not make money off the service contract." Offering different service and support options is something Teradyne sees as a trend. Prestridge says the firm has begun tailoring service contracts so clients that do not want service aren't paying for it as part of the system cost. Instead, Teradyne supplies easy-to-use programming tools to help customers develop applications and make the equipment self-calibrating and easy to service. ❑

SPECIAL EDITORIAL FEATURE

JAPAN

ELECTRONICS 1991



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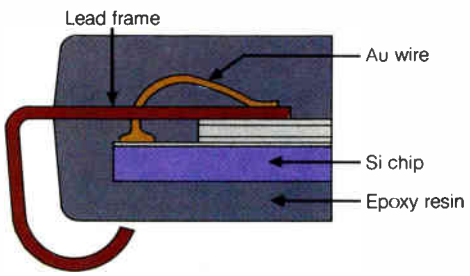

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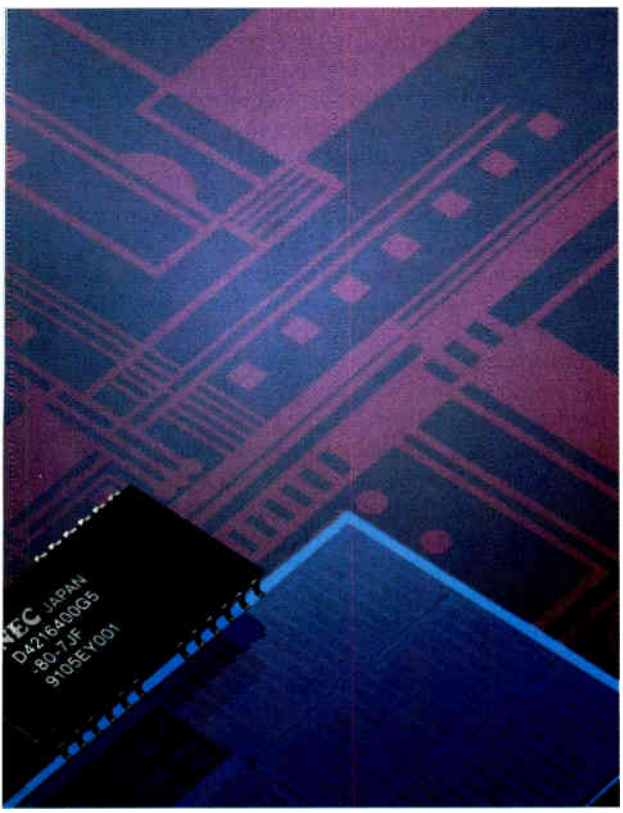

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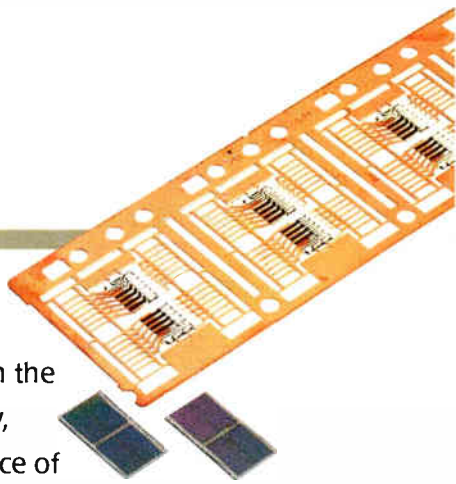

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By forming a partnership with the leader in memory technology, you can boost the performance of your workstation and shorten your time to market. NEC has the resources to tailor the speed, organization and packaging of 16M DRAMs to meet your system needs. For more information, contact NEC today.

Our Roseville, California plant will be your guarantee of prompt delivery despite future surges in demand.

NEC

CIRCLE 228

JAPAN

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The industry at home: a long stretch of growth

Although the Japanese electronics industry somewhat increased its overseas production in the past year, the emphasis was basically on meeting domestic demand. Exports to the U.S. and Europe were sluggish, but domestic demand made up for the shortfall and propelled the industry into another year of overall growth. Interestingly, although the past 12 months offered some twists and turns, Japanese electronics producers experienced no major hit from either the depressed U.S. economy or the Gulf War. Even now, the economy continues to rise, posting a new record for the longest period of sustained growth since World War II.

Although the Japanese electronics industry can most likely sustain itself on domestic demand for 1991-92 as well, some of the outside economic events that have so far left it largely untroubled may begin to have an impact. For example, the computer industry is starting to suffer from the downsizing trend that has already been felt in the U.S. While the personal computer and workstation markets are maintaining high growth, the large-computer markets, which have the biggest percentage of market share, have taken a nosedive. Computer makers are waiting to see whether customers will continue to refrain from buying big equipment.

Also affecting Japan is the networking trend. In the past year, the local-area-network market has started to form, but computer manufacturers, users, and dealers lack the ability to configure systems due to the unique nature of Japan's multivendor market. Together with problems related to customer habits, this means prospects for the LAN market are uncertain. Meanwhile, the telecommunications industry is growing up, as can be seen by its main products: cordless phones, wireless equipment, and transmission equipment. ISDN, the communications infrastructure for the next generation, is being laid out, and advances in cordless technology are infusing the entire electronics industry with new energy.

For its part, the semiconductor industry is entering a difficult phase. Unlike previous generations of chips, the transition from 1-Mbit DRAMs to 4-Mbit parts is taking longer than anticipated. In spite of this, manufacturers are beginning to mass-produce 16-Mbit DRAM chips. This will mean that three generations of dynamic random-access memories—1-, 4-, and 16-Mbit units—will be in production at the same time, a situation the semiconductor market has never faced before.

The market for test and measurement devices continues to expand for two main reasons: the bottom of the silicon cycle was shallower than expected, and the quick onset of 16-Mbit DRAMs meant there was no lag in the chip industry's capital investments. Stable T&M growth can be expected in the coming 12 months.

High-definition TVs, seen as a mainstay consumer product for the next generation, are now being made into products, and Japan's national broadcaster, NHK, has already begun broadcast testing. Even so, it is impossible to predict whether or not a large, stable HDTV market will form.

This report was prepared by Nomura Research Institute in Yokohama, Japan. Its preparation was supervised by Yasuhiko Arai, who also wrote the section on the computer industry. Shin Kusunoki was in charge of disk drives and Hiroshi Fukui handled telecommunications. Masaki Asano oversaw the report on semiconductors, Ken Katayama handled HDTV, Masaki Ichikawa took on LANs, and Tomoki Yokoyama reported on T&M. ■

Mainframes lag, but workstations and PCs are rising

As desktop machines rocket to double-digit growth, large systems are beginning to falter

The Japanese computer industry has been stung this year by the trend toward downsizing, leading to slow growth—or no growth—in the market for large systems, such as mainframes. Paradoxically, though, corporate downsizing has worked to the advantage of midsize systems such as minicomputers and superminicomputers. And at the low end, the workstation market remains robust while the market for personal computers charges along at double-digit growth rates.

Japanese corporate downsizing is similar to the trend that's in full swing in

Fujitsu Microelectronics: Technology into service

There is always change in the air, but in the 1990s it will reach a high pitch. The semiconductor industry will undoubtedly show a solid pattern of growth, with an average annual rate of increase of 10%—and yet the decade will be a turbulent one.

With Fujitsu Microelectronics Inc.'s sturdy underpinnings, however, the company looks to the decade ahead with confidence, in the knowledge that it is well positioned to flourish in the new environment.

Among the most compelling areas of change that the electronics industry will witness in the years ahead are these:

Alliances: To thrive in any technological industry in the years to come, companies will have to enter new forms of alliances and joint undertakings, even with competitors. An increasing depth of commitment and cooperation will be required by both vendor and customer. Each will need to understand the long-term technology strategy of the other for the relationship to provide maximum benefit to both.

Markets: Traditional markets, such as the computer industry, are fragmenting and new ones are emerging almost daily. The semiconductor market is being driven by a quest for greater capability and higher speed in smaller packages at lower cost.

Technology: While the market for CMOS ICs will continue to grow, application-specific integrated circuits (ASICs) based on mixed technologies will enjoy astonishing growth rates. In addition, gallium arsenide, high-electron-mobility transistors, and Josephson junction technologies will find broader applications, and parallel processors on a chip will become common.

R&D: Research and development strategies in the 1990s will have to mirror those of manufacturing. The industry must embark on more cooperative efforts that span continents. Robust local R&D efforts will often be exported around the world.

MITSUMASA ASHIDA
President

Manufacturing: Hand in hand with the tremendous investments in new technology, manufacturing must become more flexible in order to accommodate a diversity of products and customers. It must become an act of global communication and coordination, delivering rapid local service while providing cost-effective products from wherever in the world it makes sense to build them.

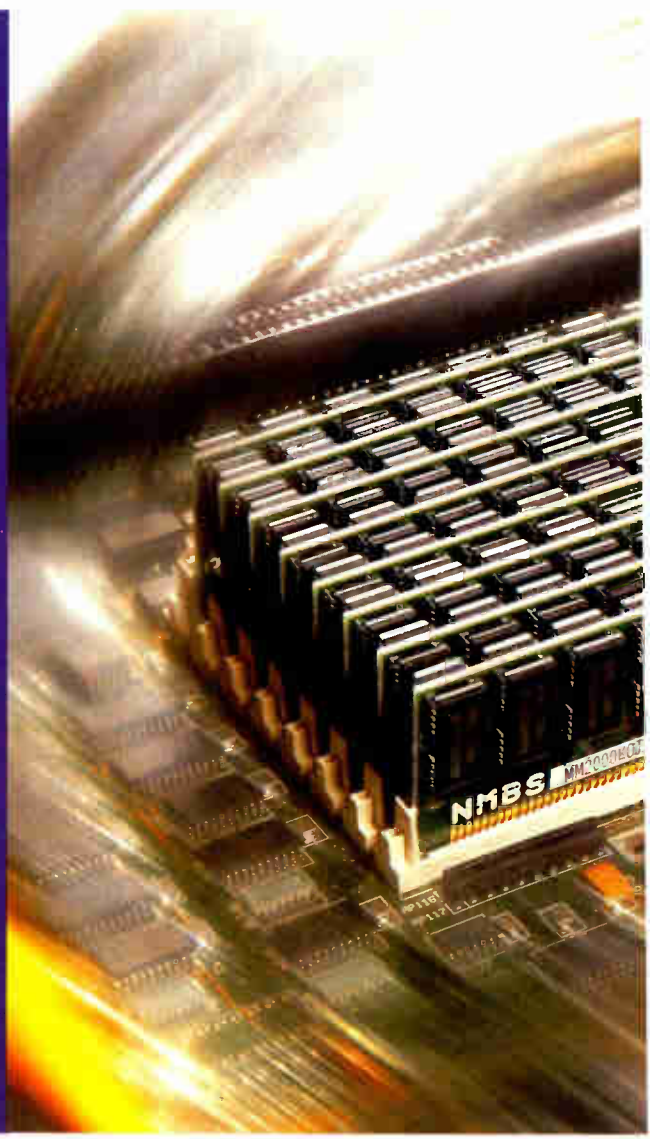
A special challenge for Fujitsu Microelectronics is to make sure that we truly understand the unique technological needs of each customer, and that Fujitsu planners and engineers translate, and champion, these needs. To support that effort, the company must ensure that the means of passing information—the information infrastructure—is adequate to the task. Otherwise, in a world where the pace of new development and the degree of business and scientific complexity are increasing almost exponentially, Fujitsu will not be able to serve its customers properly.

Fujitsu Microelectronics considers every business aspect in order to serve its customers most effectively in the more demanding future. We must lead the way through innovation, foster close relationships by translating technology into service, and develop responsive design and manufacturing capabilities.

The 1990s will not be an easy time, yet Fujitsu Microelectronics will flourish because it has prepared well for the challenges of the future. ■

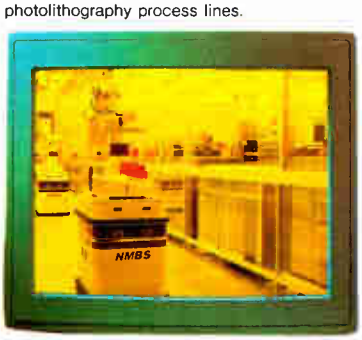
At NMBS,

creative technologies create leading products.



Our three manufacturing plants: Modules I, II, and III

Robots move freely between photolithography process lines.



Our 4M DRAM module

At NMB's newest plant, Module Ⅱ, advanced technologies are creating dominant products.

Operation began in October 1990 at NMB Semiconductor Co., Ltd. (NMBS)'s second factory. The factory contains the company's third wafer production facility, the state-of-the-art Module Ⅱ, which can handle 4M, as well as subsequent generation, dynamic random-access memory (DRAM) chips.

With a monthly processing capacity of 15,000 six-inch wafers, Module Ⅱ has greatly expanded our capabilities. The facility's production of 4M DRAMs is expected to reach 500,000 units per month by fall 1991, one million by the end of the year, and 1.5 million by the middle of 1992. Designed by Ramtron Corporation of the United States, our 4M DRAMs feature access times of less than 50ns.

In July 1990, we teamed up with Ramtron to establish a new firm, United Memories, Ltd., for the design and development of 16M DRAMs and ASMs (Application Specific Memories).

Wafer testers are arranged in a neat row.

Robots move at fully automatic diffusion process line.

NMB Semiconductor Co., Ltd.
1580 Yamamoto, Tateyama-shi,
Chiba 294, Japan
Tel: (0470)23-3121 Fax: (0470)23-2171

NMB Technologies Inc.
9730 Independence Avenue
Chatsworth, CA 91311, U.S.A.
Tel: (818)341-3355 Fax: (818)341-8207

the U.S. However, with many mainframe manufacturers competing in Japan, the makeup of the computer industry will likely become more complicated as the market of the 1990s takes shape.

Stagnation in the financial sector and sluggish capital investment in the manufacturing sector resulted in saturation in the 1990 mainframe market. Dependent on mainframe sales, IBM Japan recorded its second straight year of reduced profits. But some of the stagnation was due to customer restraint as buyers awaited new products that each of the mainframe manufacturers had announced. These included next-generation mainframes from Fujitsu, Hitachi, IBM Japan, NCR Japan, NEC, and Unisys Japan. Mainframe manufacturers saw the 1991 market as an opportunity for expansion based on their experience that demand is traditionally fueled by new products. But questions remain as to whether this year's new offerings will vivify the market.

An additional wild card is that Mitsubishi Corp.—once forced to leave the mainframe market due to problems with IBM over illegal practices in product development—has returned, thus increasing the number of vendors. Yet another factor is the amount of performance buyers tend to look for in new mainframes.

The performance of a single processor in the new generation has improved only by a factor of 1.5 to 2.9 over the last generation. As a result, manufacturers are using multiprocessor architectures in order to meet the demands of customers that require yearly performance increases of as much as 40%. Except for the NCR offering, all the new mainframes use six to eight processors each.

Sales of minicomputers and superminis—which in Japan are called small business computers—got a big boost from the strategic-information-systems boom of 1990. The downsizing trend of industry actually helped this market, as many users opted for small business computers instead of mainframes.

Most of these machines run proprietary operating systems, which has caused some fear among manufacturers in light of the movement toward open systems. With the growing popularity of client/server systems, Unix-based server systems such as the HP3000 are gaining success in Japan, indicating that the distribution of market share, now dominated by Fujitsu Ltd. and NEC Corp., may shift. Furthermore, with PC networks just beginning to catch on (see p. 72), the minicomputer and supermini market may soon see competition from PC-LAN offerings.

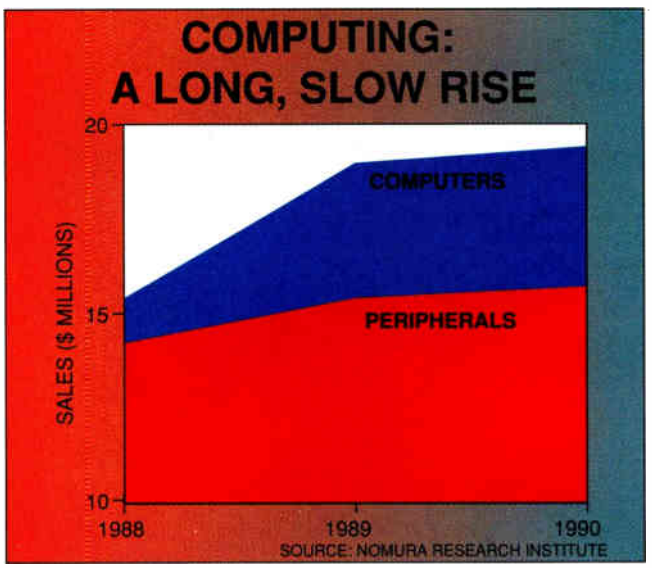
Finally, expansion of on-line transaction processing applications has created a strong demand for OLTP hardware platforms. The main beneficiaries are vendors of fault-tolerant computers such as the U.S.-based Tandem Computers Inc. and Stratus Computer Inc. Demand is also growing for multiprocessing computers built around general-purpose microprocessors from companies such as PanaSequent and Pyramid. Japanese computer makers are rushing into the OLTP market by developing their own machines or entering OEM agreements with U.S. manufacturers.

If the outlook at the high end is mixed, the low end—workstations and PCs—remains dynamic. The workstation market, especially, is expected to continue its strong growth, with demand this year rising 30% above the 100,000 units shipped last year. Many workstation vendors have U.S. parents: Sun Japan, YHP (Yokogawa Hewlett-Packard), and DEC Japan. Workstation market share held by Japanese firms is low, but domestic vendors are scrambling. NEC, for one, has rapidly increased its share over the past year.

PC sales may be lagging in the rest of the world, but in Japan the 1990 demand reached 2.4 million units, a 24% increase over 1989. Of this figure, notebook PCs accounted for 650,000 units, with notebook and laptop PCs together at 30% of the total. The success of notebook machines rests on two factors: their acceptance by users as inexpensive, low-end machines and as a substitute for Japanese word processors. This can be seen in the leveling of word-processor sales in 1990. However, the notebook market has now become saturated, and further PC growth in Japan will depend on an upsurge in desktop machines.

The rivalry between IBM Japan and NEC should be watched closely. In Japan, the NEC PC-9801, incompatible with IBM PCs despite using MS-DOS, holds nearly a 50% market share. Seiko-Epson's share is also stable, given its strategy of making NEC-compatible PCs. Though it has cornered only a very small share of the market, Fujitsu also sells IBM-incompatible PCs—and, in fact, IBM Japan itself began its PC march in Japan selling machines whose specifications differed from IBM Corp.'s American PCs. As a result of the incompatibility, IBM, for all its worldwide clout, has been unable to gain a large share of the Japanese PC market.

However, IBM Japan, in cooperation with Microsoft Japan, is now taking an open-system strategy by announcing the release of MS-DOS J4.0/V. This operating system is fully compatible with the U.S. version of MS-DOS and allows Japanese to be used on both the PC-AT and the PS/2. For its part, NEC will soon make open the 9801 specs, to aid in the formation of a PC-9801-compatible family, and other manufacturers are now developing compatibles as an antidote to the IBM incursions. In addition, by participating in the U.S.-based Advanced Computing Environment group, NEC is strategically positioning itself in case OS/2 or Unix succeeds in becoming the main PC operating system. ■



New products, new energy in the storage industry

The current crop of 2.5- and 3.5-in. disk drives seems positioned to create a whole new market

In Japan, as elsewhere, the storage-device industry has long been characterized by fierce competition and a breathless pace in new-product development, especially in hard-disk and magneto-optical-disk drives. Today's report card is no exception.

Attention in hard disks is focused on the new breed of 2.5- and 3.5-in. drives that utilize media boasting a 3-μin. glide height. In magneto-optical drives, several vendors have announced 3.5-in. (90-mm) units. Even as the fierce price war continues in the low-end personal computer arena, these new products seem positioned to create a whole new storage market.

Hard-disk development is concentrated in three product classes: 3.5-in. drives measuring an inch in height and packing 100 to 240 Mbytes; 3.5-in. standard-height drives at 500 Mbytes plus; and 2.5-in. products at 40 Mbytes or more. Most of the latter use media having a 3-μin. glide height. The leaders in hard-disk development are two U.S. corporations—Conner Peripherals Inc. and Seagate Technology—but several Japanese companies are close on their heels. Among those making fast strides in the technological development race are Fujitsu, NEC, and Toshiba.

In April, Toshiba Corp. became the world's first mass producer of hard-disk drives that utilize glass substrates. Although Areal Technology in the U.S. was the first to produce such drives, Toshiba was the first to reach a month-

NMBS: Leadership in DRAMs

NMB Semiconductor Co. Ltd. (NMBS) began development and test production of 256-Kbit dynamic random-access memory chips soon after its establishment in 1984. In 1986, it began mass-producing 1-Mbit DRAMs at Module I, a facility capable of processing 20,000 5-in. wafers monthly. Production of 1-Mbit DRAMs was expanded in 1988 with the startup of a second plant, Module II, which can turn out 15,000 6-in. wafers per month. By 1989, manufacturing operations were turning out 4 million DRAMs per month. With the September 1990 completion of Module III, NMBS is set to embark on production of 4-Mbit DRAMs. Like Module II, Module III can process 15,000 6-in. wafers per month.

Memory-chip production entails a variety of sophisticated processes. To fully automate production, both "hard" processes—the conveyance and handling of wafers—and "soft" processes—the control of process parameters and lot progress—must be automated. At Module III, this has been achieved through the strategic use of computers.

Module III also boasts an accumulation of so-called "clean technologies," including VLSI process technology, automation technology, and a range of elemental technologies. These are the secret behind NMBS's production of world-class high-tech products.

Cleanliness is paramount in the production of memory chips, and our facilities reflect this. Module I is equipped with Class 1, Class 30, and Class 300-1000 clean rooms, each of which utilizes double-layer construction both horizontally and vertically. The Class 1 room employs a system for conveying wafers via robot, thereby eliminating the need for human workers and ensuring the utmost cleanliness. Module III's ultraclean production line, which requires just two clean rooms, represents a further development of this thinking.

SHOSUKE SHINODA
President

Hereafter, NMBS intends to add a second pillar to its operations—high-value-added products, such as flash memories and application-specific memories (ASMs) for use with memory cards. To that end, the firm has linked up with the U.S. microprocessor giant Intel Corp. for the development of flash memories, and will supply those parts on an OEM basis.

Test production will be carried out at Module II in early 1992, with full-scale mass production, primarily of state-of-the-art 4- and 8-Mbit units, starting about the middle of the year. By the end of 1992, NMBS expects to be producing 1 million units monthly. ■

ly production level of more than 1,000 units. In addition, Fujitsu Ltd. has announced it will begin production in Japan of a 2.5-in. hard-disk drive developed by its U.S. research and development subsidiary, Intellistor. Once production begins, Fujitsu will have joined the group of top corporations competing worldwide to develop low-end hard-disk drives.

Some Japanese companies are exploring innovative storage technology, such as the negative pressure slider announced by Kyushu Matsushita Electric Industrial. The firm first demonstrated this product at one of Matsushita Electric Industrial Co.'s private technology exhibitions several years ago.

In contrast to conventional disk drives, where positive pressure between the disk and head is what keeps the head floating, Matsushita's product controls the distance between disk and head by using negative pressure.

This magnetic head will be used in the RD-210AA, a 3.5-in. hard-disk drive that reportedly attains a recording density of 45.3 Kbytes/in. and a track density of 1,775 tracks/in. With a device height of only 25.4 mm, the drive uses two media disks to provide 260 Mbytes of storage (unformatted). The head floats just 0.1 μm above the disk surface. Matsushita is now shipping samples of this drive.

A 5.25-in. drive code-named Sutter, the latest model from IBM Corp., is drawing industry attention because it can use magnetic resistance (MR) heads. There is much interest in MR heads in both Japan and the U.S., and Matsushita has tested this technology in a 1.75-in. hard-disk drive. The company reports it achieved a recording density of 36.3 Kbytes/in. and an impressive track density of 3,200 tracks/in. Accordingly, a single formatted 1.75-in. disk offered a storage capacity of 34 Mbytes.

Among other movements in the market, the 90-mm (3.5-in.) magneto-optical disk, the subject of long debate over standardization, has finally come onto the market. With an International Standards Organization standard now in place, IBM leads this field by dint of its June announcement of a 90-mm magneto-optical drive among a slew of new multimedia products. Other companies that are active in this market include Matsushita, Mitsubishi, Sanyo, Sony, TEAC, and Toshiba. In addition, Olympus Optical has already embarked on OEM sales, and MOST began U.S. sales in 1990.

How Disk Drives Stack up

	IBM	Sony	Olympus	Matsushita	Toshiba
Standard	ISO	ISO	ISO	ISO	ISO
Speed (rpm)	1,800	3,000	3,600	3,000	3,600
Positioning time (ms)	66	40	50	45	25
Controller	Embed. SCSI	SCSI-2	Embed. SCSI	Embed. SCSI-2	Embed. SCSI
Power consumption (W)	16.1	13	N.A.	N.A.	8
Form factor (in.)	3.5	3.5	3.5	3.5	3.5
Shipping	Yes	Yes	Q4	Yes	Q4

SOURCE: NOMURA RESEARCH INSTITUTE

In any comparison of product specifications, Toshiba's drive particularly stands out. It boasts a high-speed disk rotation rate of 3,600 rpm while keeping power consumption down to a modest 8 W (steady state). According to Toshiba, the secret is that the fan normally used for cooling during drive operation has been made unnecessary. If this is the case, then problems caused by dust have been almost completely solved. The Olympus drive matches Toshiba's 3,600-rpm rotation rate. With a mass-storage capacity of 128 Mbytes per disk, magneto-optical drives appear best suited for multimedia and file-server backup applications.

One important consideration in finding favor with a broad customer base is compatibility. Although all of the new magneto-optical products conform to the ISO standard, compatibility questions remain, since other factors—such as the sales approaches taken by PC suppliers—could affect whether there is real compatibility at the data level.

Establishing full field compatibility will be highly dependent on the drive units themselves, given the fact that magneto-optical disks produced by different manufacturers differ slightly in axial/radial acceleration and sensitivity. Accordingly, no definitive judgment can yet be made as to whether drives from competing suppliers will indeed be fully compatible with one another.

Sony Corp. has added interest to the magneto-optical sweepstakes by announcing in June a consumer product based on this technology. The company's revolutionary "Mining System" incorporates a 2.5-in. magneto-optical disk that can record up to 74 minutes of audio. The recording technique used depends on magnetic-field modulation.

With four sample bits, long-play recordings are possible through signal compression. The fact that signal compression is used means that some distortion will be present even in digital copies that are made from compact disks. In one way, though, this apparent drawback can be viewed as fortuitous: it may help avoid copyright-related problems such as those that held up digital-audio-tape technology.

Magneto-optical recording is already ahead of magnetic recording technology in terms of recording densities, and a new theory announced by Sony may increase this lead even further. The Irister (IRIS Thermal Eclipse Reading) system that Sony proposes utilizes a dual-layer recording base—one layer for recording, the other for reading.

Combining this method with bit-edge recording, Sony claims that densities can be improved by a factor of three in the recording direction and by a factor of two in the track direction. This means that overall recording density can theoretically be increased by a factor of six with current laser-diode technology, or 20 with a blue laser diode. If the Sony technology is fully developed, magneto-optical recording will pull even further into the lead over magnetic recording in terms of providing high densities. ■

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So, we've spent the last 20 years developing *not only* the finest technologies for the design and manufacture of semiconductors and electronic components, but better ways to bring those technologies to you.

World's largest ASIC production line

Take ASICs, for example, where Fujitsu leads the world, with more than 13,000 successful designs. To produce ASICs more quickly and efficiently, we built the world's largest ASIC production line, in Wakamatsu, Japan, and ASIC production facilities in the U.S. and Europe as well.

ASIC Design Centers in Europe, North America, Asia and Australia

And to get your ASIC designs into production faster, we expanded our network of ASIC design centers throughout Europe, North America, Asia and Australia. These centers are fully staffed and fully equipped to give you all the training, CAD/CAE facilities and design assistance you need.

R&D creates faster DRAMS, bigger SRAMS

From discrete semiconductors to sea-of gate arrays, and from RISC microprocessors to system modules, Fujitsu's US$2 billion total annual R&D commitment enables dramatic breakthroughs in semiconductor technology. Like the world's first 64 Mbit DRAM using i-line phase-shift photolithography and stacked

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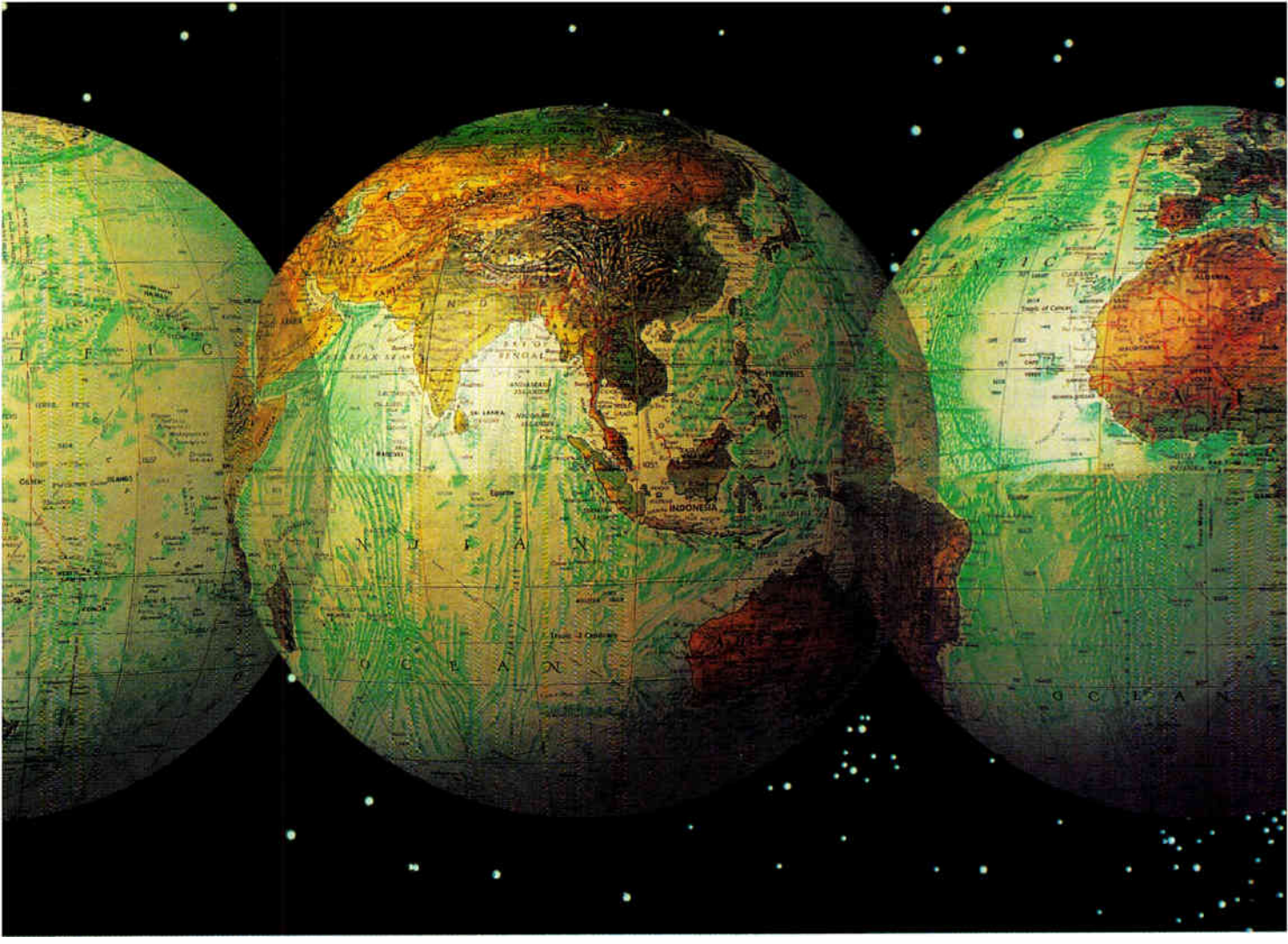

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Sub-micron Wafer fabs in the U.K., U.S. and Japan

To meet the demand for Fujitsu ICs in Europe and around the world, this year we're opening our most advanced wafer fab, in Durham, England. Together with fabs in the U.S. and Japan, and semiconductor and other electronic component plants in Japan, Ireland, the U.S., Malaysia and Singapore, this new facility will help to ensure a dependable supply of quality Fujitsu products for all our customers.

We put technology where you need it

We put leading-edge technology into all our semiconductors and electronic components. From gate arrays to memories, and from relays and connectors to keyboards, thermal printers and flat-panel plasma displays. We use our finest technology because it makes our semiconductors and electronic components more competitive. Our customers choose them for their products for the same reason. And today, with our worldwide R&D, manufacturing and local support, we're closer to our customers than ever.

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With a squeeze on DRAMs, vendors rethink strategies

Return on investment is low as chip makers cope with producing three memory generations at once

The Japanese semiconductor industry is facing increasingly difficult times—so difficult, in fact, that some industry watchers predict that by the year 2000, only three or so manufacturers will be producing the mainstay dynamic random-access memories. This prediction may be groundless, but there are some signs that a shrinking of the vendor base is already starting to occur. Of immediate concern is the 4-Mbit DRAM, which is available in volume but is not finding large numbers of sockets in computers and other equipment. Chip makers are hoping the new 16-Mbit parts will fare better.

Whatever the future may bring, chip makers today are upping their capital spending. According to announcements made in June, Japan's nine major semiconductor houses plan to increase capital investment by 4.6% over the previous year. This will bring their combined total investment value to $6.1 billion. Most of the increase will be used to boost production of 4-Mbit DRAMs and set up production facilities for next-generation 16-Mbit chips.

Trends in capital investment can perhaps best be understood in terms of shipments of semiconductor-manufacturing equipment. According to 1990 statistics released in June by the Semiconductor Equipment Association of Japan, revenues for the association's 179 domestic manufacturers totaled $5 billion, an increase of 16.1% over 1989.

This growth can largely be attributed to demand for equipment needed to manufacture 4-Mbit DRAM chips and preparation for the mass production of 16-Mbit DRAMs. With 4-Mbit production now largely in place, orders have soared this year as chip makers gear up in earnest for the 16-Mbit units. The association reports that sales for March 1991 alone totaled $791 million, the first time that 100 billion yen of monthly sales have ever been recorded.

With the rapid growth of capital spending, manufacturers are being squeezed to make a good return on their investments. According to domestic figures from Hitachi Ltd., the ratio of net-sales increase to the previous year's capital investment fell from 1.5 in 1980 to 0.5 in 1990. Using the same method to calculate ROI for Toshiba Corp., the undisputed leader in the 1-Mbit DRAM market, the ratio dipped from 0.6 in 1989 to 0.42 in 1990.

Mass production of 4-Mbit DRAMs began in earnest this year, but the transition from 1-Mbit chips is not going as smoothly as expected. When the 1-Mbit DRAM market was first being developed, the number of 1-Mbit chips being shipped surpassed the number of 256-Kbit DRAMs even before the cost per bit of the bigger devices had fallen below that of the preceding generation. However, even though the cost per bit of 4-Mbit DRAMs in Japan has already crossed that of 1-Mbit parts, it appears that it will take until next year before 4-Mbit shipments surpass those of 1-Mbit models. One contributing factor is that PC manufacturers, the largest DRAM buyers, are not yet incorporating 4-Mbit versions in their machines.

In the workstation and mainframe markets, demand for 4-Mbit DRAMs is growing gradually as new models are shipped and demand increases for the greater memory capacity that goes with better microprocessor performance. In the PC market, however, only a handful

Integrated Circuit Sales

($ millions)

	1988	1989	1990
Linear circuits	2,622	2,748	2,990
Counter circuits	13,784	16,842	16,376
Bipolar	1,975	1,643	1,788
Logic	1,589	1,352	1,499
Memory	386	291	289
MOS	11,809	15,199	14,589
Logic	5,135	6,845	7,479
Microcomputers	2,033	2,885	3,163
Others	3,102	3,960	4,316
Memory	6,674	7,882	6,647
RAM	(N.A.)	6,526	5,358
ROM	(N.A.)	1,356	1,289
Other	(N.A.)	472	463
TOTAL ICs	16,405	19,589	19,366

SOURCE: MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY

of manufacturers are using these parts. Chip vendors are hoping the turmoil in the PC industry portends changes in this picture. The trend in Japan is toward PC price reductions, as well as the use of the Intel 486SX in high-end PCs. Microsoft Corp.'s Windows 3.0 is catching on in Japan—an estimated 300,000 units will have been shipped by the end of the year. In light of all these factors, PC manufacturers can be expected to begin incorporating 4-Mbit chips into their upcoming products.

However, their use is likely to be based more on lower cost per bit than on any desire for higher levels of integration or reductions in size. The level of monthly production for 4-Mbit DRAMs that is planned at year's end is significantly higher than current levels. Manufacturers are becoming anxious that they may overproduce if 4-Mbit models cannot be introduced into the PC market smoothly. There is therefore some movement to revise planned production levels.

As a result, some manufacturers are pinning their hopes on 16-Mbit DRAMs rather than on the 4-Mbit part. In June, IBM Corp. announced it would begin producing 16-Mbit DRAMs ahead of other vendors, putting together a production system that is capable of turning out 1 million units per month by the middle of 1992. Also, the company says it will begin shipping computers that utilize these chips.

This action alone will probably not cause the Japanese semiconductor industry to rush to mass produce next-generation memory chips. However, even as they wrestle with ROI questions, all chip makers remember the rewards garnered by those that were the first to produce 1-Mbit DRAMs. Wary of the market demand for 4-Mbit DRAMs, vendors may conceivably view the 16-Mbit units as the road to a better future.

Regardless of the exact actions taken by manufacturers, conditions in the DRAM market appear to be tightening. The upshot is that Japanese semiconductor manufacturers may well find it necessary to delve into new product types, such as application-specific integrated circuits and flash memories, in order to survive. No longer will they be able to depend solely on general-purpose DRAMs as they have in the past. ■

Finally, the age of LANs begins in earnest in Japan

With more PCs in place, networking is starting to take hold, but connectivity hurdles remain

For the U.S., 1985 was a landmark year for local-area networks. This was the year that networked personal computers took off, with big computer makers like IBM Corp. beginning to investigate LANs and the new LAN vendors Novell Inc. and Banyan Systems Inc. just starting to market PC- and workstation-based LAN operating systems. It was also the year that system integrators and computer dealers such as EDS and Computerland began to back up the LAN movement.

The same situation that existed in the U.S. in 1985 occurred in Japan in 1990. It is often said that Japan's computer industry is five years behind that of the U.S. and it seems that this is true for LANs as well. As of this year, only 2.5% of all PCs in Japan are connected to LANs. Although it is reasonable to expect diffusion to take time, the LAN awareness of customers is definitely high and the number of LAN vendors has been growing rapidly in the last couple of years.

Why has the Japanese LAN market started forming at this time? The biggest reason is that the number of PCs in business use is rapidly growing. While the number of PCs installed in 1988 was one for every 20 office workers, the ratio now stands at one for every 10. Pretty much everyone is now used to conducting business by running various applications on a PC, so LANs are gaining attention for their ability to improve office efficiency by allowing data to be shared among multiple users.

In addition, as the number of PCs rises, the need to share peripherals such as printers also appears. There is not enough space in Japanese offices to install lots of printers, and high-quality printers are prohibitively priced—they cost at least $1,500, nearly twice the price found in the U.S. If for no other reason, LAN demand is high in Japan just to be able to share printers.

There are several interesting characteristics of the Japanese LAN market. First, the market is made up of many vendors. While the U.S. market is nearly standardized based on the PC-AT, PCs with differing architectures from a variety of computer manufacturers can be found in the same office in Japan, making interconnections difficult. Another characteristic is that almost all LAN products being sold in the Japanese market are from the U.S. (a scattering are from Europe), meaning that the only "pure" Japanese products are provided by computer manufacturers and two or three domestic LAN vendors.

Business networks found in Japanese offices may be configured from mainframes and/or small business computers (minicomputers and superminicomputers). For this reason, the ability to connect to a host is a major factor in deciding which product to buy. As a result, the market is made up of lots of customers that not only want to horizontally integrate multiple PCs, but are also looking for a LAN that can vertically integrate a host. Furthermore, these general-purpose machine users are very accustomed to being pampered and well-supported by computer vendors, and are highly dependent on LAN vendors to configure their networks for them. The ability of a LAN vendor to offer this kind of support is the most important factor a Japanese customer considers in choosing a LAN.

Last year, at about the time that the LAN market began expanding, the number of LAN vendors grew rapidly. One of these was the Japanese representative of Novell, Novell Japan Ltd. Novell Japan—founded with joint capital from Novell, Softbank Corp., and computer makers NEC and Fujitsu—is the dealer responsible for NetWare 386J, the Japanese version of Novell's ubiquitous NetWare. While organizing sales channels, Novell Japan is also trying to aggressively establish educational

Kodenshi: Breaking

Since its foundation, Kodenshi Industrial Research Co. Ltd. has been called simply "Kodenshi," which in Japanese means "Photo Electronics" or "Optoelectronics." True to its name, Kodenshi has tried to be a leader in the field of optical sensors and has now attained that position, ranking with major semiconductor manufacturers in this field. Thus, the brand name of Kodenshi as an optical sensor manufacturer has been established.

The full lineup of products, exactly suited for each application, supports the brand name both in terms of quality and quantity. Among Kodenshi's main products are optical sensors for industrial equipment, such as PICS, the subminiature photo electronic switch, photo interrupters for various manufacturing devices, rotary encoders for numerically controlled machine tools, and linear encoders for measurement devices. The firm also produces light-emission and acceptance elements, which are valued by auto manufacturers for high reliability.

The lineup of optical sensors for office automation equipment includes a sensor for floppy-disk drives, a rotary encoder for high-density digital recording devices used for personal computers, and a paper sensor for printers, facsimiles, and copying machines.

In consumer optical sensors, Koden-

facilities to spur the Japanese LAN market. As in the U.S., its main competitor is Microsoft Corp., which in Japan heads a consortium backing that company's LAN Manager approach. The group's objective is to standardize the specifications for LAN Manager 2.0 in order to oppose NetWare.

The large-scale computer manufacturers, Fujitsu Ltd. and Hitachi Ltd., have also entered the scene. Initially they had opposed PC-based LANs in the belief that they would be competing with their own general-purpose machines. But both companies changed their strategies when the LAN market formed. By handling both NetWare and LAN Manager, they are trying to be flexible in meeting the needs of their customers.

Other major vendors include Ricoh, which is selling AT&T Co.'s StarLAN, and Yokogawa Hewlett-Packard, which is configuring LANs for customers in engineering fields. Another somewhat innovative entrant is Ungermann Bass, the Japanese representative of the U.S. company of the same name. Ungermann Bass is aiming at providing a full lineup of products from cabling to application software as well as comprehensive customer support. In addition, there are also some seemingly unlikely new vendors such as Nippon Steel, TDK, and Kanebo entering the market from other industries.

Although the LAN market is definitely expanding, there are several remaining problems that must be solved. The largest of these is the lack of system engineers capable of integrating a multivendor hardware environment, and the scant handful of topnotch system engineers able to configure a system from such hardware. Unfortunately, there are few system integrators in Japan of the caliber of EDS or TRW at this time.

Another obstacle to the diffusion of LANs is the existence of mainframes and small business computers as part of the networking puzzle. Users cannot easily throw away the enormous number of software resources developed for their general-purpose machines. Furthermore, it is difficult for LAN vendors to offer the same kind of comprehensive support that such customers have been provided by their small-business-computer vendors.

Finally, a not inconsequential problem is that all LAN software must be made compatible with the Japanese language. On-screen messages must be translated into Japanese, software must be compatible with the 2-byte code set used, and a program for Japanese Kanji input must be provided in main memory. This last requirement will almost certainly compete for memory with the LAN driver or other device drivers.

Despite all these hurdles, it appears that technical problems should be solvable in a span of two or three years, given hard work on the part of LAN vendors. These manufacturers realize that in light of typical work flow in Japan, there is a latent demand for the ability to share both data and resources. This void could be filled by office LANs.

The most serious difficulty is to improve the ability of Japan's LAN vendors and system integrators to configure systems as easily as is done in the U.S. In Japan, where few people have the know-how to build systems even when they understand the needs of the business in question, LAN vendors and system integrators must take up the slack in proposing systems and offering comprehensive support. That's why Novell has established an education system for its distributors and dealers, and is quickly recruiting instructors, setting up showrooms, and holding seminars.

If this level of competence is achieved, not only Japanese manufacturers, but foreign LAN vendors and system integrators as well, will have an opportunity to participate in the Japanese market. However, foreign participants should have sufficient understanding of the quirks of the Japanese market. ■

new ground in optoelectronics

shi offers light-acceptance units for photoelectronic remote controls, which are widely used for TVs, video cassette recorders, lighting apparatuses, and air conditioners; sensors for compact-disk and laser-disk players, and autofocus and auto-exposure sensors for cameras. These products have been widely used by Japanese manufacturers of household appliances and precision mechanical equipment.

HIROKAZU NAKAJIMA
President

Besides its general product lines, Kodenshi has produced many customized products through collaborative development that are widely used in Japan and abroad. In only 20 years since its founding, "Kodenshi" is about to be a world brand of optical sensors.

Taking a step beyond optical sensors, the company has recently developed a new product group called the Image Input/Output Unit. Among these products are a laser-beam printer, laser-scan unit for laser facsimile, thermal-print head adopted for facsimile, and a contact image sensor.

The next step is full-scale entry into the field of information and communications equipment. Kodenshi has been supplying such products to major electric manufacturers on an original-equipment-manufacturer basis; taking advantage of the production techniques the company has accumulated so far, it plans to launch production of a facsimile machine, cordless telephone, and workstation.

Today, Kodenshi is a high-tech enterprise with a capital of $6.6 million, and sales last year totaling $66 million. The firm employs some 2,800 people in Japan and overseas. On the business side, Kodenshi hopes to begin forging partnerships of various sorts with companies in the U.S. and Europe in the years ahead. ■

Buoyed by sales of telecom tools, T&M looks solid

An uptick in IC/LSI orders should join the steady communications demand to produce good growth

Japanese demand for test and measurement equipment should remain fairly high, thanks to semiconductor and communications orders. The T&M industry enjoyed a steady, if unspectacular, 6% growth rate in 1990, with a few categories recording a remarkable rise. These were mainly tools used for fast-growing mobile-communication and ISDN equipment, such as FFT analyzers, which grew 23%; logic analyzers, 15%; and board testers, 15%.

With further growth expected in the car-phone and portable-phone markets, the demand for these tools should remain strong. Moreover, IC/LSI testers, which make up about 20% of all measurement devices, should rebound smartly from last year's 1.6% growth rate because the fall in the silicon cycle was shallower than expected.

However, T&M vendors saw some categories plummet last year. For example, sales of analog multimeters decreased 4%, because of the low cost and high performance of competing digital multimeters, and distortion meters fell a full 54%. There is some concern in the industry that overall T&M growth will fall off in the second half of 1991 as a result of revised capital-investment plans in the manufacturing industry.

The development of electronic technology such as microprocessors is promoting higher performance in measurement equipment. Furthermore, all manufacturers are being required to develop new, highly functional, high-performance products at a good price/performance ratio in order to keep up.

For example, digital multimeters have come to include such features as temperature and frequency measurements. Products capable of various common calculations are also becoming standard. In addition, consumer-electronic products and office-automation equipment are increasingly incorporating inverters, creating a demand for digital multimeters capable of measuring not only sine waves but distortion waveforms as well.

The demand for handheld multimeters is also growing as consumers want them for personal use. These buyers will likely move away from analog meters as the price of digital units comes down. In the future, analog meters will likely remain only in high-energy fields, while the demand for digital multimeters will grow.

The digital trend is also seen in oscilloscopes, where the pace of development in recent years has been remarkable. Successful development is in part due to the higher speeds of the latest analog-to-digital converters and higher microprocessor performance. High-speed processing requires oscilloscopes to be connected to computers for complex data processing, or incorporated into automatic measurement systems.

The increased demand for spectrum analyzers is largely a result of the further development of the mobile-communications industry. The development of digital car phones and next-generation cordless phones, for which demand is rapidly rising, is advancing quickly. Furthermore, time-division-multiplexing systems are being studied for use in such digital communication systems. Accordingly, an important feature to watch for in future spectrum analyzers is the ability to measure data.

At a production level of $750 million, IC/LSI testers account for the greatest sales of any T&M devices. Demand is expected to increase greatly as production of 4-Mbit dynamic random-access memories fully ramps up and 16-Mbit DRAMs start to come on line. The lure of this burgeoning market is attracting new manufacturers, making competition even tougher. ■

T&M Trends

Sales ($ Millions) and growth rates (%)

	1988	1989	1990
Digital multimeters	57 (3%)	71 (26%)	83 (10%)
Analog multimeters	16 (17)	15 (-11)	14 (-4)
Oscilloscopes	134 (14)	146 (6)	152 (3)
FFT analyzers	10 (-15)	19 (93)	24 (23)
Spectrum analyzers	52 (1)	60 (7)	66 (4)
Distortion testers	37 (-3)	30 (-25)	15 (-55)
Logic analyzers	23 (12)	24 (8)	27 (15)
MPU development	55 (-6)	52 (-3)	46 (-17)
AV measuring	75 (8)	72 (-14)	86 (32)
IC/LSI testers	600 (74)	671 (21)	731 (2)
Board testers	26 (117)	34 (30)	49 (17)

SOURCE: NOMURA RESEARCH INSTITUTE

Photoelectric Switches

Ultra-compact, highly cost-efficient

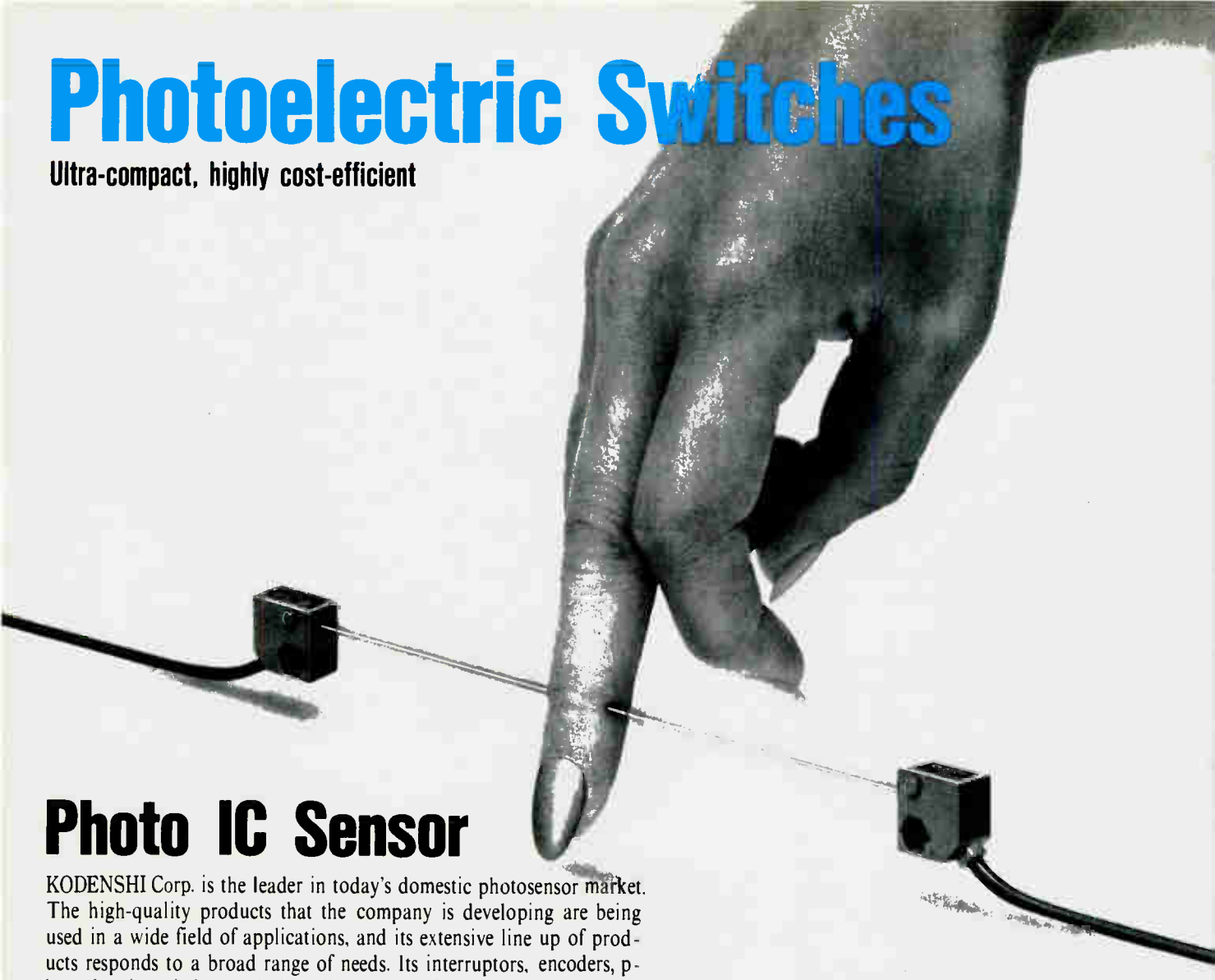


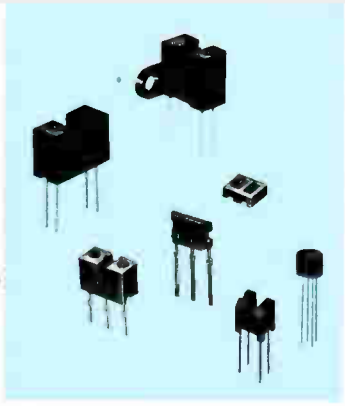
Photo IC Sensor

KODENSHI Corp. is the leader in today's domestic photosensor market. The high-quality products that the company is developing are being used in a wide field of applications, and its extensive line up of products responds to a broad range of needs. Its interruptors, encoders, photoelectric switches, and photodiode arrays, for example, are used in automatic vendors, NC machine tools, industrial robots, and cashing machines.

KODENSHI Corp.'s technology stands out at the vanguard of today's electronics age.

• Photo IC sensors

CIRCLE 224



• Photo interruptors
• Photo Reflectors

CIRCLE 225

• Encoders

CIRCLE 226

• Photodiodes
• Phototransistors
• Infrared LEDs

CIRCLE 227

KODENSHI KODENSHI CORP.

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HDTVs are here, for consumers and industry, too

All the major vendors have sets, but industry watchers wonder if the price is still too high

Development of high-definition TV in Japan is progressing along two lines: public and industrial applications. Sony Corp.'s announcement last November of an HDTV-compatible receiver for the home has been followed by announcements by all of Japan's major manufacturers, causing anticipation regarding HDTV to rise.

By July, Fujitsu, Hitachi, JVC, Mitsubishi, Panasonic, Sony, and Toshiba had all announced 36-in. HDTV sets with cathode-ray tubes for the home. This was a step above the earlier, 32-in. CRT design. For industrial use, both Sharp Corp. and Sanyo Electric Co. Ltd. have announced liquid-crystal-display projection sets.

HDTV software is a major requirement before home HDTV sets become popular. It will likely come from one of two sources: broadcasts or packaged programs. Broadcasts will have to be made using satellites or cable TV, since there is not enough bandwidth left to fit HDTV into Japan's ground-wave frequencies. As for packaged software, Sony, Matsushita, and Hitachi announced a joint HD-VCR standard in July, which should open up this market.

There are currently three broadcast satellite channels operating in Japan: two NHK channels and one private pay channel, Japan Satellite Broadcasting (JSB). All originate from the BS-3a satellite. The number of households receiving satellite broadcasts stood at 4 million, or 10% of all households, as of June. JSB, which began operations only last December, has already attracted 400,000 subscribers.

One of the two channels operated by the national broadcaster, NHK, currently conducts tests for "Hi-Vision," as HDTV is called in Japan, for one hour every day. Another satellite, BS-3b, having three transponders, was due for launch in August. One channel currently on BS-3a will be moved to BS-3b, one channel will be set aside as backup, and the third will be used solely for Hi-Vision test broadcasts eight hours a day starting at the end of the year. NHK says it plans to launch another satellite, BS-3h, in mid-1992, and BS-4 in 1997. At least one of these is to be used for 24-hour HDTV broadcasting.

Commercial broadcast stations seriously preparing for Hi-Vision compatibility are concentrated in the Tokyo or Kansai areas. If BS-3b is launched successfully, capital investment for HDTV studios and other facilities can be expected to rise soon after. Of the commercial broadcast stations, Fuji Television, followed by TBS, appear to be the most aggressive in pursuing Hi-Vision. NTV is active in pursuing compatibility with wide-screen formats, including extended-definition TV.

The biggest problem with HDTV at present is the price of the equipment needed for reception. The cost of an HDTV set is about $29,000—$14,500 for the 36-in. CRT monitor plus another $14,500 for the MUSE decoder. Manufacturers are rushing to be ready for Hi-Vision broadcasts of the 1992 Summer Olympics in Barcelona, Spain. Although they are fighting to get the price of equipment to about half its current level, they won't be ready to mass-produce second-generation circuits for the MUSE decoder until 1993 at the earliest.

One method manufacturers are using to develop a market for HDTV sets is to produce relatively low-priced, NTSC wide-screen TVs, which are easier to popularize than full-scale HDTV. The first of these was JVC's Multi-Wide-Vision set marketed in March at $7,300. A production level of 1,000 units per month is expected. NTSC wide-screen

The HDTV Scorecard

Major Products Introduced since October 1990

Fujitsu	36-in. HDTV
Hitachi	32-in. HD monitor, MUSE decoder, 46-in. rear-projector CRT, prototype HD VCR
JVC	36-in. HDTV, 47-in. rear-projector CRT, MUSE decoder, 36-in. multiwide-vision TV, MUSE-NTSC converter, 32-in. HD monitor
Mitsubishi	36-in. HD monitor, 36-in. professional HD monitor, MUSE-NTSC converter, MUSE decoder, 36-in. TV
NEC	MUSE decoder, 54-in. HD rear-projector CRT
Panasonic	36-in. HDTV, MUSE decoder
Sanyo	HD front-projector LCD, HD VPD
Sharp	HD front-projector LCD, MUSE decoder, 110-in. screen
Sony	36-in. HD monitor, MUSE decoder, MUSE-NTSC converter
Toshiba	32-in. HD monitor, MUSE decoder, 36-in. TV

SOURCE: COMPANY REPORTS

TVs from other manufacturers will likely be priced almost identically.

For perspective on HDTV penetration, it is enlightening to look back at the popularization of past TV formats in Japan. Traditionally, a new medium requires 10% penetration to be considered accepted. In Japan, this means that HDTV would need to be in 4 million homes. In 1959, when the proportion of households owning a black-and-white TV reached 10%, the price of a TV was $437, while the average household income was $255 per month. This means that a set cost about two months' salary.

The same was true in the popularization of color TV. When the number of households owning a color TV reached 10%, the price of a set was $1,300 and the average household monthly income was $656. If this relationship still holds true today, then a $7,300 price tag on an HDTV set—twice the average monthly household income—could actually be low enough for wide-screen TVs to reach 10% penetration.

That's why many industry watchers believe that offering a down converter plus wide-screen monitor is a good lead up to the popularization of HDTV. This same concept was used in Europe by the Eureka camp of Thomson SA and Philips Electronics NV to sell sets compatible with the D2MAC and PAL+ transmission systems. One possible problem with this strategy, however, is that consumers will mistake low-resolution, TV-grade equipment with Hi-Vision gear and be left thinking that high prices won't buy good picture quality. If this happens the consumer might even come to shun HDTV altogether.

The ideal way to popularize HDTV is to get comparatively low-priced wide-screen sets into people's homes, while keeping them aware of the higher picture quality HDTV provides and hopefully selling some true HDTV sets in the process. The importance of having consumers experience HDTV's high picture quality themselves is also important.

From the beginning, NHK has said that a screen having a diagonal of at least 1 meter is necessary to be able to fully appreciate the advantages of HDTV. With a direct-view CRT tube, this would require a 40-in. screen. However, of screens currently being manufactured, the largest screen size that could be used in a comparison is the 36-in. HDTV size; 37 in. is the largest NTSC screen size available.

This is one reason why wide-screen projection TVs are being given more attention. NTSC rear-projection TV screens are becoming remarkably better looking with advances in projection-tube brightness and screen processing technology. Even front-projection TVs have become easy to install in homes ever since Sharp came out with liquid-crystal projection TVs. There is plenty of room left for technological advances in projection TVs.

Meanwhile, NHK is aggressively trying to put together a library of video software so that it can begin Hi-Vision broadcasting. But there is not enough software in existence. The price of making one hour of HDTV software per day or converting movies to the HDTV format (including copyright fees) is said to require an investment of $36 million to $44 million per year. When you add in the cost of operating a satellite transponder the costs become enormous. Broadcasters need to be prudent with the timing of their investments.

Although it appears that it will take a long time before HDTV can reach the 10% penetration level, black-and-white TV took seven years to get there and color TV took 10. It will take a lot of work by the HDTV industry to get anywhere near 10% diffusion. ■

Graphtec: A unique spot in the market

Graphtec Corp. is widely recognized as a specialized manufacturer of input devices, drawing equipment, and recording instruments. Its innovative technology and unparalleled industry expertise evolved progressively over the company's 42-year history, and have allowed Graphtec to attain a unique position in first the domestic and later the international marketplace.

By concentrating on what it does best, in accordance with a basic policy that describes the primary business as that of an international specialist manufacturer, the company has devoted its efforts and resources to developing a full line of competitive products.

Graphtec has the ability to meet a wide range of user requirements over a broad spectrum of industry applications. The company will continue striving to provide advanced, timely, and cost-effective solutions for increasingly diverse, complex requirements. In addition, it will work to broaden the appeal of Graphtec's products in an effort to reach new groups of potential customers.

Research and development divisions now occupy more spacious and better-equipped facilities in Graphtec's new headquarters. These latest investments will allow the company to build on its already considerable technical strength.

Business continues to have an increasingly international orientation. Graphtec's management team will respond aggressively to the globalization trend by maintaining a strong local presence in its markets worldwide, because continued expansion in overseas markets is fundamental to future success.

We are now standing at the threshold of the 21st century, in an era that has seen the end of the Cold War. Changes continue to take place at a speed that surpasses all expectations and outpaces the imagination.

Graphtec must also meet its obligations by adapting to the requirements of the new age. In this way the company can best serve its customers, who ultimately constitute the most important consideration. ■

TADASHI MIYACHI
President

Wireless boom, deregulation spark heated growth

Sales of wireless phones are rising 100% a year, and ISDN is adding to the telecom upsurge

Five years ago, Japan took the first step toward deregulating the telecommunications market, and this movement has brightened the prospects for communication equipment vendors ever since. Consumers are well aware of the benefits of telecom services, and users and vendors alike are looking ahead to a large change in product performance when computer networking and radio technologies come together.

Accordingly, telecommunications should continue to be a high-growth market. In 1990, equipment production in Japan was about $21.6 billion, a 13% increase over 1989, and there's no sign of a slowdown. The three products that contributed the most to last year's solid growth were telephones, wireless communication equipment, and transmission equipment.

In telephones, sales of wireless phones (including cellular) have grown at a yearly rate of 100% in the last three years, accounting for over 50% of telephone production in monetary terms. Cordless phones made up more than 50% of the 8 million telephones sold in Japan last year. One wireless telephone system operating on extension lines is the second-generation cordless telephone system (equivalent to CT2 in the U.S. and Europe), which will go into service in another year or two. The multiple-access multiplexing method likely to be used in this system is TDMA/TDD, the technical specifications for which are being worked on by a review board of the Ministry of Posts and Telecommunications. A decision is due in May.

The main pillars of future wireless telephone service from NTT, the national carrier, are pocket phones and personal-identification (PID) service. The idea behind pocket-phone service is to locate numerous wireless base stations in buildings and other sites to create service areas of 100 to 200 meters in diameter. These would be controlled by overland networks such as the integrated services digital network that will stretch across Japan. The other main wireless service, PID, lets customers call from terminals using cards bearing their personal IDs and code numbers. In addition to these services from NTT, there are several mobile-communication vendors offering other personal communication services.

Realizing the potential for growth, more than 30 companies are already selling wireless telephone products. However, it is important to note that only businesses with well-developed sales networks—such as Sharp, Sanyo, Kenwood, Sony, and a few others—have had much luck selling cordless phones for home use.

Besides telephones, the major wireless product is equipment designed for installation in fixed locations. The number of fixed base stations in Japan has expanded the service area for new common carriers servicing mobile-communication customers. IDO will begin portable phone service in the 23 wards of Tokyo and part of the city of Kawasaki in October, and in Kanagawa, Saitama, and Chiba next April. This service will be in accordance with the Motorola Inc. TACS standard already accepted for the Kanto and Tokai regions. IDO plans on $73 million worth of capital investment in order to begin.

Current cellular phone systems that utilize analog wireless transmission systems have reached their maximum capacity. More than half—or close to 400,000—of these analog subscribers are in Tokyo. To accommodate the flood of customers, vendors are pushing hard to develop digital cellular phone systems.

The Ministry of Posts and Telecommunications has conducted an investigation into specifications for wireless air interfaces and audio codecs, two important aspects of wireless communication that must be standardized. The choice was a time-division multiple-access (TDMA) scheme, a method common to the U.S. and Japan. In codecs, Motorola's VSELP (vector-sum excited linear prediction) system was selected.

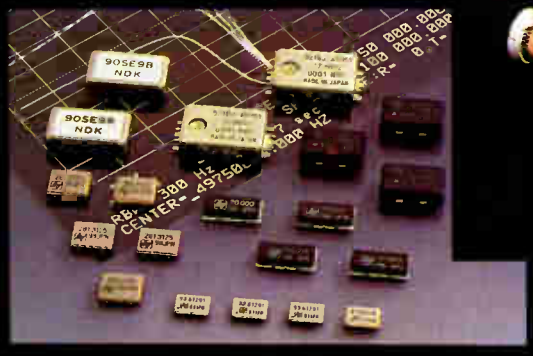
In transmission equipment, many computer data-communication systems using digital and ISDN lines are being built for use in corporate information systems. The demand for communications-control equipment, or gear needed for handling data transmission, will likely rise. Such gear is connectable to computer networks and can be integrated into private branch exchanges. This is why the market is largely controlled by corporations that have advanced computer and communications network technology, among them Fujitsu Ltd. and NEC Corp. IBM Japan also handles a great deal of communications-control equipment.

Several large corporations with extensive networks of regional business units plan to introduce ISDN lines on a large scale. Toyota Motors, 7 Eleven Japan, and others have already decided to install several thousand ISDN lines each to connect their sales outlets. The number of firms participating in ISDN service as of March was 27,300 on INS Net 64 and 560 on INS Net 1500. ISDN is not only used for data transmissions from sales outlets, but is also widely used for applications such as G4 facsimile machines, teleconference systems, and inter-LAN connections. ■

NDK Crystal Chip Products: Opening up new possibilities for mobile communications.

NDK Surface Mount Crystal Products are launching manufacturers of mobile communications equipment into the future. NDK continues to be a leader in the development of high-quality crystal products with research and development programs aimed at improved communications lifestyles.Drawing on a vast store of high technology, NDK manufactures a wide range of quartz crystal units, oscillators and other crystal products that fully support the flow of voluminous information.

Accuracy and stable performance are more points in our favor — more reasons to team up with NDK in your pursuit of advance developments.



SMD Crystal Units:

[CP21B] 7.5×5.1×1.2mm, frequency range: 16-110MHz
[CP12A] 12.5×5.5×2.5mm, frequency range: 3.5-25MHz

SMD Crystal Oscillators:

[5118G] Height: Max. 4.5mm, Volume: 0.96cc, Weight: 2.0g
Frequency Stability: $\pm 2.5 \times 10^{-6}$ (−30 to +75°C)
[5218J] Height: Max. 4.5mm, Volume: 0.96cc, Weight: 2.0g
Frequency Stability: $\pm 1 \times 10^{-6}$ (−20 to +70°C)

SMD MCF:

Height: Max. 4.5mm, Volume: 0.81cc, Weight: 3.0g
Only operable with 90MHz band and 12.5kHz channel space

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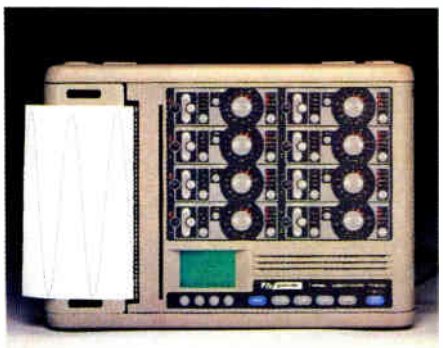

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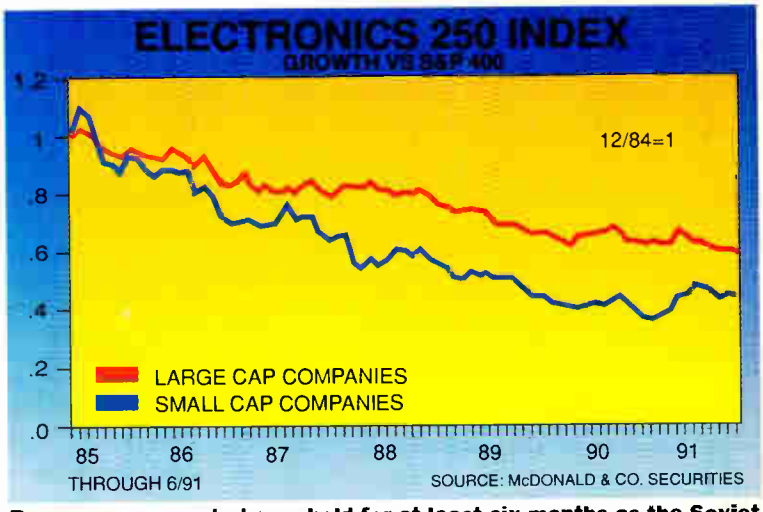
THE LONG-AWAITED STRONG COMEBACK MAY BE STALLING



Recovery appears to be on hold for at least six months as the Soviet situation as well as global financial woes have slowed progress.

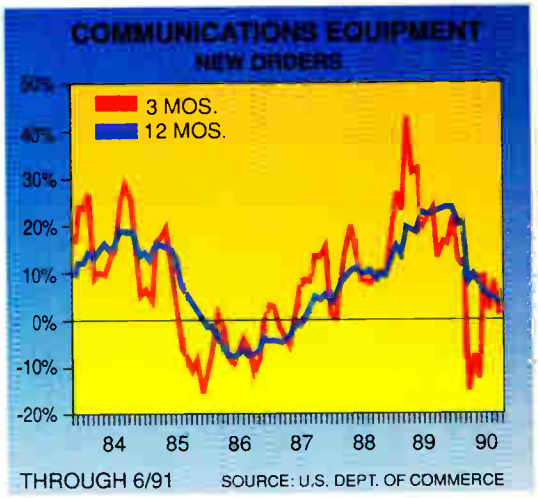
Remember the good old days when you could blame almost anything on the Soviet Union? Well, those days may be here again: recent events in the USSR could put off the U.S. domestic recovery until well into 1992. The coup against President Mikhail Gorbachev could easily erase the comfortable feeling of post-cold war progress, delaying a true recovery at least six to nine months. On top of that, dependence on world credit markets and a battered financial industry continue to limit the potential effectiveness of lower interest rates.

In electronics, order trends for components, primary durable categories, and capital equipment showed further weakness in June. This could help push any sustainable recovery for the industry into 1992. Also, the personal computer market appears to be awash in a glut of product not seen since 1983. While lower prices seem to be encouraging orders, the cost of maintaining revenues is creating entirely new sets of challenges for even the strongest industry players.

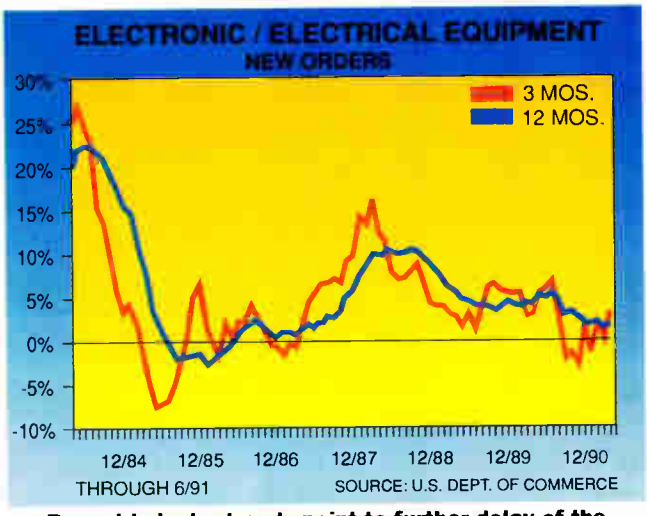
Communications equipment orders, after recovering earlier this year, are once again showing significant weakness. In the same vein, equipment orders once again appear to be weakening, and the softness in aerospace demand shows little sign of abating soon. Automotive orders appear somewhat improved, but remain depressed compared to last year's production. Distributor orders are also starting to weaken again.

The good news remains on the inventory front. In spite of continuing weakness in demand, companies continue to attack their inventory positions with a vengeance. This bodes well for earnings once demand picks up—but when? In the meantime, the industry continues to look for ways to minimize inventory risk, in spite of the near-term earnings impact.

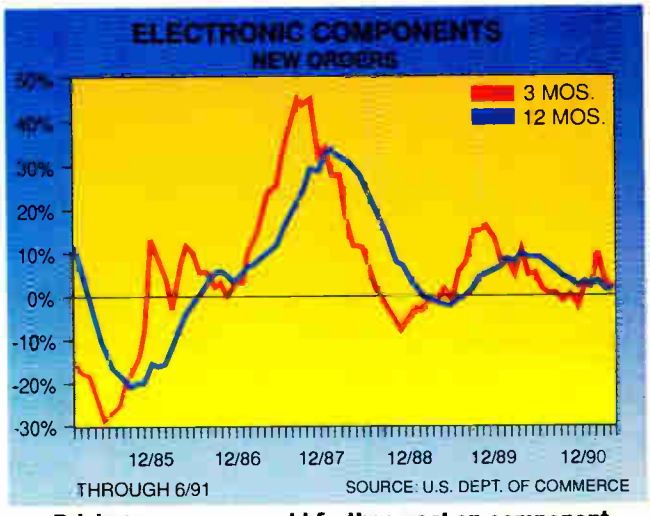
By Mark Parr, McDonald Securities Inc., Cleveland (216-443-2379) ❑



Weakness appears to be re-emerging after several strong months for this sector.



Recent industry trends point to further delay of the expected comeback from the recession.



Pricing pressures could further weaken component business over the next several months.

TOM CAMPBELL

SPEAKS OUT

CAN GOOD IDEAS BECOME GOOD LAWS?

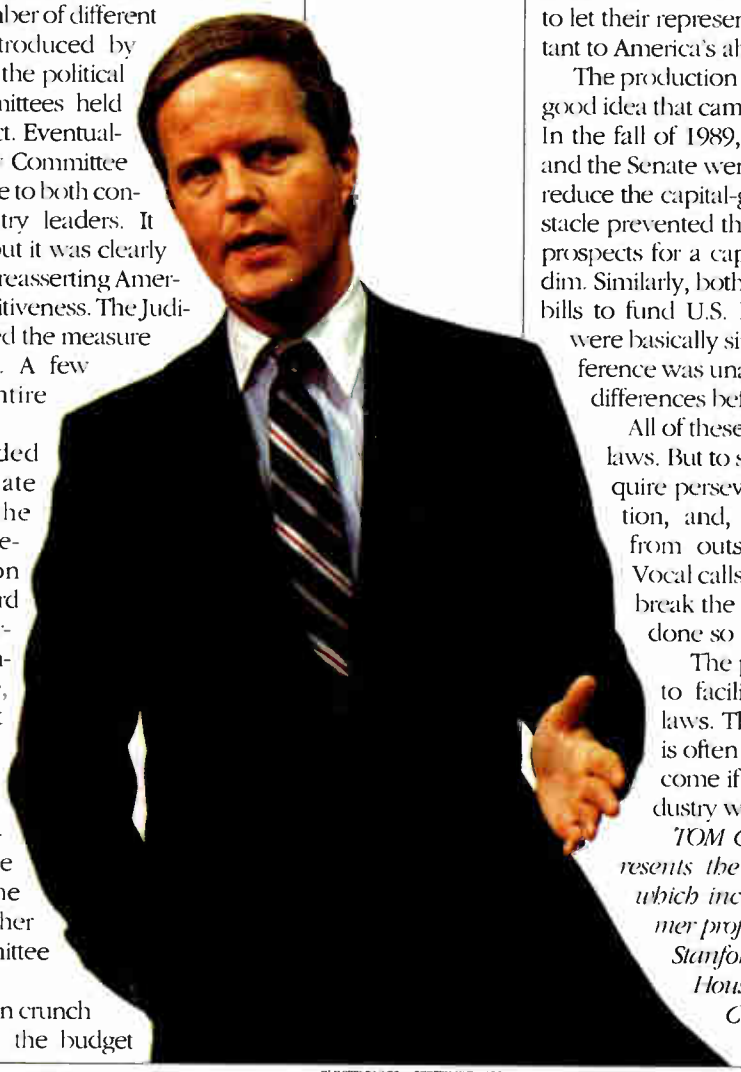
In Congress, a good idea does not always translate into a good law. Take the case of the need to reform our antitrust laws to allow production joint ventures. The issue is important to the electronics industry. Many emerging high-tech products—like superconducting materials, high-megabyte dynamic random-access memories, and biotechnology products—will require far more capital and risk than any one American company will be able to accept alone. To overcome this obstacle, Japanese and European companies are allowed to pool their resources for manufacturing joint ventures in high-capital, high-risk fields.

But current U.S. law deters American firms from doing likewise. Our antitrust laws need to be reformed to allow competitive production and marketing joint ventures, where no realistic probability of monopoly exists. The House of Representatives debated this issue extensively in the 101st Congress. A number of different approaches were introduced by members from across the political spectrum. Two committees held hearings on the subject. Eventually the House Judiciary Committee crafted a bill acceptable to both congressional and industry leaders. It was a moderate bill, but it was clearly a positive step toward reasserting America's high-tech competitiveness. The Judiciary Committee passed the measure with little opposition. A few weeks later, the entire House did the same.

But progress ended there. The full Senate never considered the measure, largely because of opposition from Ohio Sen. Howard Metzenbaum, the chairman of the Senate Antitrust Subcommittee, who simply did not schedule a markup of the bill in his subcommittee. Proponents were unable to circumvent the committee process to bring the measure directly to either the full Judiciary Committee or the Senate floor.

As the end-of-session crunch approached and with the budget struggle monopolizing most of Congress's attention last fall, we, the backers of the bill, were unable to overcome this and other sticking points. The bill died, and the whole process had to begin anew in the 102nd Congress.

VOCAL CALLS TO ACTION FROM ALL LEVELS OF INDUSTRY CAN BREAK THE LEGISLATIVE GRIDLOCK.



For a production joint-venture bill to become law over the next two years, it must be an industry priority. Business representatives in Washington were quite effective in bringing the issue into the forefront in the last Congress, but we will need more assistance from grassroots businesspeople. To pass the measure in the Senate in spite of Metzenbaum's objections will require a concerted, nationwide effort. Leaders from the private sector will have to work together with legislators to craft language regarding foreign companies to make the bill acceptable to both the President and House Judiciary Committee Chairman Jack Brooks. And businesspeople at all levels will have to let their representatives know the bill is important to America's ability to compete worldwide.

The production joint-venture bill is not the only good idea that came up short in the last Congress. In the fall of 1989, a majority in both the House and the Senate went on record in favor of a bill to reduce the capital-gains tax. But a procedural obstacle prevented the cut from becoming law, and prospects for a capital-gains tax cut now appear dim. Similarly, both chambers of Congress passed bills to fund U.S. high-tech programs. The bills were basically similar, but a House-Senate conference was unable to work out the remaining differences before the session ended.

All of these good ideas can become good laws. But to successfully enact them will require perseverance, a clear sense of direction, and, most importantly, assistance from outside Congress—at all levels. Vocal calls to action from the outside can break the legislative gridlock. They have done so in the past.

The private sector has the potential to facilitate needed changes in our laws. The plodding pace of Congress is often frustrating. But it can be overcome if members of Congress and industry work together.

TOM CAMPBELL, a Republican, represents the 12th District of California, which includes the Silicon Valley. A former professor of law and economics at Stanford University, he serves on the House Judiciary Committee and the Committee on Science, Space, and Technology.

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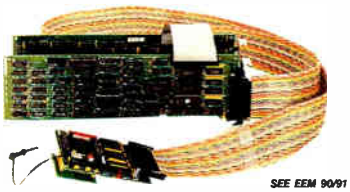

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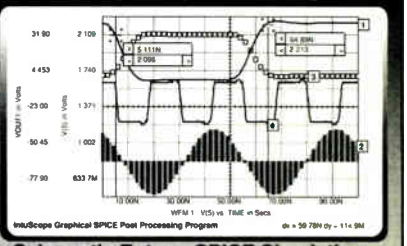

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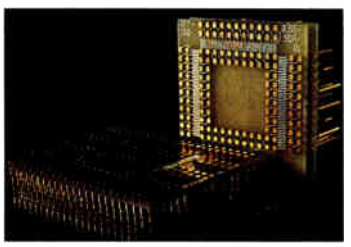

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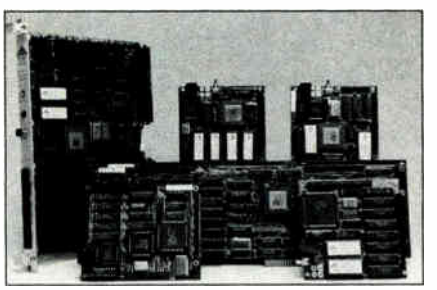

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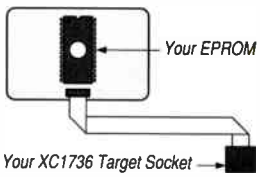

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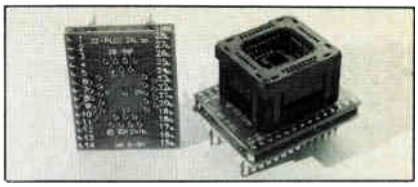

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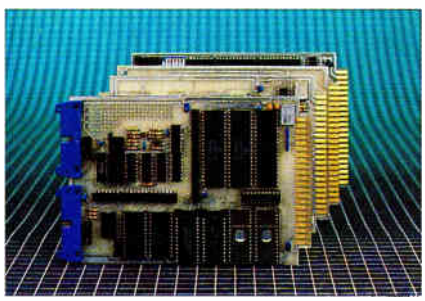

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LAST WORD

WILL BUSH '92 PULL A NIXON '72?

From all the evidence I have gathered so far, it looks as if the 1992 presidential election will be the hardest-fought, closest contest since 1972. What's that? You say McGovern carried only Massachusetts and Washington, D.C., in 1972? And as it stands now, Bush figures to do at least that well against whatever hapless sad sack the Democrats manage to draft?

Nonetheless—and this is the reason for bringing up this analogy—you may also recall that although Nixon had the election in the bag, he was so dissatisfied with the performance of the economy that he ordered a massive pump-priming effort that included higher spending, lower taxes, easier money, and devaluation of the dollar. And the inflationary effects were all kept camouflaged until after the election by wage and price controls.

Of course, Bush doesn't have all the options that Nixon did. The dollar can no longer be unilaterally devalued; the other G-7 countries have something to say about that. The authority for wage and price controls has long since lapsed. And Alan Greenspan isn't about to open the floodgates just before the election—since he has been reappointed pending Senate confirmation, there is no danger that some toady successor could be named who would do just that. However, if the administration does decide to stimulate the economy next year, it would almost certainly be in the area of higher spending and lower taxes rather than these other options.

As I see it, the hike in spending and cut in taxes next year will be a strong bipartisan effort. The Democrats are getting desperate; assuming that Bush wins next year, that means the Republicans will have controlled the White House for 24 of the past 28 years. It has dawned on at least some of the opposition "leaders" that, although passage of a quota bill may be life's highest calling, it won't get them into 1600 Pennsylvania Ave. As a result, they have begun to cast their nets for alternative ideas and have hit on two that appear to have widespread appeal. First, a $1,000 tax credit per child. The bill is profamily, appeals to those with large numbers of children (read: certain ethnic groups that have recently switched to voting GOP), and reduces taxes for those below the middle of the income scale. Second, some sort of universal healthcare benefits. Previously associated only with helping the poor and unemployed, the bill has recently picked up support from a large number of middle-class Americans who are either self-employed or work for small companies, and who are being priced out of the market.

As a result, the Republicans will feel impelled to counter with alternative legislation. Any healthcare bill they propose will rely less on the government and more on the private sector, but the net result will be the same: bigger deficits.

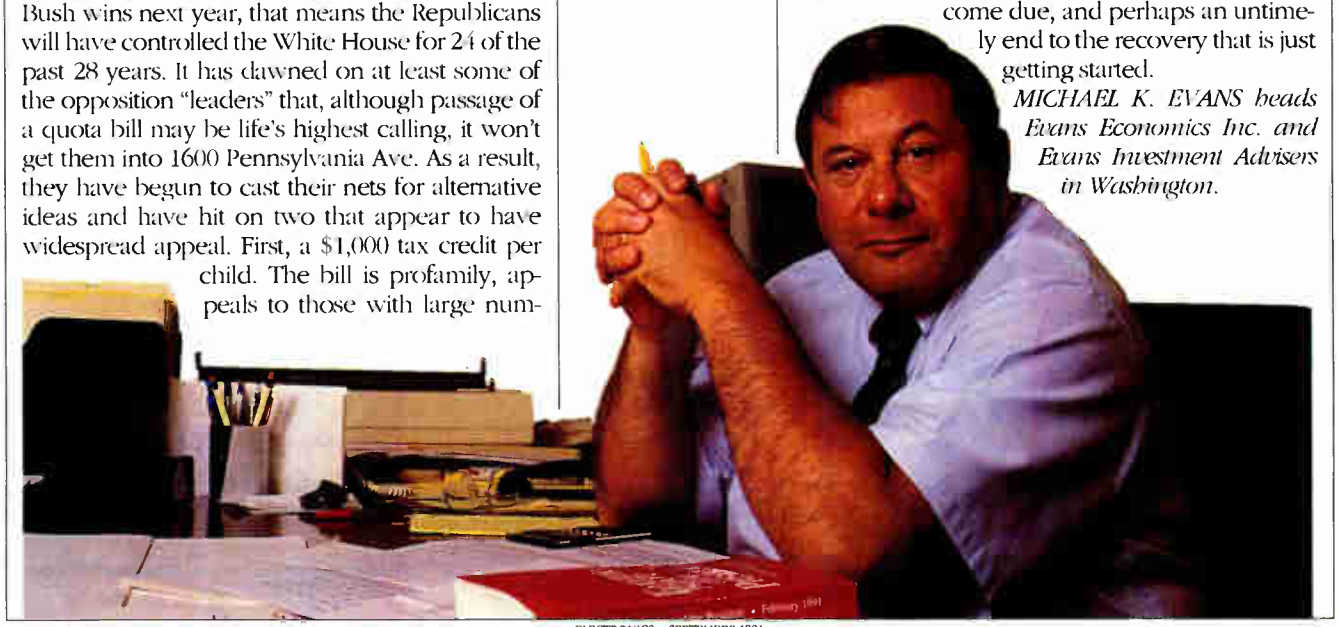
Some will argue that the current budget represents a formidable roadblock standing in the way of increasing the deficits. That is, of course, the merest nonsense. Congress wrote that law, and Congress can change it. I hardly need remind Washington watchers that the first Gramm-Rudman bill mandated a balanced budget by 1991.

Larger deficits, of course, always have their economic consequences, reflected either in higher interest rates or higher inflation—or both. Because of lags inherent in the economy, it is invariably the case that fiscal stimulus in any given year causes higher inflation the following year—that is, in 1993. Because financial markets are now aware of such political sleights of hand, long-term interest rates will probably rise as soon as the latest budget scam is promulgated.

So here's my prognosis: look for higher spending in 1992, higher interest rates in 1993 as the bills come due, and perhaps an untimely end to the recovery that is just getting started.

EVEN WITH THE ELECTION IN THE BAG, BUSH MAY PRIME THE ECONOMIC PUMP.

MICHAEL K. EVANS heads Evans Economics Inc. and Evans Investment Advisers in Washington.



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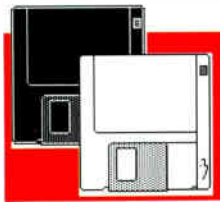

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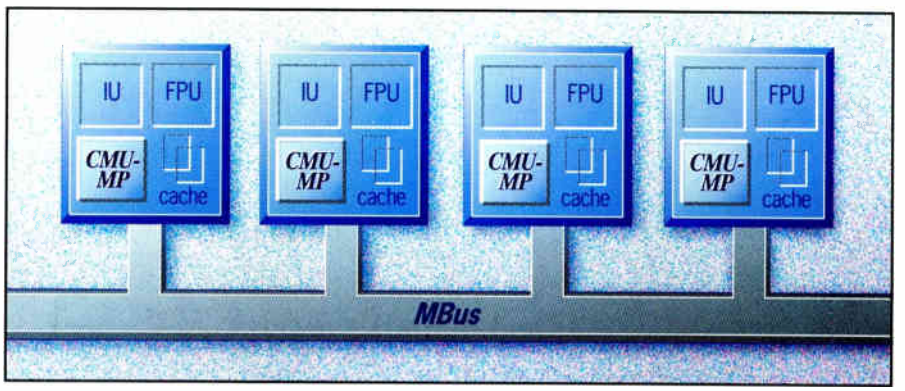

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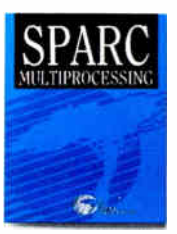

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