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By VICTOR K. McELHENY Special to The New York Times
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SANTA CLARA, Calif., Jan. 15—The United States electronic industry has developed circuitry so miniaturized that it is pushing to install many computer functions in such things as automobiles, gasoline pumps, traffic signals and supermarket cash registers.

This development is expected, within a few years, to give computer technology more impact on daily life than it has today, when computer circuitry in consumer products is limited to pocket calculators, digital watches and some cameras.

The latest miniaturization phase is also expected to increase the power and lower the cost of desk top "minicomputers" and to give more independence to computer terminals now used only to gain access to big central calculators. Thus a relatively small computer could operate on its own and perform more complex functions.

Electronic miniaturization involves reducing in size the wires and switches used to transmit electronic information, permitting thousands of switches and their wires to be embedded in a tiny silicon wafer smaller than a fingernail.

Nearly Invisible

"There is almost no limit to the number of places you could put it," Prof. Anthony Oettinger of Harvard University, an expert on the use of computers, said in a telephone interview. "It's a very profound kind of thing, even after you distinguish between the reality and the flackery."

The technology involved is the so-called semiconductor memory for storing information electronically, a device designed to be much cheaper, faster and more compact than the ferrite core memories that have dominated the field.

The semiconductor memory became a commercial reality only five years ago, but already generates sales by electronics companies, such as the Intel Corporation here, which had sales of $134.5-million in 1974.

The buildings of Intel were put up on a former citrus orchard. Santa Clara south of San Francisco Bay next to San Jose, is in the heart of what those in the electronics industry call "Silicon Valley" because so many makers of semiconductors are here.

In 1971, the semiconductor memory technology led to so-called microprocessors, tiny devices that could be hooked up with memories to make "microcomputers" on a single chip of silicon a few millimeters square.

'Smart' Instruments

And so, according to Dr. Bernard Oliver, vice president for research and development of the Hewlett-Packard Company, "the central processing unit, the dominant part of the computer that you used to get billed by the second for using, has shrunk to the point of invisibility. The processing unit has become a little bit of a thing."

Ultimately, he said, this will change the "architecture" of computers, first worked out by the late Dr. John von Neumann, where all the information has to be processed by a single central calculator.

In the future, whole batteries of microprocessors might work like clerks in an office, with one or more of them exercising "executive control," Dr. Oliver said.

In the meantime, microprocessors like those used in the hand calculators Hewlett-Packard introduced in 1972 are being installed in what the industry calls "smart" instruments, such as a distance measurement unit for surveyors.

Many observers of the industry expect that microcomputers, precisely controlling the burning of fuel in car engines, and antipollution devices will be indispensable in reducing pollution and achieving fuel economy.

The automobile industry has shown intense interest, in sponsoring seminars and large research programs, and skepticism about the practicality of microcomputers in cars.

Auto industry scientists have said that major problems of cost and reliability will have to be solved.

Two researchers from the Ford Motor Company, while reporting success in a test of microprocessor equipment, said the devices would not work unless tough, simple equipment could be developed for delivering information to the microcomputer and for carrying out its commands.

R. H. Temple and S. S. Devlin of the Ford scientific staff in Dearborn, Mich., told the Institute of Electrical and Electronics Engineers in New York last March that "reliable, low-cost, mass-producable, accurate sensors and actuators that will survive in the extremely hostile automotive environment" are needed.

Even if microprocessors do not find a place in hot, corrosive automobile engines and exhaust pipes, they might achieve significant fuel savings another way, according to engineers at Intel and elsewhere.

Harold V. Feeney Jr., marketing manager for Intel's Micro Computer Systems Division, cited left-turn traffic signals that do not let all cars in a left-turn line go through on one light. Mr. Feeney said he figured he wasted 24 hours a year at left-turn signals.

Waste of Fuel

"It might now be possible," he said, "to take a dumb signal and with a few hundred dollars of microprocessors, add some intelligence to it."

Such microprocessor-equipped signals could speed traffic on local streets, bar entry to freeway lanes after an accident or even signal the closing of freeway entrances, in case of a large traffic jam.

Dr. John R. Pierce of the California Institute of Technology, writing in January's Scientific American magazine, mentioned one estimate that fuel consumption might be reduced 10 per cent in areas controlled by sophisticated signals.

"Repeated starting and stopping wastes fuel," he wrote. "Although traffic lights are old, computer controlled signal systems to facilitate the flow of traffic are fairly new. Computerized traffic control can reduce the number of starts and stops."

Leaders in the semiconductor and microprocessor business are International Business Machines, which produces the devices for its own computers, and Intel, which sells to many other companies.

Intel was founded in 1968 by Drs. Robert N. Noyce ad Gordon E. Moore, who had helped found and lead another large electronics company, Fairchild Semiconductor. Intel's first profitable year was 1971, when the total sales volume was $9.4 million.

Eight Bits at a Time

There has been stiff competition from Texas Instruments Inc., National Semiconductor Corporation, Motorola, Inc., and a smaller Texas company called Mostek.

In a race with its competitors, Intel has enlarged the capacity of its semiconductor memories from 1,000 "bits" of stored information to 4,000, and introduced the ability to handle eight bits at a time to improve on Intel's earlier devices that handled four.

The concern has moved into the digital watch field, and into building "add-on" banks of memory devices for big computers. It sells microprocessors for use in minicomputers.

Minicomputers are widely used in industry for controlling machine operations. Microprocessors are expected to win some of this market, and more importantly to extend the process control business to thousands of machines too small for the economical use of a minicomputer.