Tiny Computer on a Chip Ready for Soaring Sales
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After years of electronic industry ballyhoo, the microprocessor—a microscopic computer laid out on a fingernail-size square of silicon—is on the threshold of mass markets.

This so-called computer on a chip, which has been declining sharply in price since its invention in 1971, has been pushing its way into more and more uses and is expected to become a billion-dollar industry in a few years. It has served the public in pocket calculators, video games and microwave ovens. It has helped businesses speed sales, control costs and watch inventories with sophisticated grocery scales, gasoline pumps and point-of-sale terminals, or "smart" cash registers.

Now the microprocessor is poised to enter markets where it will serve basic purposes of individual consumers—in automobiles, telephones and utility meters, for example. Following sales of nearly $200 million in microprocessor systems last year and as much as $400 million expected this year, the electronics industry expects sales to soar before long.

Critical steps in this direction were taken in the last few months by America's largest automobile manufacturers, the General Motors Corporation and the Ford Motor Company. A few days ago Ford announced selection of two major semiconductor manufacturers, Texas Instruments Inc. of Dallas and the Intel Corporation of Santa Clara, Calif., as its partners for installing millions of microprocessors in new cars of 1980 and beyond.

James K. Bakken, general manager of Ford's Electrical and Electronics division, said in a telephone interview after the announcement, "We think electronics has a great big place in the cars of the 1980's."

Up to now, the tiny computors have been used on only a few automobiles, such as the Cadillac Seville and the Oldsmobile Toronado, as a start toward helping car makers comply with twin Federal requirements—to control pollution and to improve fuel economy at the same time.

Under the Ford arrangement, Texas Instruments is considered likely to use some version of its 9900 family of microprocessors, which it began introducing last year. Intel is expected to supply an elaboration of its so-called 8048 single-chip microprocessor.

General Motors, while maintaining silence about its plans, is reliably reported to have chosen Motorola Inc. for an even closer partnership in which Motorola would not only supply

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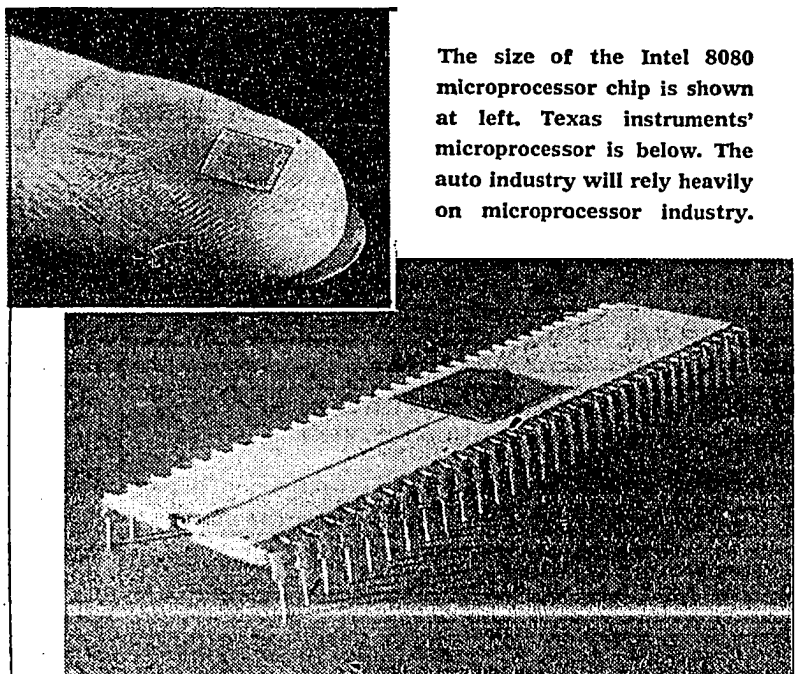

The size of the Intel 8080 microprocessor chip is shown at left. Texas instruments' microprocessor is below. The auto industry will rely heavily on microprocessor industry.

Boom Near for Chip Computers

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microprocessors but also assist a General Motors subsidiary, Delco Electronics of Kokomo, Ind., to begin mass manufacture of the Motorola device. It is expected to be based upon the Motorola 6800 microprocessor.

A trade journal, Electronics, said in its Jan. 20 issue that the General Motors-Motorola arrangement "may well be the largest single semiconductor buy in history." According to the magazine, Motorola could be supplying between 2 million and 6 million of its microprocessors to General Motors annually in 1980. Including allied devices, sales to G.M. could approach $100 million.

Shipments of the Motorola 6800 last year have been estimated by industry analysts at less than 100,000, bringing in perhaps $10 million to Motorola and a second supplier, American Microsystems Inc. Shipments of the dominant advanced microprocessor, Intel's 8080, by Intel and several other manufacturers, were said to have exceeded 400,000 last year, generating about $35 million in sales.

In the years ahead, such devices are planned for virtually all new cars, not only for timing the firing of sparkplugs and regulating the flow of gas from carburetors (to help fuel economy) but also for controlling the recycling of exhaust gases in pollution-control systems, operating dashboard displays of information about the car's operations, running antiskid braking systems and, eventually, controlling the transmission.

The prices of these relatively complicated microprocessor systems are generally expected to fall well below $10, and the experience of manufacturing them is expected to help drive down the price of other microprocessors to be used in such things as telephone receivers and utilities' electric meters.

A microprocessor inside the telephone could remember frequently called numbers so that only one or two buttons would be pushed to place a call, forward calls automatically or automatically keep dialing a busy number.

Installed in electric meters, the microprocessor could provide the billing information necessary for time-of-day pricing of electricity. The idea is to encourage utility customers to shift discretionary use of electricity out of periods of peak demand, when older, less efficient power plants often must be put into service. By shifting demand through imposing higher prices during peak periods, utilities hope to avoid brownouts and to ease pressures for building extra capacity. Environmentalists also hope to slow the building of new power plants, particularly nuclear plants, through time-of-day pricing.

The microprocessor industry essentially began with an invention in 1971 by an Intel engineer who was developing circuits intended for use in a pocket calculator planned by a now-defunct Japanese company, Busicom. The first microprocessors handled information in electronic "words" consisting of four binary digits, or bits of information. Later ones use eight-bit or even 16-bit words.

Eight-bit devices, such as Motorola's 6800 and Intel's 8080, are considered second-generation microprocessors. In the third generation of microprocessors, which began appearing last year, industry observers note a divergence into two classes—one simple, the other complex.

The first class aims at low cost and the performance of relatively simple functions, such as controlling a microwave oven. Products for such uses include Texas Instruments' revised calculator circuit called the T.M.S.-1000, selling between $2 and $3 in large quantities. The National Semiconductor Corporation has introduced a "number cruncher," selling for less than $12 in quantities of 100 or more. The Mostek Corporation of Carrollton, Tex., has brought out its 3870 microprocessor, advertised at below $10 in quantities above 1,000.

The more complex microprocessors carry more sophisticated memory units.

Wilfred P. Corrigan, president of the Fairchild Camera and Instrument Corporation, a major semiconductor manufacturer in "Silicon Valley," south of San Francisco, recently predicted that sales of the simpler, low-cost microprocessors would more than double this year, to perhaps $125 million, from $56 million in 1976.

Last year's sales of the more complex units, such as the Motorola 6800, which Fairchild recently agreed to begin manufacturing, totaled $160 million, Mr. Corrigan estimated. This year the sales could reach $264 million, he said.