Intel Corp

# INTEL®
# MICRO COMPUTERS

An up-to-the-minute report on
what's been built with them
and how you can build systems
quickly, simply and economically.

**APRIL 1973**

# INTEL MICRO COMPUTER WORKS IN SEIKO'S DESK-TOP COMPUTER

An Intel micro computer put the full calculating power of a computer in a simple-to-operate machine no larger than a typewriter.

Seiko's S-500 is a sophisticated computer that can be operated without learning a complex programming language. Most function keys are coded in the universal language of mathematics. Programming is accomplished by inserting magnetic cards. Results are printed out in two colors. Most people can begin to use the machine effectively after only a few days practice.

Seiko designed the machine from the ground up to use Intel's MCS-8 micro computer. The micro computer performs all calculations, controls the keyboard, reads and writes the magnetic cards, generates displays and controls the printer.

Seiko estimates they saved 1 to 1½ years in development time by using an Intel micro computer in place of a conventional TTL design. They say that the Intel 8008 one-chip computer replaced about 200 TTL packages and cut costs in half for that part of the machine.

# INTEL MICRO COMPUTER WORKS IN HELENA LABS BLOOD ANALYZER


Helena Laboratories is using an Intel micro computer in an instrument that measures the protein content of blood, printing a separate quantitative reading for each of several different proteins.

The Intel micro computer translates the raw data from a sensing instrument into medically meaningful numbers.

The people at Helena Labs say that the micro computer on one PC board replaced three PC boards plus a power supply, cutting the overall size of the electronics package in half. They estimate that using the micro computer reduced the cost of the electronics about 30%.

# INTEL MICRO COMPUTER FOR PITNEY BOWES-ALPEX POINT-OF-SALE TERMINAL

Pitney Bowes-Alpex is incorporating an Intel micro computer in their SPICE™ point-of-sale terminal to perform arithmetic and data processing functions.

The terminals are now in use at retail stores and supermarkets nationwide. Operating in conjunction with an in-store controller, the terminals can automatically read price tags with a scanner, print sales slips, adjust inventory and even check the customer's credit.

The people at Pitney Bowes-Alpex say they selected Intel micro computers in order to reduce package size, cut the IC count, shorten development time and lower costs.

Size reduction, compared to space required using conventional off-the-shelf ICs, is estimated to be about 35%.

Cost reduction, compared to alternative techniques, is estimated to range from 20% to 30% for the arithmetic and data processing functions performed by the micro computers.

Development time was cut an estimated 25%, compared to the time required using conventional methods.

# INTEL MICRO COMPUTER WORKS IN INFOREX CHECK PROCESSOR

Inforex is using an Intel micro computer in a system that processes incoming bill-paying checks for banks, retail stores, credit card companies and the like. The system reads the return portion of the bill with a numeric optical scanner, endorses the check for deposit and records the entire transaction on magnetic tape. By performing several clerical tasks at one station under the control of one operator, the system speeds processing and greatly reduces clerical costs.

An Intel one-chip computer performs as a micro processor in the character recognition system for the optical scanner.

Inforex says the one-chip computer does the work of about 100 discrete components and replaces an entire 9″ x 10″ PC board otherwise required. They estimate that the micro computer reduces the cost of the character recognition system by about 20%.

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# INTEL MICRO COMPUTER WORKS IN OMNI'S BUSINESS MACHINE

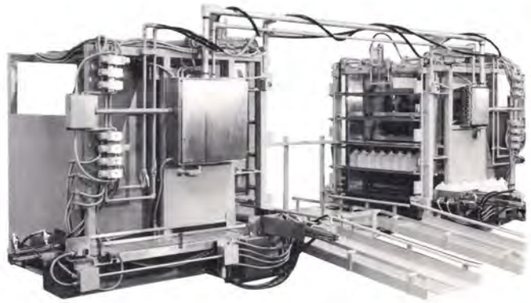

This general-purpose data processing machine for small businesses is built by Omni Electronics using an Intel micro computer as the heart of the system. Suitably programmed, this machine will tabulate accounts, type invoices, write checks, and even produce personalized form letters.

Omni says they saved about $3,000 by using an Intel micro computer in place of a mini. Moreover, the micro computer enabled them to reduce the whole system to typewriter size.

They say the micro computer has even more speed than they need, and offers the extraordinary reliability they require in this application.

In addition to the Intel integrated CPU, which does all central processing, the machine uses Intel's electrically-programmed PROMs for bootstrap programming and Intel's 2102 N-channel 1024-bit MOS RAMs as the central memory, a memory which stores up to 16K 8-bit bytes. Peripheral memory is supplied by one to eight Omni tape decks, which store 15,000,000 bits per cartridge.

# INTEL MICRO COMPUTER WORKS IN COMSTAR'S PROCESS CONTROL COMPUTER



An Intel micro computer does all the thinking for this automatic bottle-loading machine. The micro computer, built by Comstar Corporation of Edina, Minnesota, for Conveyor Specialities, tells the machine how to load bottles of different sizes and when to perform each step in the loading process.

The little computer in a 6″ x 6″ x 1½″ space replaces several racks of counters, timers and relays that would otherwise be required. According to Comstar, the computer's flexible programming is a major advantage. Programs on PROMs can be changed in half an hour.

Comstar estimates that the micro computer halved the cost of the control portion of this system, and reduced the time required to build it by a factor of two or three. The company is now building other types of systems with Intel micro computers, including an automatic meat weighing and packaging machine.

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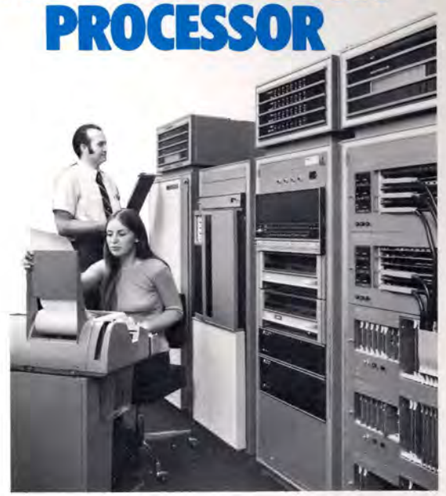
# INTEL MICRO COMPUTER WORKS IN STAID'S POINT-OF-SALE TERMINAL

**Staid**, Inc. of Casselberry, Florida is using Intel micro computers to build advanced point-of-sale terminals for a large chain of cafeterias in the Southeast. Operated by the cashier, the terminal automatically enters item prices, totals items, adds taxes, prints a sales slip, dispenses change, adjusts the inventory of each item as it is sold, and transmits all this information to corporate headquarters. It can handle 100 separate items and is expandable to accommodate 200.

Staid says the Intel micro computer on only two PC cards does the work of about a dozen cards of random logic, and increases estimated reliability by an order of magnitude. Cost reduction, compared to random logic, is estimated to range from 20% to 30%.

Since the micro computers are programmed by Intel PROMs, Staid can produce point-of-sale terminals for the other types of businesses that have different requirements without redesign. They simply change the PROMs to make the terminal perform according to the new customer's requirements. Obviously, this saves a lot of money and enables them to deliver systems soon after receipt of order.

# INTEL MICRO COMPUTER WORKS IN ACTION COMMUNICATION SYSTEMS' DATA COMMUNICATION PROCESSOR



Action Communication Systems of Dallas used Intel micro computers as front-end processors in this high-speed dial-up communications controller built for The Bekins Company.

Action adopted Intel micro computers in order to save both development time and system cost. The Bekins system was fully developed and delivered *only 90 days* after Action decided to use Intel micro computers. And Action estimates they saved about $10,000 in over-all cost.

The Bekins controller, located in Glendale, California, is the heart of a nationwide multi-terminal system that carries administrative messages, financial data, shipping notices and customer inquiries. A micro computer on each of fives lines puts messages in a binary synchronous format, checks for errors, and signals for re-transmission when an error is detected.

Action used Intel's standard SIM4-02 micro computer boards in the system, and did the final programming with Intel's electrically-programmed PROMs. Intel's Micro Computer Systems Group worked very closely with Action in both the design and debugging phases of the project.

# THE MICRO COMPUTERS


Intel's 4004 4-bit central processor typically replaces about 90 TTL MSI and SSI packages. It's the heart of the MCS-4 set of four micro computer devices—which includes a 2048-bit ROM with a 4-bit I/O port, a 320-bit RAM with a 4-bit output port and a 10-port shift register for I/O expansion. They fit together without any interfacing circuitry to make complete systems with 32K bits of ROM and 5K bits of RAM. Using a few simple interfacing devices, you can build much larger systems with up to 96K bits of ROM.

Intel's 8008 8-bit central processor typically replaces about 125 TTL MSI and SSI packages. It's the heart of the MCS-8 micro computer set—which includes standard Intel ROMs, RAMs and shift registers. The central processor can directly address 16,000 8-bit bytes stored in any combination of these memory devices. The processor has interrupt capability, operates asynchronously or synchronously, and can perform as many as seven nesting sub-routines. Systems require some interfacing circuitry.


# SUPPORT THAT MAKES SYSTEM-BUILDING EASY

## FOR MCS-4™ SYSTEMS

1. **Prototyping Board, SIM4-01.** Forms operational microprogrammed computer with Intel erasable PROMs in place of mask-programmed ROMs. Holds up to 8k bits of PROM and 1280 bits of RAM.
2. **Larger Prototyping Board, SIM4-02.** Like SIM4-01 above, but it holds 32k bits of PROM and 5k bits of RAM.
3. **4008/4009 Standard Memory and I/O Interface Set.** Provides direct interface between the 4004 and standard Intel PROMs, ROMs, and RAMs for program storage, and increases the available number of I/O ports.
4. **PROM Programmer, MP7-03.** Intel erasable PROMs plug into this board for programming using a teletypewriter.
5. **SIM4 Hardware Assembler.** Four PROMs plug into either SIM4 prototyping board, enabling your micro computer prototype to assemble its own programs. PROM types A0740, 741, 742, and 743.
6. **SIM4 Hardware Simulator on PROMS.** Enables prototype to simulate its own operation.
7. **System Interface and Control Module.** Interconnects all other support hardware and a TTY for program assembly, simulation, PROM programming, prototype operation and debugging. MCB4-10 for SIM4-01 and MCB4-20 for SIM4-02.
8. **Fortran IV Assembler.** Gives you the assistance of any general-purpose computer in developing MCS-4 programs.
9. **Fortran IV Simulator.** Permits any general-purpose computer to simulate the micro computer you are designing.
10. **Users Manual for MCS-4.** This 176 page manual tells you all you need to know to use MCS-4 components successfully.
11. **Library of Programs.** Contributed by users, free to users.

## FOR MCS-8™ SYSTEMS

1. **Prototyping Board, SIM8-01.** Forms operational microprogrammed computer with Intel's erasable PROMs in place of mask-programmed ROMs. Holds up to 16k bits of PROM and 8K bits of RAM.
2. **PROM Programmer, MP7-03.** Intel erasable PROMs plug into this board for programming using a teletypewriter.
3. **SIM8 Hardware Assembler.** Eight PROMs plug into SIM8 board, enabling the prototype to assemble its own programs.
4. **System Interface and Control Module.** Interconnects all other support hardware and a TTY for program assembly, simulation, PROM programming, prototype operation, and debugging. Intel MCB8-10.
5. **Chip-Select and I/O Test Program.** On PROM which plugs into prototyping board, Intel A0801.
6. **RAM Test Program.** On PROM that plugs into prototyping board, Intel A0802.
7. **Bootstrap Loader.** Enables you to enter data or a program into the RAMs from a teletypewriter paper tape or keyboard, and execute the program from the RAMs. Consists of three PROMs (A0860, 861 and 863) that plug into the prototyping board.
8. **Fortran IV Assembler.** Gives you the assistance of any general-purpose computer in developing MCS-8 programs.
9. **Fortran IV Simulator.** Permits any general-purpose computer to simulate the micro computer you are designing.
10. **Users Manual for MCS-8.** This 128 page manual tells you what you need to know to use MCS-8 components successfully.
11. **Library of Programs.** Contributed by users, free to users.

Intel has formed a Micro Computer Systems Group with the sole mission of helping you build systems using micro computer sets. They developed the design aids above and will assist you in every other way possible.

All this makes it quite practical and economical to design and build your own systems.

To learn more about these exciting possibilities contact Micro Computer Systems Group, Intel Corporation, 3065 Bowers Avenue, Santa Clara, Calif. 95051. Phone (408) 246-7501.