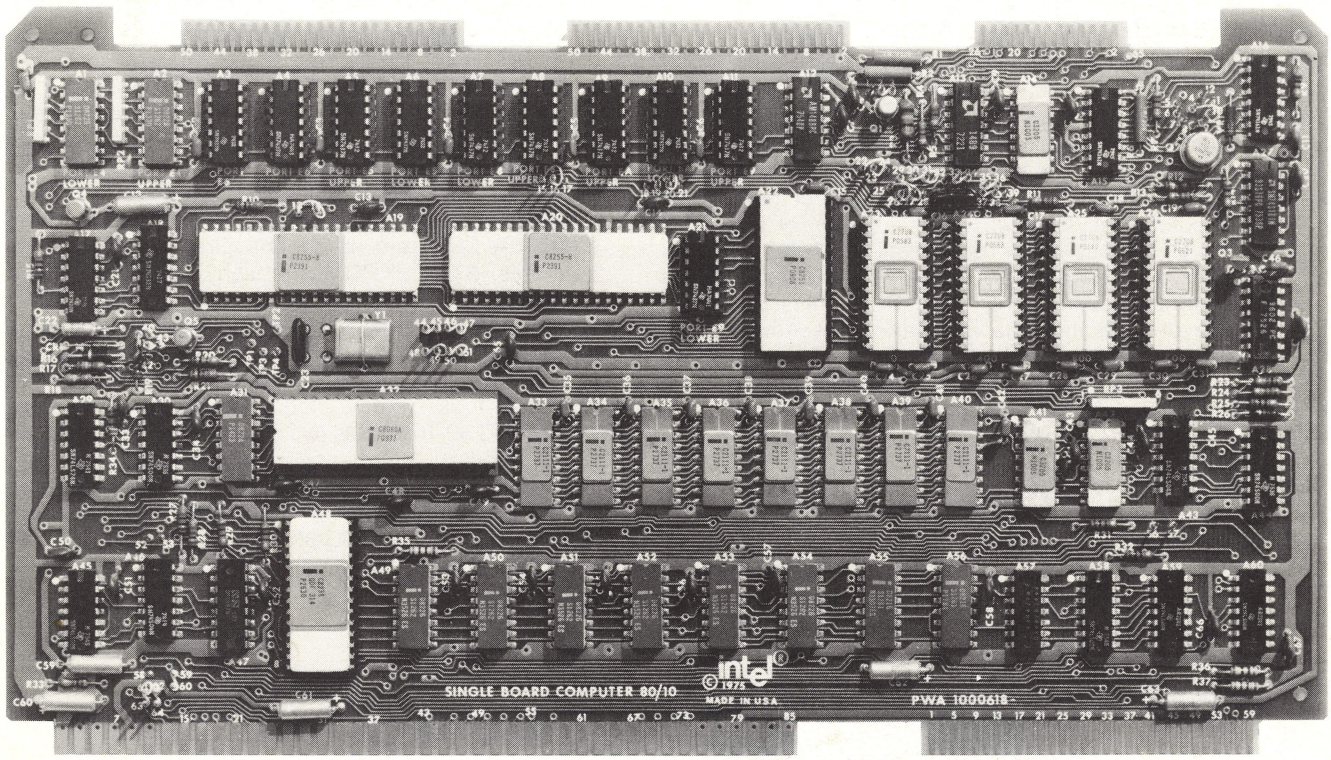
intel® Microcomputer News

Volume 3, No. 2

THE SBC 80/10 . . . A COMPLETE GENERAL-PURPOSE COMPUTER WITH CPU, MEMORY, PROGRAMMABLE SERIAL AND PARALLEL I/O ON A SINGLE P.C. BOARD . . . IS NOW AVAILABLE FROM INTEL DISTRIBUTORS WORLDWIDE



This is the new Intel® Single Board Computer, the SBC 80/10. On a single 6¾″ × 12″ printed circuit board, the 80/10 has an 8080A Cental Processing Unit, 1K bytes of RAM memory, sockets for 4K bytes of EPROM or masked ROM memory, 48 programmable I/O lines with sockets for interchangeable line drivers and terminators, a programmable synchronous/asynchronous communications interface with selectable teletype or RS232C compatibility, a single-level multi-source interrupt structure, and bus drivers for memory and I/O expansion. Complete details on the SBC 80/10, which is priced at $295 in quantities of 100, begin on page 2.

DIVISIONAL STATUS ACHIEVED BY MICROCOMPUTER SYSTEMS

Bill Davidow is named General Manager of Intel's fourth operating division, with Les Vadasz as Assistant G.M.

The Intel Microcomputer Systems Group, which came into existence in late 1971 with just four employees, was afforded full divisional status within Intel Corporation during the last week of February. The new MCS Division will be headed by Dr. William H. Davidow, who has directed the activities of the former MCS group since 1973. Leslie Vadasz, formerly Engineering Vice President in the Components Division, has been named Assistant General Manager. Vadasz headed the Intel design department which developed the industry's first microprocessor.

The new MCS Division is divided into Components and Systems groups. Managerial positions are filled by Jean-Claude Cornet, Microcomputer Engineering; Sterling Hou, Systems Engineering; William Lattin, Future Systems; Terry Opdendyk, Software Development; Don Atkins, Manufacturing; Nick Nichols, Applications; Jim Lally, Systems Marketing; and Dale Williams, Components Marketing.

Since November 1971, when the company introduced the world's first microcomputer system, the MCS-4™ (which featured the 4-bit, P-Channel 4004 CPU), Intel has dominated worldwide activity in both microprocessors and microcomputers. The 4004 remains as the industry's top-selling microprocessor, but it has been joined by such major Intel product innovations as the first 8-bit microprocessor system, the MCS-8™; the first N-Channel microcomputer, MCS-80™; the first "family" of Schottky bipolar computing elements (Series 3000); an enhanced version of the initial 4-bit system, the MCS-40™; PL/M™, first programming language designed specifically for microcomputers; the first of the microcomputer development systems (Intellec®); and the newly-announced complete computer on a single printed circuit board, the SBC 80/10.

IN-DEPTH SEMINARS ON SBC 80/10 SCHEDULED FOR 45 CITIES WITH DATES, LOCATIONS ON PAGE 6.

PRICED AT $295*, THE SBC 80/10 SINGLE BOARD COMPUTER IS INTRODUCED IN *ELECTRONICS* AS "THE SUPER COMPONENT: THE ONE-BOARD COMPUTER WITH PROGRAMMABLE I/O."

A complete computer subsystem on a small, 6¾″ × 12″ board, the low-cost SBC 80/10 includes all the processing power, memory and input/output capacity required to satisfy most OEM processing and control applications.

A complete computer system on a single printed circuit board, the SBC 80/10, was introduced by the Microcomputer Systems Division in the lead article in *Electronics Magazine* on February 5th. The article explained that the new Intel computer subsystem was the realization of a long-time goal of microcomputer designers, that of "a computer usable as a single-board, plug-in component, without extra boards or customizing." The article stressed the importance of programmable I/O, saying the new programmable interfaces "allow the OEM to use software to customize the parallel I/O ports and communications interfaces, eliminating the previous need for inefficient hard-wired ports or I/O boards specially designed and manufactured for a custom application."

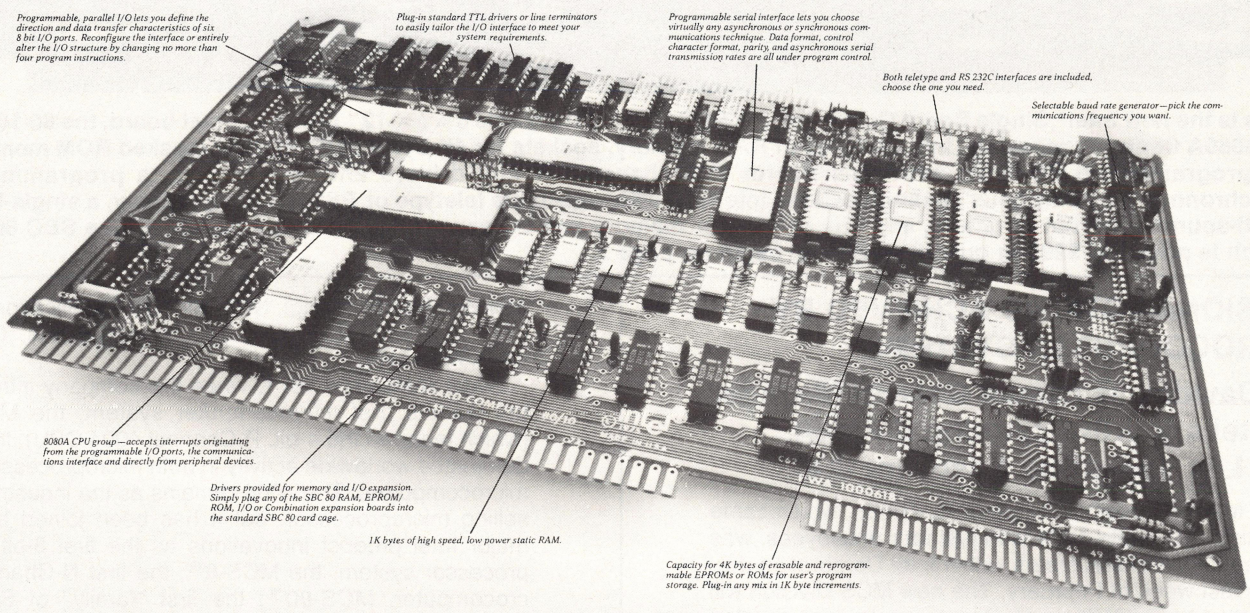
Mike Maerz, product marketing manager for OEM microcomputer systems, said that the SBC 80/10 is "the lowest cost OEM computer system available today, including enough processing power, read/write and EPROM memory, parallel and serial I/O to satisfy the vast majority of OEM applications with a single board."

Comprehensive seminars, conducted by Intel applications engineers, have been organized by Intel distributors throughout the U.S. and Canada to provide in-depth information on the new Single Board Computer. A complete seminar schedule may be found on page 6. Documentation on the SBC 80/10 is also available from all Intel distributors, or it may be obtained by completing and returning the coupon on the back page. A newly-published SBC 80/10 Hardware Reference Manual is available for $5.00.

*100 quantity price

Intel expertise in LSI technology made the creation of this complete computer-on-a-board possible.

The SBC 80/10 is the only OEM computer system that uses LSI technology to provide all the essential computer elements—microprocessor, memory and programmable I/O—on one board. All the key components on the SBC 80/10 board are manufactured by Intel. These include the 8080A CPU and its support circuitry, 8111 static LSI RAMs, 8708 EPROMs (erasable and reprogrammable read-only memories), metal-masked 8308 ROMs, an 8251 USART (Universal Synchronous/Asynchronous Receiver/Transmitter) for serial communications interface, and Intel 8255s for parallel peripheral interfaces. Use of these volume-produced Intel LSI components on the SBC 80/10 boards (which are also produced in volume as standard, off-the-shelf computer subsystems) make possible the low unit cost of the Single Board Computers. While individual boards may be obtained from Intel distributors at $495, SBC 80/10 prices reduce to $295 each in quantities of 100.



The first complete single board computer for $295.

The Intel® SBC 80/10 Single Board Computer, with programmable I/O, is designed for the profit conscious OEM in a hurry. The SBC 80/10 is the fastest and lowest cost way of getting your products to market. And when your sales equipment increase to the point where it makes sense to build your own Single Board Computer, we'll make arrangements for you to use our bill of material, fab and assembly drawings, and artwork.

Now it's possible to standardize on one computer board for all your products. Everything you need—CPU, ROM, RAM and I/O is on a single 6.75″ x 12″ board. And since we've extended the programmable nature of the CPU to the I/O interface you can use the same board even when you make an interface change or completely redesign your product's input/output section. Just initialize the programmable I/O devices with the appropriate program instructions and you have individually defined the direction and data transfer characteristics of the six on-board ports. Programmable I/O makes your products more versatile and cuts parts cost and development time.

Cut development costs even more with the Intellec MDS™ Microcomputer Development System with optional Diskette Operating System and unique ICE-80 In-Circuit-Emulator. Develop and debug your systems software directly on the SBC 80/10 using the symbolic debugging capability of ICE-80.

The 80/10 is supported by macroassemblers, text editor, Intel's PL/M™ compiler, a user's library with over 150 programs, and comprehensive documentation.

Training is available at training centers or scheduled at your plant. For additional technical assistance contact your Intel Field Applications Engineer.

The Intel® SBC 80/10 is available from distributor stock. To order contact: Almac/Stroum, Component Specialties, Components Plus, Cramer, Elmar, Hamilton/Avnet, Industrial Components, Liberty, Pioneer, Sheridan, or L.A. Varah.

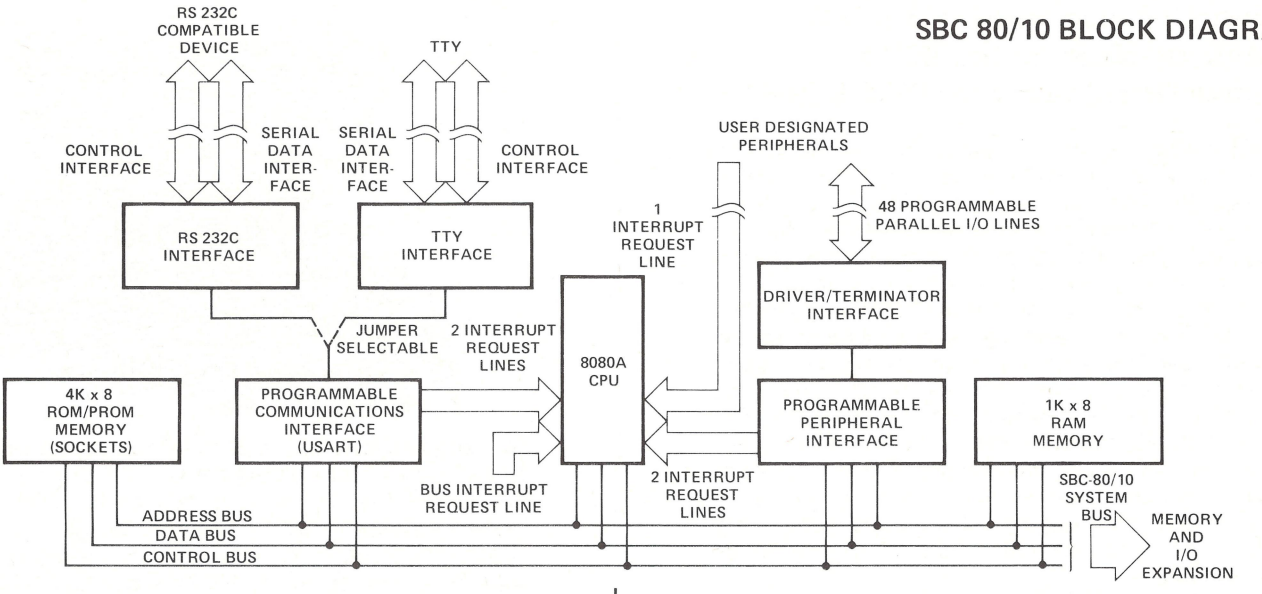
For your copy of the SBC 80/10 brochure, use the bingo card or write: Intel Corporation, 3065 Bowers Avenue, Santa Clara, California 95051.

intel delivers.

*100 quantity, domestic USA price only. I/O drivers, terminators, EPROMs or ROMs not included

This two-page spread advertisement on the SBC 80/10 will appear in leading trade magazines, beginning in April.

SBC 80/10 BLOCK DIAGRAM



Intel has used high-density LSI technology for all computer functions, including I/O and bus control. This eliminates the need for costly additional boards, normally required in computer subsystems to provide non-volatile memory capability, parallel I/O and serial I/O. Expansion is easily accomplished for those applications requiring additional memory or input-output capability. The majority of OEM applications will be solved with a single SBC 80/10 board, but five peripheral expansion boards and a standard modular backplane/card cage assembly are also available. Programs may be written using Intel's high-level language, PL/M®, or 8080 assembly language. In addition, the SBC 80/10 is fully supported with a comprehensive line of hardware and software development aids, which include the Intellec® MDS Microcomputer Development System and its unique ICE-80 In-Circuit Emulator. Individualized assistance is available from Intel's international staff of field applications engineers.

INCLUDED ON THE SBC 80/10 ARE FEATURES NEVER BEFORE AVAILABLE ON ONE P.C. BOARD

The Single Board Computer includes an 8080A CPU, a crystal clock, 1K bytes of RAM, sockets for 4K bytes of EPROM or ROM, 48 programmable I/O lines with sockets for interchangeable drivers and terminators, a programmable USART with selectable TTY or RS232C compatibility, a multi-source single-level interrupt and bus drivers for I/O and memory expansion.

Processing power of the SBC 80/10 is sufficient for most OEM products, including industrial process control systems, subsystems of large distributed intelligence control systems, numerically controlled machine tools, automated test instruments, data communications equipment, business machines, desktop computers, and a variety of commercial equipment. To complement the popular 8080A CPU, which is an 8-bit N-Channel MOS device on a single LSI chip, the central processor subsystem on the SBC 80/10 includes a crystal-stabilized system clock, control buffers for the one-board computer's 16-bit three-state address bus and bi-directional 8-bit three-state data bus, and high-current drivers for expanding memory and I/O via the system bus.

For storing system data, the SBC 80/10 includes eight Intel 8111 static LSI random access (read/write) memory chips. The 8111s provide 1K bytes of RAM memory. On-board sockets are provided for non-volatile memory of up to 4K bytes. During program development, Intel 8708 EPROMs will generally be selected by the OEM. The EPROMs may be erased by ultraviolet (UV) light in minutes and then reprogrammed. When the OEM system program is firm, masked Intel 8308 ROMs may be substituted for the EPROMs to further economize for high volume production runs. The EPROM or ROM memory may be added in 1K byte increments.

Programmable LSI interface devices on the SBC 80/10—both parallel and serial—provide easy user-customization of the I/O functions.

The SBC 80/10 includes two types of programmable input-output devices, enabling the user to configure and re-configure the I/O subsystems with system software. Two Intel 8255 Programmable Peripheral Interface chips provide 48 I/O lines (24 lines per chip). These are organized as six programmable 8-bit ports offering a variety of user-selectable operating modes (selected by system software), including bi-directional or uni-directional data transfer, latched or unlatched, or strobed or not-strobed operations. Because the I/O lines may be configured in combinations to satisfy user requirements, the variety of interface combinations created through port combinations are almost limitless.

Sockets are provided for interchangeable I/O line drivers and terminators to take full advantage—on all 48 I/O lines—of the large number of possible input-output configurations. The user has the capability of selecting a driver with appropriate sink current, polarity and interface characteristics for each output port. Any of Intel's standard terminators may be used to terminate input ports. The user may choose any of several industry standard interface cables—flat cable, round cable or woven cable.

A programmable serial communications interface for the 80/10 is implemented using an 8251 USART.

Serial I/O logic is implemented in the SBC 80/10 by a programmable communications interface device, the Intel 8251 USART. The 8251 is programmable in asynchronous and synchronous communications modes, including IBM Bi-Sync. The mode of operation, data format, control character format, parity and asynchronous serial transmission rates are all under program control. Asynchronous data rates are chosen by using a variable, jumper selectable baud rate generator as a communications clock and programming the data rate. Synchronous baud rates are also directly selectable with the generator. On-board RS232C and teletype interfaces allow direct interface of the SBC 80/10 with teletypes, CRT displays, RS232 compatible cassettes and synchronous or asynchronous modems. Jumper wiring is used to select the baud rate and either the TTY or RS232C standard interfaces.

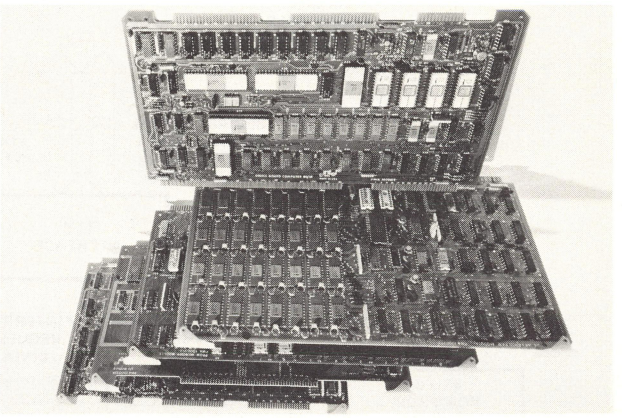
The single-level SBC 80/10 interrupt system provides for interrupt origination from the programmable parallel I/O, the 8251 USART, or via the sytem bus and I/O edge connector. Parallel and serial I/O interrupts can be automatically generated upon either the transmission or receipt of a byte of information to or from designated peripherals. The interrupts can be masked under program control, preventing them from interrupting the CPU.

MOST OEM APPLICATIONS WILL REQUIRE ONLY ONE SBC 80/10 SUBSYSTEM, BUT THE SINGLE BOARD COMPUTER PERMITS INCREMENTAL EXPANSION TO 64K BYTES OF MEMORY, 504 INPUT AND 504 OUTPUT LINES.

Five standard peripheral expansion boards and a modular backplane/card cage assembly are available off-the-shelf to satisfy increased memory or I/O requirements.

To complement the SBC 80/10 and provide even greater versatility, Intel introduced five standard peripheral expansion boards and a modular backplane/card cage assembly with the Single Board Computer. Five boards are currently available through Intel distributors. These include the unique SBC-104 Combination Board which contains 4K bytes of RAM, capacity for 4K bytes of EPROM or ROM, 48 programmable I/O lines and a programmable communications interface with RS232C compatibility. On-board sockets on the combination memory-I/O board are provided for either 8708 EPROMs or 8308 masked ROMs, which may be added in 1K byte increments up to the 4,096-byte capacity. The combination board also includes eight interrupt request lines and a pending-interrupt request register (which may be read by the 8080A CPU) memory, I/O and interrupt register addresses are jumper selectable.

Two EPROM boards are available for non-volatile memory expansion. The SBC-406 board provides expansion capacity for up to 6K bytes of 8702A EPROMs or 8302 ROMs (in 256-byte increments). Memory addresses are jumper selectable. The 16K EPROM/ROM expansion board allows the user to expand his system by 16K of non-volatile memory, using either 8708 EPROMs or 8308 ROMs in 1K byte increments. Memory addresses are also jumper selectable on the SBC-416 (16K) board.



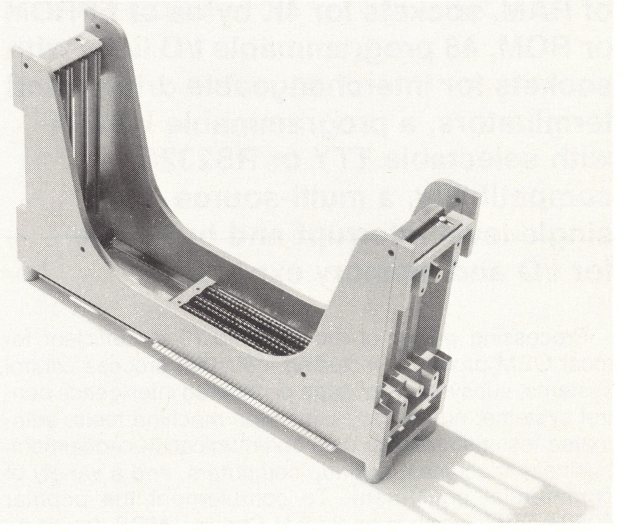
Memory capacity of the SBC 80/10 may be expanded to 64K bytes and input-output to 504 input lines and 504 output lines by using standard expansion boards in the same 6¾″ × 12″ size as the Single Board Computer. Pictured here are some of the expansion boards, which include a 16K RAM board, a 6K EPROM board, a 16K EPROM board, a General Purpose I/O board and a combination memory and I/O board.

32 parallel input lines and 32 parallel output lines are provided on the SBC-508 General Purpose I/O Expansion Board. Input ports may be latched or unlatched, and output ports are latched and may be strobed. TTL drivers and terminators are included, and the port addresses are jumper selectable. Communications to and from external devices are provided via three-state buffered data paths.

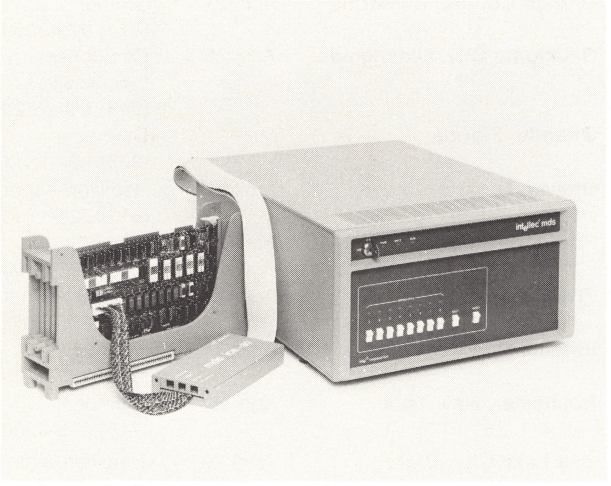
The SBC-016 16K Read/Write Memory board allows SBC 80/10 memory to be expanded by 16K bytes of dynamic RAM. All necessary refresh circuitry is on the SBC-016. The dynamic read/write memory array consists of Intel 2107 4K-bit RAMs.

A custom-designed Backplane/Card Cage facilitates the interconnection and housing of the SBC 80/10 and its expansion boards.

The expansion modules are easily interfaced with the SBC 80/10 by using a standard SBC-604 modular backplane/card cage assembly. The assembly allows the



interfacing of the SBC 80/10 with up to three expansion boards, and the entire assembly may be housed in a standard 3½" RETMA rack. Each card cage contains mating connectors which allow it to be interconnected with other four-card cages for larger systems. The card cages are designed for modular expansion and may be bolted together. The assembly mounts in any of three planes.



PROGRAMS CAN BE DEVELOPED AND DEBUGGED DIRECTLY ON THE SBC 80/10, USING THE INTELLEC® MDS MICROCOMPUTER DEVELOPMENT SYSTEM AND ITS UNIQUE IN-CIRCUIT EMULATOR

The Intellec MDS and ICE-80 minimize the time required to develop system hardware and software and ease the integration of the SBC 80/10 into OEM products.

The Intellec MDS Microcomputer Development System and its ICE-80 In-Circuit Emulator can be used to accelerate the development, testing and debugging of OEM products based on an SBC 80/10 subsystem. In addition, the MDS can be used in conjunction with ICE-80 to isolate system "bugs" on the production line and in the field. ICE-80 debugging is performed by executing English language-type commands from the Intellec MDS system console, and has the ability to refer to critical program labels and parameters by their symbolic names instead of their absolute memory locations. An optional Diskette Operating System (with either single or dual diskette drives) is also available for the Intellec MDS. Use of the DOS enables faster loading, assembling, editing, executing and debugging of programs (as compared to conventional paper tape, card or cassette peripherals). The Intellec MDS has been described in detail in previous editions of MICROCOMPUTER NEWS. Additional information may be obtained from Intel distributors, by completing and returning the coupon on the back cover, or by inquiring directly to Intel Corporation, Literature Department, 3065 Bowers Avenue, Santa Clara, California 95051.

EXPANDED MCS-40™ USER'S MANUAL INCLUDING UPDATES AND CHAPTER ON APPLICATIONS, PUBLISHED IN MARCH

A new MCS-40™ User's Manual is available now from the Intel Literature Department for $5.00 per copy. The 304-page publication is the Third Edition devoted to the MCS-40 product line and includes complete, separate data sheets on all components in the 4-bit microcomputer component family.

New devices described in the Third Edition include the 4269 Programmable Keyboard/Display device and the 4265 Programmable General Purpose I/O device, both of which were introduced in the last edition of MICROCOMPUTER NEWS. Also described are 8-bit devices such as the 8251 Programmable Serial Communications device and the 8253 Programmable Timer, which interface to MCS-40 CPUs via the 4265.

All material described in previous editions has been expanded and updated, and a new chapter on applications has been added. There are eight chapters, discussing in detail: 1) Processors; 2) Programming the MCS-40 Microcomputer System; 3) Interface Design; 4) System Configurations; 5) the MCS-40 Component Family; 6) Application Notes; 7) Development Aids; and 8) Packaging and Ordering Information.

EXTENDED TEMPERATURE COMPONENTS FOR MCS-40™ INTRODUCED

New MCS-40 components with specifications guaranteed over the extended industrial temperature range (−40°C to +85°C) have been introduced by the Microcomputer Systems Division. The new specifications now make Intel 4-bit systems usable in volume applications where hostile temperature environments might be encountered, according to Ben S. Franklin, MCS-40 product manager.

Franklin said that low-cost microcomputer systems with extended temperature range performance guarantees have not previously been generally available. The new components are available in quantities as low as 100 pieces. Typical extended temperature range applications listed by Franklin include products such as traffic light controllers, billboards, instruments and other products used out of doors in adverse weather, and machinery, materials processing and other industrial controllers.
trial controls.

Except for speed and drive currents of certain components, specifications for the extended temperature range components are the same as for MCS-40 components with commercial temperature range specifications. The 4040 and 4004 CPUs are guaranteed to operate over a clock period range of 1.35 microseconds to 2.0 microseconds over the full −40°C to +85°C range, with power supply tolerances of ±5%. Other system components have maximum access times and other speed guarantees compatible with the clock period guarantees of the central processor units.

Guaranteed drive currents are also compatible with system requirements over the extended temperature range. For example, the I/O ports of the 4308 ROM are specified to sink a minimum of 2 mA, thus maintaining ample drive for external TTL devices. Franklin said the guarantees ensure the extended temperature range components can be used interchangeably with commercial range components in essentially all applications. As a result, he explained, a basic system can be designed for use in hostile environments with the high-temperature parts and in benign environments with the commercial range parts.

SIX-WEEK, 45 CITY SEMINAR SERIES ON THE SBC 80/10 BEGINS APRIL 6, CO-SPONSORED BY INTEL DISTRIBUTORS

A series of half-day seminars on the new SBC 80/10 Single Board Computer will begin in early April and conclude in late May. The seminars are jointly sponsored by Intel and distributors for the SBC 80/10. Attendance at the seminars may be arranged by contacting the co-sponsoring distributor. The schedule of U.S. and Canadian cities on this page also lists the seminar dates. Distributors for the SBC 80/10 are Almac/Stroum, Component Specialties, Components Plus, Cramer, Elmar, Hamilton-Avnet, Industrial Components, Liberty, Pioneer, Sheridan and L.A. Varah.

City	Date	Distributor/ Telephone
Atlanta, Georgia	May 7	Cramer (404) 448-9050
Austin, Texas	April 22	Component Specialties (214) 357-4576
Baltimore, Maryland	May 5	Hamilton-Avnet (301) 796-5000
Boston, Massachusetts	April 22	Cramer (617) 969-7700
	May 11	Hamilton-Avnet (617) 273-2120
Calgary, Alberta, Canada	May 13	L.A. Varah (403) 276-8818
Cherry Hill, New Jersey	April 27	Hamilton-Avnet (609) 234-2133
Chicago, Illinois	April 7	Cramer (312) 593-8320
Cincinnati, Ohio	April 29	Sheridan (513) 761-5432
Cleveland, Ohio	April 6	(216) 289-0101
Columbus, Ohio	April 13	Pioneer (513) 236-9900
Culver City, California	April 20	Hamilton-Avnet (213) 558-2121
Dallas, Texas	April 14	Hamilton-Avnet (214) 661-8661
Danbury, Connecticut	April 28	Hamilton-Avnet (203) 762-0361
Dayton, Ohio	April 14	Pioneer (513) 236-9900
Denver, Colorado	April 28	Hamilton-Avnet (303) 534-1212
Ft. Lauderdale, Florida	May 13	Hamilton-Avnet (305) 925-5401
Grand Rapids, Michigan	April 23	Pioneer (313) 729-8500
Greensboro, North Carolina	May 6	Cramer (919) 725-8711
Hauppage (L.I.), New York	April 20	Cramer (516) 231-5600
Houston, Texas	April 21	Hamilton-Avnet (713) 526-4661
Indianapolis, Indiana	April 28	Pioneer (317) 547-7777
Melbourne, Florida	May 12	Hamilton-Avnet (305) 925-5401
Miami, Florida	May 13	Cramer (305) 923-8181
Minneapolis, Minnesota	May 12	Industrial Components (612) 831-2666
Montreal, Quebec, Canada	April 28	Hamilton-Avnet (514) 331-6443
Mountain View, California	April 19	Hamilton-Avnet (415) 961-7000
Newark, New Jersey	April 22	Cramer (609) 424-5993
North Haven, Massachusetts	April 27	Cramer (617) 969-7700
Orange County, California	April 21	Cramer (714) 979-3000
Oklahoma City, Oklahoma	April 28	Component Specialties (918) 664-2820
Orlando, Florida	May 11	Cramer (305) 894-1511
Ottawa, Ontario, Canada	April 27	Hamilton-Avnet (613) 226-1700
Portland, Oregon	April 22	Almac/Stroum (503) 292-3534
Phoenix, Arizona	April 15	Hamilton-Avnet (602) 275-7851
Pittsburgh, Pennsylvania	April 27	Pioneer (412) 782-2300
Rochester, New York	April 20	Cramer (716) 275-0300
Salt Lake City, Utah	April 29	Hamilton-Avnet (801) 262-8451
San Diego, California	April 20	Hamilton-Avnet (714) 279-2421
Seattle, Washington	April 21	Almac/Stroum (206) 763-2300
Sunnyvale, California	May 19	Cramer (408) 739-3011
Tampa/St. Petersburg, Florida	May 10	Cramer (305) 923-8181
Toledo, Ohio	April 8	Pioneer (216) 587-3600
Toronto, Ontario, Canada	April 26 AM	Cramer (416) 661-9222
	PM	Hamilton-Avnet (416) 677-7432
Tulsa, Oklahoma	April 29	Component Specialties (918) 664-2820
Vancouver, B.C., Canada	May 12	L.A. Varah (604) 873-3211
Washington, D.C.	May 5	Cramer (301) 796-5000

BURR-BROWN ANNOUNCES NEW ANALOG I/O PERIPHERALS FOR SBC 80/10 AND INTELLEC® MDS

Three new analog peripherals available for delivery in May from Burr-Brown Corporation provide an easy way to interface Intel microcomputers to the analog world. These systems provide analog input or analog output interfaces that need only be plugged into the SBC 604 Cardcage or Intellec MDS Microcomputer Development System (MDS-800) for operation. They are packaged on printed circuit boards that are electrically and mechanically compatible with both SBC 80 and MDS-800 boards.

Each analog system is treated as memory by the 8080A CPU to simplify programming. Both the A/D converter input and the D/A converter output are 12-bit words, so two 8-bit memory locations are required for each channel. The analog interface for each system is at a flat cable connector at the edge of the card opposite the bus interface.

Two new analog input boards are available in 8-channel and 16-channel versions.

Analog input boards may be chosen in either an 8-channel differential input version (MP8408) or a 16-channel single-ended input version (MP8416). The Burr-Brown SDM853 modular data acquisition system is used to implement the two new input boards. Both analog systems include an input multiplexer, instrumentation amplifier, sample/hold and 12-bit A/D converter along with all the necessary timing, decoding and control logic. The model 546 DC-DC converter (+5V to ±15V) is also used so that only the SBC 80 or MDS-800 +5VDC power supply is required.

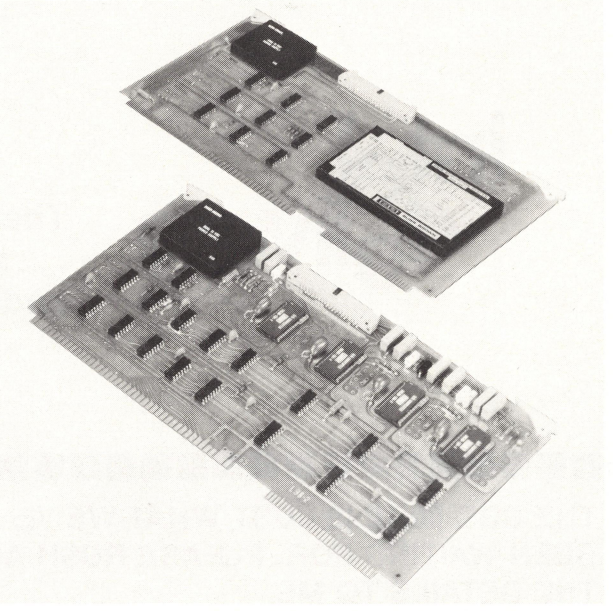
The MP8408 occupies 16 contiguous memory locations, and the MP8416 occupies 32 contiguous locations. The address block on the board is strap selectable so that it may be placed anywhere in memory. The LHLD instruction, followed by the proper address, is used to read a data channel. It will automatically select the desired channel, start conversion, and transfer the A/D converter output for that channel to the CPU's H and L registers when conversion is complete. The CPU then "waits" while the conversion proceeds. When the 33-microsecond conversion is complete, the CPU resumes operation.

New analog output system has DC-DC converter and four analog output channels.

The MP8304 analog output system provides four output channels, using four hybrid 12-bit D/A converters. These boards also contain the 546 DC-DC converter for operation on +5VDC power. The input of the D/A converters are double buffered to allow strobing a complete 12-bit word into a D/A converter's input register. This minimizes output glitches. The MP8304 occupies eight contiguous memory locations, and the board's address block is strap selectable so that it may be placed anywhere in memory. Data is transferred to a specific D/A converter by using an SHLD instruction referenced to the lower of the two memory locations for that D/A converter. The lower four bits of the H register and all eight bits of the L register will automatically be transferred to the proper D/A converter.

Complete information on the new analog I/O boards may be obtained from Burr-Brown.

The new Burr-Brown boards are offered as complete sytems, including all hardware necessary for operation. In addition, they are available as OEM versions without the flat cable assembly or the DC-DC converter. OEM units require power supply voltages of ±15VDC. The boards with flat cable and DC-DC converter sell for $695 in unit quantities. The OEM versions are priced at $295 in 100 quantities. Full details are available from Burr-Brown Corporation, P.O. Box 11400, Tucson, Arizona 85734, phone (602) 294-1431.



INTEL® MICROCOMPUTER WORKSHOPS

	April	May	June
MCS-80™/ICE-80	5-8 B 5-8 SC	3-6 B 3-6 SC	7-10 B 7-10 SC
B = Boston, Massachusetts SC = Santa Clara, California	19-22 B 19-22 SC	17-20 B 17-20 SC	21-24 B 21-24 SC
PL/M™ HIGH-LEVEL PROGRAMMING LANGUAGE	12-14 SC	10-12 B	14-16 SC
MCS-40™	26-28 SC		2-4 SC
SERIES 3000 BIPOLAR COMPUTING ELEMENTS	19-21 SC	24-26 SC	28-30 SC

Workshops will also be scheduled for the SBC 80/10 Single Board Computer. Contact MCS Training (408) 246-7501 for details. You can also arrange for on-site courses in your plant through MCS Training.

INTEL CORPORATION
MICROCOMPUTER SYSTEMS DIVISION
3065 BOWERS AVENUE
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