martin research

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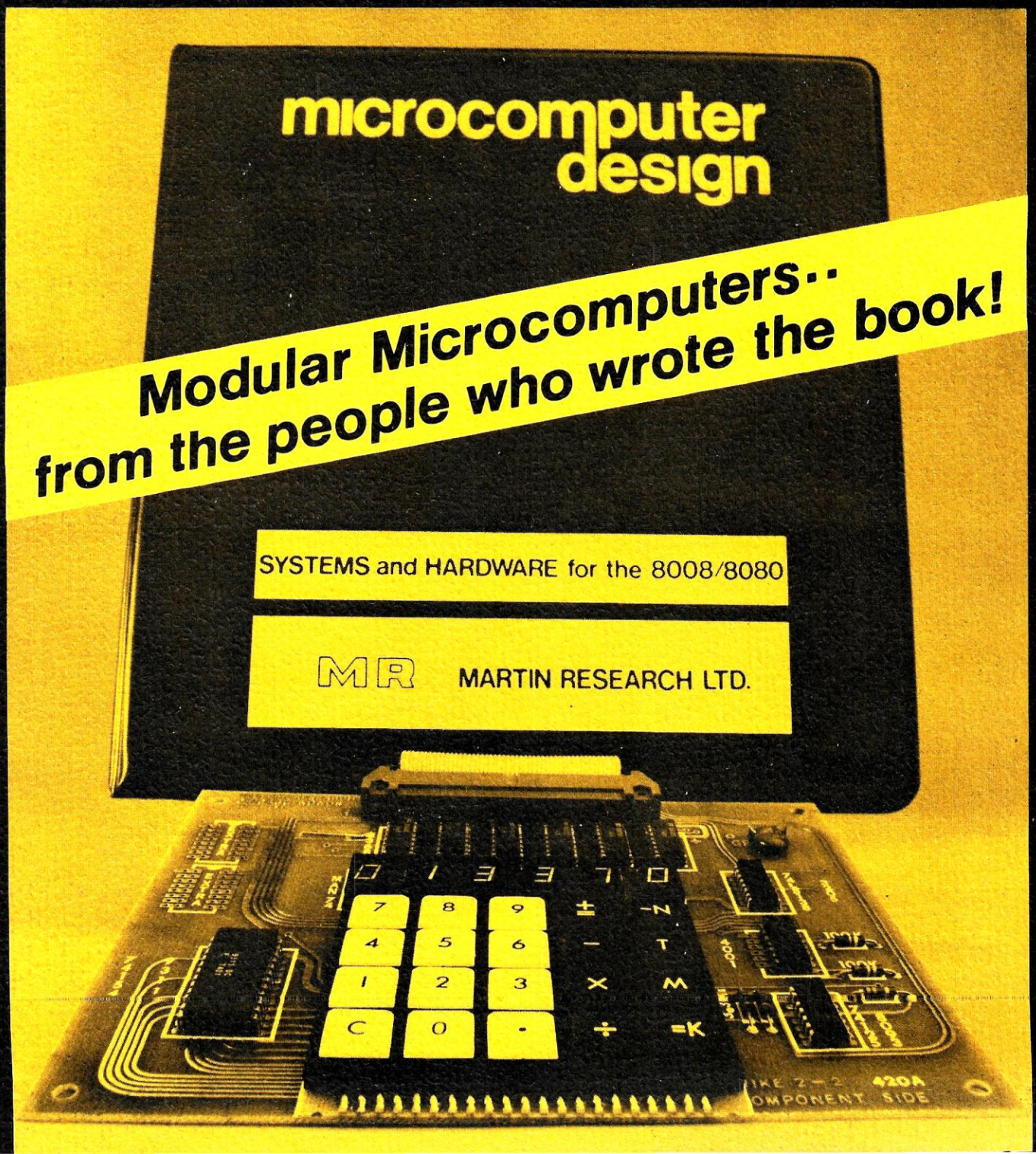

Martin Research is a young company whose goal is to provide tools for understanding and applying new technological developments . . . specifically, *microprocessors.*

The microprocessor ...

The microprocessor is revolutionizing electronics. Essentially the ultra-miniaturized central processing unit of a small computer, the microprocessor brings the flexibility, adaptability, and logical processing power of the digital computer into relatively small and inexpensive electronics applications.

Fields affected are diverse; business machines, industrial controls, communications, and computer peripherals, to name a few. Examples are many: fancy programmable calculators; electronic games; auto-tuning digital radios; automotive carburetion and emission controls, and anti-skid braking; building security and temperature monitoring; elevator controls; machine tool programmers; traffic light systems; medical patient-monitoring systems; biochemical analyzers; telephone exchanges; teleprinters; typesetters; point-of-sale cash registers; computer terminals; and automatic digital grocery scales.

Unquestionably, one of the most significant implications of the microprocessor is the **home computer.** *Formerly an impractical dream, at best, the affordable computer is now a reality! And, while promising to rival amateur radio communications as an avocation for scientifically-minded hobbyists, the home computer is also a serious matter for thousands of engineers, programmers, educators, physicians, accountants, and others with a professional interest in keeping up with the state of the art.*

... martin research

When the first eight-bit microprocessor became available late in 1972, Martin Research was one of the first companies in the United States to acquire one. By the end of the year, a working machine, specifically designed, was up and running.

On contract with a large pharmaceutical company, the CPU was designed into a computerized data acquisition console, whose purpose was to monitor a number of physiological vital signs. This was the first of a series of projects, still continuing, in which Martin Research functions as a consultant in developing microcomputers for a manufacturer's specialized requirements.

In 1974, using notes compiled during more than two years of intensive experience, Martin Research published the book *Microcomputer Design.* Described near the end of this catalog, this book has become an industry standard for engineers working with microprocessors.

Now, Martin Research announces a new line of *modular micros . . .*

modular micros **martin research**

modular micros!

We are proud to announce the *modular micros* from Martin Research. These versatile printed circuit modules can be configured to produce a variety of microcomputer systems, from the simple to the complex.

BEST VALUE !

Not just a collection of parts, with the wirewrapping left to you . . . . but complete with commercial-grade printed circuit boards, made by top PC houses, with plated-through holes. Minimizes construction time, and greatly reduces troubleshooting.

MOST ADAPTABLE!

Our universal bus structure is compatible with all standard eight-bit microprocessors! This is a major advantage for the user who wishes to upgrade his system in the future. And, it is ideal for the OEM building prototypes with competing processors. Memory and accessory boards remain compatible when the CPU is changed. The *MIKE 2* system, now being shipped, is based on the popular 8008 processor, and the 8080-based *MIKE 3* is in production (available November, 1975). Other CPUs are planned.

MOST FLEXIBLE!

The system architecture, designed for optimum flexibility, allows any board to be inserted in any position on the bus. A flat cable and snap-on fifty-pin connectors make for easy expansion.

SUPERIOR SYSTEMS DESIGN!

Programs are entered on a calculator-style keyboard, and six bright LED digits display data and memory addresses. A Monitor program in a PROM makes program entry easy. This is a significant advance over console designs with cumbersome arrays of toggle switches and lamps.

FAST MEMORY AVAILABLE!

Our 4K static RAM board uses RAM chips fast enough--450 ns--to avoid making the CPU wait for memory access in most applications. Now in stock, this board is price-competitive with others' memory boards with far slower specifications. Warning: some manufacturers using slow RAM do not inform the buyer of this fact. The result is that the CPU must wait for memory, resulting in a computer much slower than the specs might imply.

BEST FOR YOUR APPLICATION!

With microcomputer systems starting at under $400, the *modular micros* are ideal for:

- The computer enthusiast, in his home;
- The professional engineer or programmer, to keep up with the state of the art;
- The manufacturer, for prototyping microcomputer systems, or for incorporation in his product.

(OEMs: write for further information.)

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mike 2

The basic *MIKE 2* system includes a 441 CPU Board, with an 8008 microprocessor; a 420 Console Board, with a 20-key keyboard and six fully-decoded digits; a 425 Breadboard, for assembling custom circuitry; and a 423 PROM/RAM board, with 256 bytes of RAM, and a PROM containing a versatile Monitor program. Fully assembled and tested, this *MIKE 2* system is available as the AT 804. Each board is described more fully in the pages that follow.

Please note that special introductory prices are now in effect, for our customers whose orders are received by November 15, 1975!

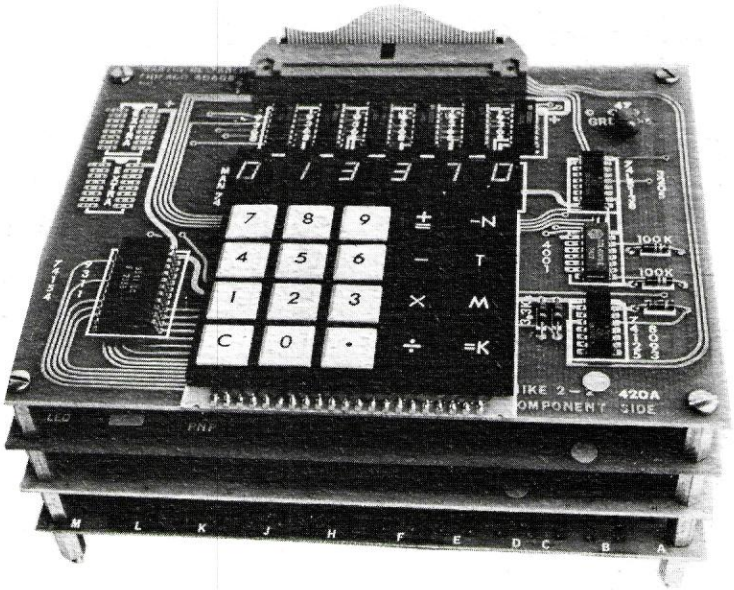
With the basic *MIKE 2* system, the user can store programs in RAM and execute them, using the calculator-type keyboard. Instructions are entered in octal form, and are displayed automatically on the six bright digits. The user can rapidly address any location in memory, and display the contents at that address. The Monitor automatically alternates between memory address and contents at the selected location. All these functions, supported by the Monitor, are features of even the smallest *MIKE 2* system.

For expansion, the user could add a Short Stack option and another page (256 bytes) of RAM. Now, when a program is interrupted, all registers are saved, so that the original program resumes accurately when the interrupt is completed. And, program breakpoints can be inserted, so that the contents of registers and status flags can be examined at the breakpoint locations. A logical adjunct would be the Demo PROM, supporting memory test routines, a digital clock program, and other useful functions.

For a still more versatile system, the user might install seven PROMs programmed by Martin Research with the MIL MON-8 program. With a Teletype interface board, the MON-8 allows the user to type in his program symbolically (eg, OUT 015 for an Output 15 instruction). The MON-8 also allows for symbolic or numeric program listings and many other functions.

The *MIKE 3* system--based on the powerful 8080--is compatible with the *MIKE 2* bus structure. Available in November, the *MIKE 3* is the next logical step in upgrading the microcomputer.

To stay informed on these exciting modular micro *developments, keep in touch with Martin Research!*



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The *441 CPU* is a central processing unit on a single printed circuit board. Based on the 8008 microprocessor, the 441 circuitry generates the essential control signals needed throughout the *MIKE 2* modular microcomputer system.

The 441 supports an exclusive *16-Channel Scope Display* option, which draws timing diagrams of all important *MIKE 2* system signals (up to 16) on an external triggered-sweep oscilloscope. Useful in debugging and for educational purposes, this inexpensive option compares in usefulness to digital display consoles costing thousands of dollars.

The *Short Stack* option, another valuable feature, boosts the interrupt-handling ability of the 8008 microprocessor. Plugging into designated spaces on the 441 CPU board, four integrated circuits make up a two-byte stack, allowing the *MIKE 2* Monitor program to store registers and flags temporarily upon receipt of an interrupt. Since the *MIKE 2* Monitor also uses page 013 in RAM memory for interrupt handling, a version of the *Short Stack* option which includes the necessary RAM chips is available as well, at nominal cost. *(For details, see separate product literature on the Short Stack, KT9000.)*

A reliable crystal-controlled clock is standard with the 441; its speed may be set for either the 8008 or the 8008-1 (60% faster) by interchanging one inexpensive part, but without changing the crystal. Other standard features: a flexible three-state data bus, with bus drivers to allow full system expansion; full memory address capability; and specialized control signals which simplify system expansion by minimizing the extra interface circuitry needed on each new memory or input/output board.

SPECIFICATIONS

Speed	20μs instruction time, standard version. 12.5μs (60% faster), 8008-1 version.
Instructions	Full complement of 48 basic 8008 instructions.
Memory capacity	Supports full 8008 memory addressing capability: 16K bytes.
Interfacing	Connects directly to the modular micro bus with standard fifty-pin connectors. Three-state data bus drivers sink up to 40 MA; memory address registers (DH and DL) drive up to 10 TTL loads.
Power	Requires +5 V, 370 MA; -9 V, 40 MA; regulated ±5%. (-9 V can be derived from a -12 V supply using an optional on-board zener diode.)

PROM/RAM BOARD

Model 423

DS423

The *423 PROM/RAM BOARD* is a basic memory component for computer systems in the *modular micro* family. With room for up to 2K bytes of programmable read only memory (PROM) and 1K bytes of random access memory (RAM), the 423 supports a system monitor program, and provides space for storage of users' programs. The memory address of each block of PROM and RAM is user-selectable. An optional WAIT circuit on the board allows the user to accommodate slow memory chips to a fast CPU.

SPECIFICATIONS

Memory Capacity — Up to 2K bytes of PROM: uses up to eight type 1702A, 256 by 8 reprogrammable memory devices. Up to 1K of RAM: up to eight type 2112 256 by 4 static RAM chips.

Speed — 1.0µs access time, RAM and PROM.

Interfacing — Connects directly to the *modular micro* bus with standard fifty-pin connectors. Bus drivers on board ensure adequate driving power for expanded systems. In a typical *modular micro* system, PROMs occupy pages 000 through 007, RAMs page 010 through 013. However, memory addresses are user-selectable using jumpers on the board.

Power — With 256 bytes each of PROM and RAM, requires +5 V, 380 MA; -9 V, 35 MA; regulated ±5%. (-9 V can be derived from a -12 V supply using optional on-board diodes.)

A MONITOR IN A PROM

A unique feature of the *modular micro* series is the convenient Monitor program which is provided with each system. Permanently stored in a PROM which plugs into a socket on the 423 PROM/RAM board, the Monitor allows the user to program the microcomputer with the system's 20-pad keyboard.

Functions supported include addressing memory at any location; reading the contents of memory; writing into RAM; and executing a user's program in RAM. Stepping through memory, one location at a time, is a snap!

With the addition of *Short Stack* hardware to the *MIKE 2* system, the 8008 Monitor saves internal flags and registers upon receipt of an interrupt. Later, the main program can continue undisturbed. In the *MIKE 3* system, this and other expanded functions are standard, supported by the 8080 Monitor.

FOUR KILOBYTE RANDOM ACCESS MEMORY

DS405

Model 405

The *FOUR KILOBYTE RANDOM ACCESS MEMORY* is a member of the family of modular microcomputers from Martin Research. Consisting of 4,096 eight-bit bytes of memory storage (for a total of 32,768 bits), this 4K RAM is fully compatible either with an 8080 system--the *MIKE 3*--or with an 8008 system--the *MIKE 2.* Featuring static memory devices, the 405 includes full memory address decoding, with user-programmable addresses. An optional WAIT circuit on the board allows the user to accomodate slow RAM chips to a fast CPU. The board requires a single +5 volt supply, and uses standard 50-pin connectors for plug-in interfacing with the *MIKE 3/MIKE 2* bus.

SPECIFICATIONS

Speed

450 nanoseconds access time is standard for 4K RAMs purchased from Martin Research. This speed is suitable both for our 8080 system (*MIKE 3)* and for the 8008 *(MIKE 2).*

Power

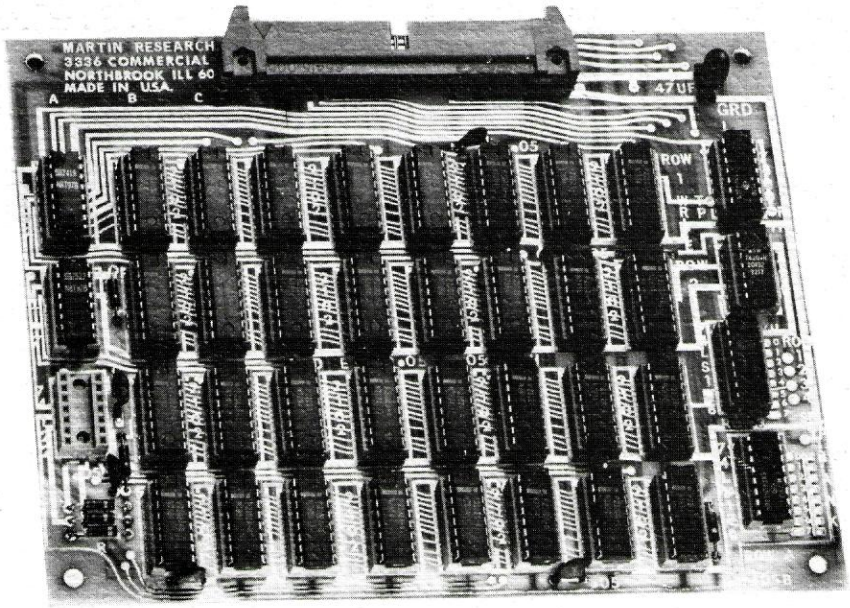
Requires +5 volt supply, regulated ±5%. Typical current requirement for full complement of 4K, using 32 type 2102A-4 RAM chips, 1.0A.

Interfacing

Connects directly to the modular micro bus with fifty-pin connectors. Memory address is user-selectable using jumpers on the board.

Mechanical

Standard size for Martin modular micro family: 5.5 by 7.0 inches (140 by 178 mm). Printed circuit boards are manufactured by commercial PC houses to meet professional standards, with plated-through holes, solder-mask protection of traces on the solder side of the board, and silkscreened part outlines for ease in assembly and repair.



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CONSOLE BOARD

Model 420

The *420 Console Board* consists of a calculator-type keyboard and a six-digit display. In a typical modular micro system, the keyboard is used to program the microcomputer, and the bright, large (0.3-inch) digits are used to display data and memory addresses.

The keyboard may also be used for any other data input function, and the digits for any other display purpose--under control of the microcomputer. The keyboard is simply an input port, and the display, a set of output ports. The digit drivers will display data in octal, decimal, or hexadecimal (0-9 and A-F) formats.

A significant advance over older console designs--where banks of switches and lights are hardwired into the system control circuitry--the 420 keyboard/display reflects state-of-the-art systems design, as used in the latest generation of small computers.

PHOTO: Closeup shows bright digits, 20 keys

SPECIFICATIONS

Keyboard interface:

The numerals 0-9, and six special-function keys, are electronically interpreted in hexadecimal and make up microcomputer input port 006. Two more control keys interface as additional bits in input 006. The remaining two keys are related to the system interrupt function.

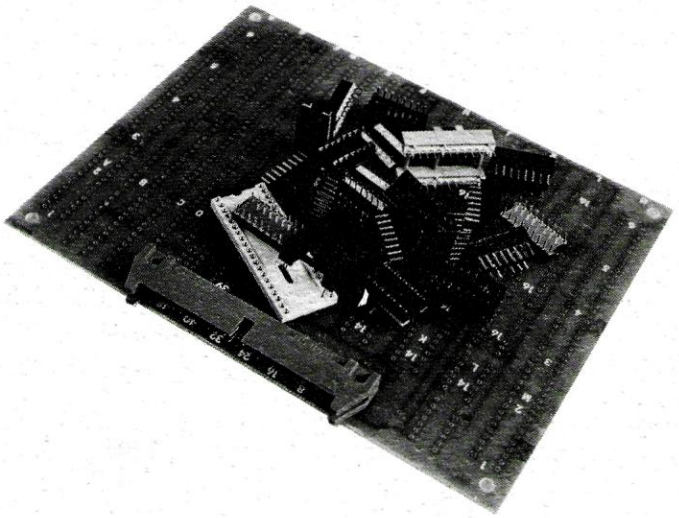
Display interface: The six LED digits are driven by microcomputer output ports 015, 016, and 017. The 423's decoders display the numerals 0 through 9, and the hexadecimal numbers from A through F, thus: A, b, C, d, E, F.

System interface: Board connects directly to the *modular micro* bus with standard fifty-pin connectors. Includes bus drivers for adequate drive power in expanded systems.

Power: Requires a single +5 volt supply, ±5%, 950 MA.

The *425 Breadboard* is a printed circuit board for use in interfacing custom electronic designs to a modular microcomputer system. Useful in prototyping and for the experimenter, the 425 is a standard-size modular micro board, with over nine hundred pre-tinned holes, arranged to accommodate standard integrated circuits. ICs may be inserted directly into the board, or sockets may be used, interconnections being made point-to-point with hook-up wire and solder. Or, for greater flexibility, accessory kits of sockets for use with wirewrap tools are available.

The 425 connects to the modular micro bus with a standard fifty-pin connector. The 425 provides a convenient place for signals and power supply connections external to the modular micro system to be brought onto the computer bus. The 425 also includes space on either side for additional flat cable headers (20/40/50-pin), for interfacing via cable to accessories and peripheral devices.



BREADBOARD
with assortment of
sockets for custom circuitry

A number of circuit kits are available which allow the user to add special functions to the modular microcomputer system. Designed for insertion into a 425 breadboard, in general each includes a collection of parts and sockets, and full instructions.

Available now: kits for interfacing to ASCII keyboards; to 8-bit parallel TTL input/output sources; to the ASR33; and to other makes of printers.

Shown at right: The PR11000, a 110 character per second, 80-column dot matrix printer available from Martin Research. Write for details, pricing.

PRICE LIST

		Special Price	After Nov. 15
PART I.	MIKE 2 MODULAR MICRO SYSTEMS		
AT804-3	MIKE 2 microcomputer. With AT441 CPU board, 8008; without Short Stack or Scope options; AT423 PROM/RAM board, with Monitor PROM, 256 bytes of RAM; AT420 console board; 425 breadboard; connectors & hardware; Manual. Assembled & tested.	$345.00	$395.00
AT804-2	MIKE 2, assembled and tested, but without 8008 chip.	305.00	355.00
AT804-5	MIKE 2 system, like AT804-3, but with 8008-1, 60% faster.	357.00	407.00
PART II.	MIKE 3 MODULAR MICRO SYSTEMS		
AT811-3	MIKE 3 microcomputer. AT431 CPU board, with 8080; AT423 PROM/RAM board, with Monitor PROM, 512 bytes of RAM; AT420 console board; 425 breadboard; connectors & hardware; Manual. Assembled & tested. Available November 15, 1975.	495.00	495.00
PART III.	MODULAR MICRO SYSTEM MANUALS		
MN804	MIKE 2 Manual. Comes automatically with 8008 system. When ordered separately, comes with certificate worth amount shown in (brackets), good for 90 days towards modular micro purchase over $200.00.	19.00 (10.00)	25.00 (15.00)
MN811	MIKE 3 Manual. Comes with 8080 system. Separately: with certificate worth amount in (brackets), good 90 days toward modular micro purchase over $200.00.	29.00 (10.00)	35.00 (15.00)
PART IV.	KITS FOR UPGRADING THE CENTRAL PROCESSING UNIT (CPU)		
AT812-2	8080 UPGRADE KIT. For upgrading MIKE 2 8008 system to an 8080 system. AT431, 8080; 8080 Monitor PROM; 2-2112 RAM chips; Manual updates. Boards assembled & tested. Available 11/15; price good through 12/31/75.	289.00	314.00
KT9000-1	*SHORT STACK OPTION. To enhance 8008 interrupt handling 4 ICs, wirewrap sockets; 2 2112s, solder sockets. Instructions.*	*29.00*	*35.00*
KT9007	*16-CHANNEL SCOPE DISPLAY. Kit of ICs for adding 16-channel display to 8008 system. With solder sockets.*	*12.00*	*12.00*
AT441-3	8008 CPU board, with 8008. Assembled and tested.	115.00	149.00
AT441-5	8008 CPU board, with 8008-1, 60% faster. A&T.	125.00	162.00
AT431-3	8080 CPU board, with 8080. A&T. Avail. 11/15.	255.00	255.00

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PRICE LIST

PART V.	MEMORY EXPANSION	Special Price	After Nov. 15
AT405-4	4K RAM board. With 4K of 450 ns RAM. A&T.	$190.00	$249.00
AT405-3	4K RAM board, stuffed with 2K, 450 ns. A&T.	131.00	149.00
AT405-2	4K RAM board, stuffed with 1K, 450 ns. A&T.	99.00	109.00
AT423-1	PROM/RAM board. With decoders, connectors; no memory. Assembled and tested.	72.00	78.00
2200	1702A PROMs, unprogrammed, for PROM/RAM boards.	25.00	25.00
2205	2112 RAMs, 256 by 4, 1.0 us, for PROM/RAM boards.	4.75	4.75
2207	2102A-4 RAMs, 1024 by 1, 450 ns, for 4K RAM boards.	5.00	5.00
PART VI.	INPUT/OUTPUT EXPANSION		
BD425	*BREADBOARD. PC board only (connectors: see Part IX).*	*15.00*	*15.00*
KT9001-1	*UNIVERSAL I/O KIT. For use on breadboard; interfaces one 8-bit TTL input port, one output. Parts, sockets.*	*13.00*	*14.00*
KT9002	*WIREWRAP SOCKET KIT. 4 14-pin wirewrap sockets; 10 16-pin; 2 20-pin; 4 24-pin; 1 40-pin.*	*26.00*	*28.00*
KT9003	*SOLDER-TAIL SOCKET KIT. Same as KT9002, solder type.*	*12.00*	*13.00*
KT9004-1	*TELEPRINTER INTERFACE. For serial/parallel in, serial out, 5-level (Baudot) or 8-level (ASCII) printers, such as M33, M28, Creed. Parts and sockets.*	*25.00*	*28.00*
KT9005	*PARALLEL KEYBOARD INTERFACE. Parts, wirewrap sockets for standard 8-bit ASCII keyboard interface.*	*12.00*	*13.00*
KT9006	*PRINTER/KEYBOARD INTERFACE. Kit of parts, wirewrap sockets for 110 CPS printer interface (see Part VII). Also includes keyboard interface, KT9005.*	*42.00*	*46.00*
AT420	CONSOLE board. 20-key keyboard, 6-digit decoded display. Assembled and tested.	84.00	92.00
PART VII.	PERIPHERALS		
PR11000	110 CPS PRINTER. 80 columns, upper/lower case, 94 chars., dot matrix printer. 8-bit parallel in. Desk-top; 33 lbs. Details, pricing available on request.	(By quote)	
PART VIII.	SOFTWARE PACKAGES		
2200-21	*MIKE 2 DEMO PROM. With a variety of demonstration programs: tests, digital clock, etc. 1702A PROM.*	*29.00*	*32.00*
KT2210-1	*MON-8 MONITOR. Set of 7 1702A PROMs, with Microsystems' MON-8 Monitor. For MIKE 2, ASCII keyboard, and 110-baud serial ASCII printer (eg, Teletype M33).*	*160.00*	*160.00*
KT2210-2	*BAUDOT MONITOR. Set of 8 1702As, with MON-8, modified for 75-baud, 5-level (Baudot), parallel in, serial out (such as Creed).*	*180.00*	*180.00*
KT2210-4	*110 CPS PRINTER MONITOR. Set of 7 1702As, with MON-8, modified for PR11000 (Part VII) and keyboard.*	*160.00*	*160.00*
PART IX.	CONNECTORS AND HARDWARE		
1000	PC BOARD HEADER. 50-pin, rt. angle, solder leads.	3.00	3.00
1002	WIREWRAP PCB HEADER. 50-pin, rt. ang., wirewrap pins.	7.50	7.50
1001	RIBBON CABLE CONNECTOR. 50-pin, clamp-on style.	6.00	6.00
1503-*XXX*	RIBBON CABLE, 50-cond. (*XXX* = length, in., 18 min.)	0.15 per in.	

PARTS: *For other components, ask for our Replacement Parts List.*

Discount schedule for **modular micro** systems and components:

Total list price, $2000 and up 7%
Total list price, $6000 and up 14%
Total list price, $20,000 and up 20%

OEMs: *write for quotes on large quantities and on specialized systems!*

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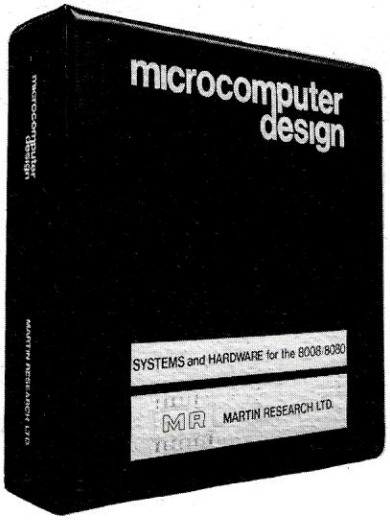
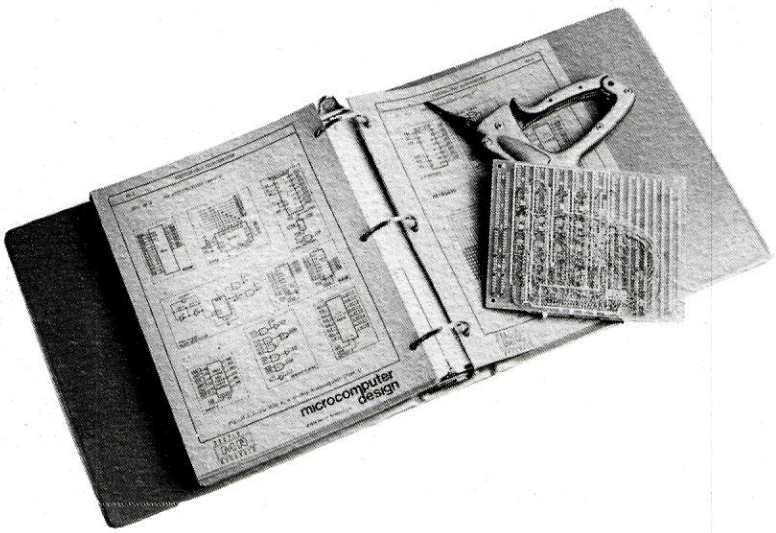
microcomputer design

Our innovative book on designing with microprocessors, published in 1974, has become an industry standard! The first major source on cost-effective design around these versatile digital building blocks, *Microcomputer Design* is now in its second printing.



Unlike many hastily-prepared books on the subject --which do little more than reprint magazine articles, or discuss applications in general terms, or rehash manufacturers' literature--*Microcomputer Design* is an original, practical manual for the design engineer. Written with over two years of intensive corporate experience with microprocessors, this book's 300-plus pages are loaded with dozens of schematics and carefully-written circuit descriptions.

- What should go into the peripheral, and what goes into the microcomputer.
- The most efficient bus structure for the 8008 yet published.
- A complete communications controller with keyboard, only 19 chips, including 8008, ROM, RAM, and interface.
- Over 40 pages on interrupt handling with the 8008; an excellent introduction to vectored interrupts, applicable to all eight-bit microprocessors.
- Most design concepts applicable to any eight-bit CPU.
- Innovative sections on interval timers, A/D circuits for microprocessors, and other frequently-used adjunct circuitry.
- An easy-to-use lay-flat format for convenience; allows updates in future.



Book with 8080 CPU: $150
(Reduced from $200!)

Book with 8008-1: $110
(60% faster than 8008!)

Book with 8008: $100
(Still a bargain!)

Book alone: $75

Book with modular micro purchase over $200: $50

Write for quantity and educational discount rates.

MR

microcomputer design

Chapter Outline

1.	INTRODUCTION	*What a microcomputer is and how it is used. Focus of this book: practical microcomputer design, with examples and schematics.*
2.	THE 8008	*Brief introduction to microcomputers. 8008 architecture, block diagram. Timing signals. PCI, PCR, PCC, PCW cycles explained. Instructions listed in numerical order.*
3.	THE 8080	*General description. Some comparisons with the 8008. Applicability of 8008 designs in this book to the 8080. 8080 instruction set.*
4.	OTHER MICROPROCESSORS	*Important characteristics of other available microprocessors, in chart form.*
5.	8008 MAIN TIMING LOGIC	*Clock circuits.* Efficient enable and strobe signal generation saves CPU chip count.* Master reset.**
6.	BUS STRUCTURES	*Introduction to bus structures. Latching logic; three-state devices. Advanced strobe techniques. Bus transceivers and bi-bus drivers. The 8008 data bus.*
7.	INPUT/OUTPUT INSTRUCTIONS	*8008 I/O data transfer sequences. Generating input enable and output strobe signals.* Peripheral strobe decoding techniques.**
8.	INPUT DESIGN APPROACHES	*8008/8080 data bus input voltages. Multiplexers.* Bus-only input design.* Expanding 8008 input ports with conditional inputs.* Additional input ports addressed as memory.**
9.	OUTPUT TECHNIQUES	*Pulse outputs.* Conditional outputs.* Addressable latches.* Other latching outputs.* When an input is an output.*
10.	COMBINED INPUT/OUTPUTS	*Combined input/output techniques: table lookups.* Sine table.* Byte-swapping.* Adding a UART to a microcomputer.**
11.	ADDING 8008 INSTRUCTIONS	*Normally unused 8008 instruction codes. Output any register.* One-byte PUSH-POP instruction.* Numbered JUMP, CALL, RETURN instructions.* One-byte WAIT instruction.**
12.	EXPANDING 8008 CAPABILITIES	*One-byte push-pop (LIFO) register.* Sixteen-byte LIFO.* A 32-byte FIFO register.**
13.	RANDOM ACCESS MEMORY	*8008 memory referencing. The RAM-PAGE option: optimal design for small microcomputers.* The 256 x 4 RAM;* 1024 x 1 static RAM;* 4096 x 1 dynamic RAM.* Sketch of transparent dynamic RAM refresh system for 8008.**
14.	READ ONLY MEMORY	*Simple diode-rpogrammable ROM for breadboarding, prototyping.* Field-programmable ROM (F/ROM), with programmer.* Reprogrammable PROMs. Comparison of types of ROM. ROMIN option allows flexible addressing of ROM in the microcomputer.**
15.	DIRECT MEMORY ACCESS	*Direct memory access defined. Sketch of system for 8080 microprocessor.**

** Schematic diagram included.*

Chapter Outline

16.	INTERRUPTS	*The initial interrupt. 8008 interrupt race. Simple interrupts.* Introduction to priority interrupt systems.* Interrupt request register.* Synchronization register.* Priority encoders, registers.* Interrupts being serviced registers.* Interrupts being serviced register.* Priority comparator.* Interrupt jam logic.* Numbered return instruction.* Using an addressable latch as an interrupt register.* Three-level priority interrupt system.* Full eight-level priority interrupt system.* Outline of daisy-chain interrupt system.*
17.	SAVING STATUS DURING INTERRUPTS	*Necessity for saving status: the PC stack; index registers; flags. Overview of status-saving techniques for 8008. Saving registers with hardware.* Latching up the flags.* Saving all four flags with hardware.* Four system examples, with software.*
18.	INTERVAL TIMERS	*How timers are used. Timer that causes interrupts.* Timer for input ports.* Interval timer clocks.* Precounters.*
19.	DIGITAL DISPLAYS	*Digital displays at microcomputer output ports.* Segment decoders.* Multiplexing.**
20.	PERIPHERAL INTERFACE DESIGN	*Systems considerations in designing a peripheral interface. Cost-effective modularity. An efficient 8008 bus structure for optimal peripheral interfacing.**
21.	KEYBOARDS	*Keyboard encoders.* FIFO data buffer.* Inputting to the microprocessor.* Implementing the REPEAT function with software:* Doing it with interrupts.*
22.	ANALOG INPUTS AND OUTPUTS	*An analog interface system for microcomputers. Input amplifiers.* One-channel A/D converter.* Sample/hold; track/hold.* Analog multiplexer.* Successive approximation A/D converter.* D/A converter.* Multiple analog outputs.* Analog range switching; software.**
23.	SOFTWARE TRICKS	*Clear the A register. Complement. Multiple precision ADD and SUBTRACT. Incrementing the H and L registers. Clear RAM. Indexed jump table. Indexed loops. Hard HALT instruction. PUSH all registers.*
24.	TESTING	*Testing microprocessors. Simple test program. Designing for easy testing. Sixteen-channel oscilloscope display for any triggered-sweep 'scope.* Three-digit display to read data bus information in octal form, on the fly at normal system speed.* Reading T3 information only.* Stepping through instructions.* Using the READY line for testing. Using self-transfer instructions for testing.*
25.	MINIMAL MICROCOMPUTERS	*A nine-chip 8008 microcomputer, suitable for CPU testing and instruction.* Using the CC-DH register as a buffer.* A twenty-dollar microcomputer.* A seven-chip microcomputer with 2,048 bytes of ROM.**
26.	NINETEEN-CHIP MICROCOMPUTER	*Nineteen-chip microcomputer circuit with full ASCII keyboard, extra input port, 2,048 bytes of ROM, 256 bytes of RAM.**

** Schematic diagram included.*

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