

Introduction to the MIKE 2

Martin Research has received hundreds of inquiries about our micro-computer modules--both from readers of our book, *MICROCOMPUTER DESIGN*, and from computer hobbyists. Demand for the *MIKE 201* exceeded our initial supply of printed circuit boards. Volume production of PC boards is now underway, and we expect to begin shipping again on June 16, 1975.

Before you decide you can't wait, let us describe what we believe is the best microcomputer yet available.

- FIRST:** All of our parts are new and of top quality. No factory seconds or temperature rejects.
- SECOND:** All printed circuit boards are commercial quality, made by professional PC houses to our specifications. Component holes are plated through for easy solderability. Each board comes with its own connector for rapid insertion and removal.
- THIRD:** The system architecture has been designed for optimum flexibility. It uses a carefully-designed bus structure which permits *any* board to be inserted in any position on the bus. To expand the system, you simply plug more boards onto the bus.
- FOURTH:** All critical control signals needed throughout the system are decoded right on the CPU board and piped around the system on the bus. Hardware interfaces to the microprocessor generally need only two chips--one strobe decoder, and one latching device (for output ports) or three-state driving device (for inputs).
- FIFTH:** There are no critical adjustments during assembly. The main timing is controlled by a reliable crystal on the CPU board.

The Boards

The *MIKE 203* system contains four circuit boards, described below.

- MIKE 2-1
CPU
BOARD** An 8008, crystal-controlled oscillator, and all the timing for the system. The bidirectional bus drivers on the CPU board allow many accessory boards to be added to the microcomputer.
- MIKE 2-20
CONSOLE
BOARD** The *MIKE 2-20* has six large, 0.3-inch seven-segment display digits and a twenty-key calculator-type keyboard. Unlike systems with banks of toggle switches and lights, this micro is easy to program, since codes are easily visualized. The six digits are driven by decoding latches, and can be read in octal, decimal, or hex; they are user-accessible, constituting three output ports.
- MIKE 2-3
PROM/RAM
BOARD** This board has room for up to 1K of RAM (1024 eight-bit bytes, or 8192 bits) and 2K of PROM (2048 bytes). Handles up to eight 2112s and up to 8 1702As. The basic system, the *MIKE 203*, uses 256 words of RAM (two 2112s) and 256 words of PROM (one 1702A). The PROM is preprogrammed with our monitor program, described below.



**MIKE 2-15
BREAD-
BOARD**

A standard-sized *MIKE 2* board, with a connector for interfacing to the system bus. All power and bus signals are accessible. Pre-drilled with over 700 holes, with half the board configured for standard 14- and 16-pin DIPs (+5 and ground at the corners), and the other half with universal spacing, for any size sockets.

MIKE 2 Monitor

Just as important as the hardware is the *MIKE 2 MONITOR* that comes with the *MIKE 203*. Consisting of 256 words in a single 1702A PROM, *M2M* allows you to write instructions into memory at any location, and read instructions, simply by punching the keys on the keyboard.

**DATA
ENTRY**

Instructions and data are entered into the *MIKE 2* simply by punching the keyboard. With a little practice, it's just as fast as your pocket calculator. As a key is pressed, the digit appears on the LED display. When a second digit is entered, the first automatically moves left and the second takes its place. For example, say you are entering the number 135, which is the octal number for an 8008 *OUTPUT 16* instruction. You type in the 1, and the display reads 000001. Then you press the 3, and the digits say 000013. Finally, you press the 5, and the display reads 000135. (Incidentally, you do not have to punch in leading zeros.) As the data appears on the displays, it is also loaded into the 8008's E register, where it is available for further use.

A number of special-purpose keys on the keyboard are used to program the microcomputer.

**LOAD H
KEY**

This key is used to address memory. It transfers the contents of the 8008's E register to its H register, then clears the E register (to 000). For example, you have just entered 010 onto the display; now you press this key. The 8008 H register address is now 010, and this is the new high-order memory address for writing into and reading from memory.

**LOAD L
KEY**

This key also references memory, at its *low-order* address. Together, the LOAD H and LOAD L keys can address any location in the 8008's full complement of 16K of memory. After the LOAD L key loads the L register from the E (clearing the E), the display blinks back and forth between the *address* of memory, and the *contents* at that address.

**WRITE
KEY**

This key writes into RAM memory. It takes the value previously entered into the E register, writes into RAM at the H/L memory address, and clears the E register. Then it increments the L register (and the H if the L overflows), preparing the user for the next instruction. Now the display begins to alternate between the new address in memory and its contents.

**READ
KEY**

This key reads the contents of RAM or PROM at any address, as selected by the LOAD H and LOAD L keys. The display alternates



between memory address and contents. Each time the READ key is pressed, the program automatically steps to the next-higher location in memory, so that you can check the contents of a whole program quite rapidly.

EXECUTE KEY This key jumps to location 010 000 in RAM memory and executes whatever program you have stored there.

INTERRUPT KEYS One key sets the interrupt flip-flop on the CPU board low. (Now no peripheral device on the MIKE 2 bus can cause an interrupt.) The second key resets the flop, causing an interrupt to the 8008. The M2M program takes over, saving the status of the 8008's internal registers automatically. (The A register contents are at 013 370 in RAM; B, at 013 371; C, 013 372; D, 013 372; E, 013 374; flags, i.e., carry, parity, sign, zero, 013 375; H, 013 376; and L 013 377.) The digital display automatically flashes back and forth between location 013 370 and the contents of the A register. The other saved registers and flags can be read out in succession by pressing the READ key. This feature allows the user to use the 8008's interrupt capabilities without including status-saving software in each program.

CONTINUE KEY This key continues execution of the main program at the point where the CPU left off when it was interrupted.

Programming

Here is an example of a program for testing operation of the MIKE 203. First, the program; then, how you load it in and execute it.

THE	010000	304	LAE	LOAD A REGISTER FROM E REGISTER
PROGRAM	010001	004 021	ADI 021	ADD 021, I.E., 00 010 001 (OR, 0001 0001)
	010003	100 007 010	JFC 010007	IF THE A REG. HAS NOT YET OVERFLOWED, FALL THRU NEXT INSTRUCT.
	010006	250	XRA	OVERFLOW; CLEAR A REGISTER
	010007	340	LEA	STORE THE COUNT IN THE E REG.
	010010	133	OUT 15	OUTPUT TO DIGITS 1 & 2, 4 BITS FOR EACH DIGIT
	010011	135	OUT 16	OUTPUT TO DIGITS 3 & 4
	010012	137	OUT 17	OUTPUT TO DIGITS 5 & 6
	010013	045	RST 040	JUMP TO LOCATION IN M2M PROGRAM WHICH DEVELOPS 1.2 SEC. DELAY
	010014	104 000 010	JMP 010000	START AGAIN

ENTERING THE PROGRAM	1. 1, 0. (Display reads 010.)	4. 3, 0, 4. (304 on display.)
	2. LOAD H.	5. WRITE. (Display moves to next location.)
	3. LOAD L. (This loads L register with 000. Now memory location is 010000. Digits flash this address and its current contents.)	6. 4, WRITE.
		7. 21, WRITE.
		8. 100, WRITE.
		9. 7, WRITE.



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|-----------------|--|
| 10. WRITE. | 16. 45, WRITE. |
| 11. 250, WRITE. | 17. 104, WRITE. |
| 12. 340, WRITE. | 18. WRITE. (Unnecessary to punch 000.) |
| 13. 133, WRITE. | 19. 10, WRITE. |
| 14. 135, WRITE. | 20. EXECUTE. |
| 15. 137, WRITE. | |

The display will now count as follows, changing once every 1.2 sec.:

111111	222222	333333	444444	555555	666666	777777	888888
999999	AAAAAA	BBBBBB	CCCCCC	DDDDDD	EEEEEE	FFFFFF	000000
111111	ETC.						

The System

MECHANICAL The MIKE 203 is complete except for a cabinet of your own design, and a power supply. The four boards provided each measure 5.5 by 7.0 inches (140 by 178 mm), and include a fifty-pin connector at the rear which connects to a fifty-wire flexible cable. The boards stack up, one on top of the other, and are separated by rigid metal spacers (provided). Eighteen inches (457 mm) of cable are supplied with the MIKE 203, more than enough for foreseeable expansion.

POWER Power requirements for the basic MIKE 203, including only those basic memory chips detailed above: +5 V, 1.4 A; -9 V, 70 MA. A power supply providing these voltages and ± 12 volts as well is under development and will be announced shortly.

Extras

A number of circuit boards are under development:

**MIKE 2-5
4K RAM
BOARD** Available as this sheet goes to press, our 4 K RAM board has room for up to thirty-two 2102 static RAM chips. It includes decoders and bus drivers for complete interfacing with the MIKE 2 system. Adds up to 4,096 bytes (32,768 bits) of memory. Requires a single +5-volt supply.

MIKE 2-6 CRT DISPLAY INTERFACE.

MIKE 2-9 CASSETTE RECORDER INTERFACE, for use with audio machines.

MIKE 2-10 TELETYPE INTERFACE, for hard copy. Includes control ROM.

MIKE 2-14 PROM PROGRAMMER, for 1702A PROM memories.

MIKE 2-? YOUR SUGGESTIONS APPRECIATED.

For further details, stay in contact with Martin Research. To be added to our mailing list, just drop us a postcard or call us up; we'll send you bulletins as new developments occur.

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PART	DESCRIPTION	BOARD & CONNECTOR ONLY	KIT	ASSEMBLED & TESTED
MIKE 2-1	CPU board, without 8008	19.95	54.95	74.95
MIKE 2-1A	CPU board with 8008	-----	94.95	114.95
MIKE 2-1B	CPU board with 8008-1, fast crystal (60% faster than standard 8008)	-----	99.95	119.95
MIKE 2-20	Console board	19.95	68.95	83.95
MIKE 2-3	PROM/RAM board with 1-1702A (M2M program), 2-2112s	19.95	78.95	93.95
MIKE 2-15	Breadboard	19.95	19.95	-----
MIKE 2-030	18" cable and spacers	-----	4.50	6.00
MIKE 2-100	MIKE 2 MANUAL	-----	10.00	10.00
MIKE 203	MIKE 2 microcomputer system. One each: 2-1, 2-20, 2-3, 2-15, 2-030, 2-100. Without 8008.	-----	229.95	279.95
MIKE 203A	MIKE 203, with 8008 microprocessor	-----	269.95	319.95
MIKE 203B	MIKE 203, with 8008-1, fast XTAL	-----	275.95	325.95
MIKE 2-5	4K RAM board. No 2102s, decoders	28.95	-----	-----
MIKE 2-5A	With decoders, 1K of RAM, 450 ns speed	-----	77.95	99.95
MIKE 2-5B	With 2K of RAM, 450 ns	-----	107.95	130.95
MIKE 2-5C	With 3K of RAM, 450 ns	-----	136.95	160.95
MIKE 2-5D	With 4K of RAM, 450 ns	-----	164.95	189.95
2112	Extra 2112 256 x 4 RAM ICs for MIKE 2-3	-----	4.75	-----
1702A	Extra 1702A PROMs for MIKE 2-3	-----	24.95	-----
MOD-8	7-1702A PROMs, programmed and tested with Microsystems' MOD-8 monitor program	-----	-----	159.95
MOD-8/CREED	8-1702A PROMs, programmed and tested with modified MOD-8 for use with 5-bit CREED teletypewriters	-----	-----	179.95
MIKE 2-151	Universal I/O breadboard kit: breadboard, chips for interfacing any eight-bit parallel input/output source. With MIKE 2-15 , connectors, instructions, 1-74LS138/3205, 1-74273, 2-74125s.	-----	27.95	-----
MIKE 2-16	CREED interface board. Connects 5-bit CREED machine with MIKE 2 . Available as kit only (MIKE 2-15 plus kit of parts).	-----	34.95	-----
MICRO- COMPUTER DESIGN	A 300+-page book on hardware design around the 8008. Write for details, pricing. Price with MIKE 2 purchase of \$200 or more:	-----	-----	50.00



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- QUANTITY PRICES** Please contact Martin Research for quotations on quantity prices on *MIKE 2* parts and systems. Educational rates have been established for the book *MICROCOMPUTER DESIGN*; educators, please write on your letterhead for price lists.
- OUTSIDE UNITED STATES** Our export agent reserves the right to request prepayment in advance of shipment. Shipping is charged at cost; please specify surface mail or air shipment.
- WARRANTY POLICY** Parts and circuitry guaranteed to operate as advertised. Parts on warranty for thirty days. However, we cannot be held responsible for damage to parts determined to result from carelessness or misuse. In case of problems, please write Martin Research with an explanation. In order to ensure credit, please do not return goods until you have received written permission.

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