



### System Description:

The basic system is composed of four plug-in cards, the control panel, the interface board, plus the power supply and software.

The unique buss concept presents all necessary signals to all the cards in the system. Cards are plugged in as needed without backplane jumpers or wrap-type connections. Cards can be plugged in any position on the buss to build a complete system.

The interface board (IF-101MD) combines five common-bussed "DEC" type connectors for holding the plug-in cards with the SK-10/IF36 interface socket. The SK10 is used as a patch-board to interconnect interfaces to the computer or for custom circuit assembly allowing use of the new LIR Outboards (such as the LR13, LR14, and LR21).

The separate power supply (CDP-5) has adequate capacity to, not only power the basic system, but accessory cards as well (memory, special I/O cards, etc.) It is remotely operable and can be placed where convenient.

The basic card set needed to operate the Micro-Designer includes the Central Processor and Interface Controller (CPIC-80/B), the Memory (MB-80/B), and Micro-Control Panel (MCP-80/B) and the Asynchronous Board (ASB-80/B).

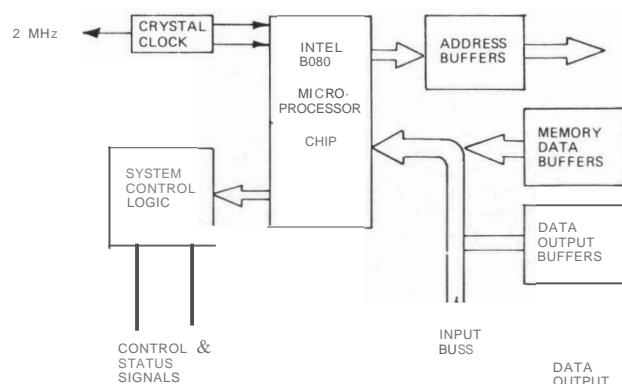
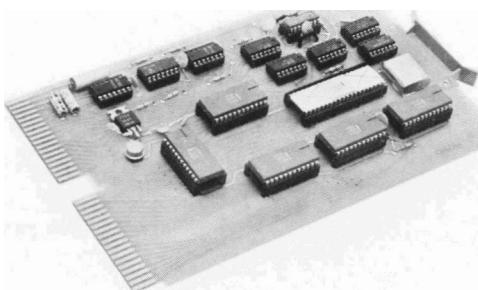


**E & L INSTRUMENTS INCORPORATED**

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# CENTRAL PROCESSOR AND INTERFACE CONTROLLER

## -----CPIC - 80/8-----



This card forms the heart of the microcomputer containing the microcomputer "chip," 2 MHz crystal clock, tri-state buffers and interface control logic. The Intel 8080 microprocessor chip is used for processing data and control; it is well documented and a great deal of software has been developed for use with 8080 systems. The 8080 can perform an additional 78 basic instructions, more, if the various combinations are considered. Operations include data transfer, logical and math operations, input and output of data, decision making and branching.

OTHER FEATURES: On-board voltage regulators for +12 VDC and -5 VDC.  
Uses only +5 VDC and  $\pm 15$  VDC.

DEC size compatible.

SPECIFICATIONS: Buss compatible with all other Micro-Designer System cards.

MAXIMUM CURRENT REQUIREMENTS: + 5 0.95A  
+15 60MA  
- 15 5MA

### Signals Available:

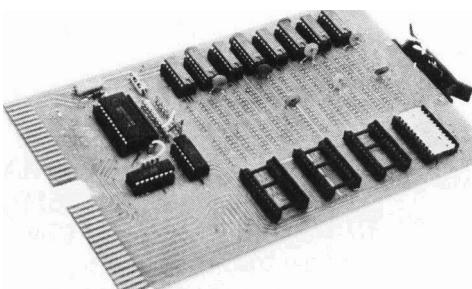
OUTPUTS/	$A_0$ - $A_{15}$	Sixteen bits of address data for addressing up to 64K of memory and 256 input and 256 output devices. (Three-State)
	$D_0$ - $D_7$	Buffered data outputs to memory and external devices. (Three-State)
	$\phi_1$	Phase one clock signal, two MHz, used to synchronize computer operations.
	HLTA	HALT ACKNOWLEDGE indicates that the computer has entered a halt state by executing a halt type instruction.
	HLDA	HOLD ACKNOWLEDGE signals external devices that the computer has suspended operations and is in a hold state. Address lines $A_0$ - $A_{15}$ and data output lines $D_0$ - $D_7$ are forced into their high-impedance or third-state, allowing other devices to use the buss.
	INTE	INTERRUPT ENABLED is output to external devices to signal that the interrupt circuitry in the 8080 chip is now able to sense external interrupts.
	INTA	INTERRUPT ACKNOWLEDGE is used to signal external devices that the computer has been interrupted.
	WAIT	WAIT indicates that the computer is waiting for a synchronizing READY input before going further in executing the program. This is used in the Single Step mode.
	IN, OUT	IN and OUT are used to synchronize the flow of data to and from the computer to external devices. Signals are issued with respect to the computer. These signals are generated when either an INPUT or OUTPUT instruction, is executed by the computer. Active at logic 0.

INPUTS/	MD <sub>0</sub> - MD <sub>7</sub>	These are input lines from the memories. Data from a selected memory location will always be present on these lines, ready to be input to the computer through circuits on the CPIC-80/B board.
	D <sub>0</sub> - D <sub>7</sub>	Data INPUT buss lines are used to input data to the computer from external devices. These lines are also used for access to the bi-directional eight bit data bus.
	HOLD	The H0 LD signal is used to put the 8080 in the H0 LD state, suspending operation and forcing the address and data output buses into their high-impedance or third-state.
	INT	This input interrupts the computer and allows external hardware to jam an instruction into the computer to cause it to perform some other function. There are two of these inputs. One is for external devices and the other is for the Micro Control Panel (MCP-80/B).
	READY	This input is used to indicate that the computer is to wait for an external pulse before going on to the next instruction. When put at a logic 0, the computer enters the WAIT state. At a logic 1, the computer operates normally.
	RESET	A pulse to logic 0 on this RESET input will cause the computer to start the program located at location 0.

NOTE: If an input or output is not to be used, it can be left unconnected since on-board pull-up resistors are used to provide normal logic levels.

## MEMORY SYSTEM

**MB - 80/B**

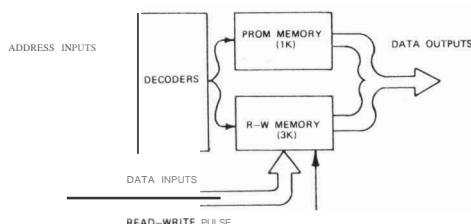


### Memory System (MB-80/B) :

This board holds the memory necessary for program and data storage. It can hold up to 3K or read-write (R-W) memory and up to 1K of Programmable Read-Only-Memory (PROM) for permanent storage of programs and data. A minimum configuration of 1K of R-W or 256 words of PROM is necessary to initiate designs and is provided with the basic system. The readily available 1702A, ultraviolet erasable PROMS are used.

Simple, movable wires are used on the memory card to select memory addressing. These are solderless jumpers which allow instant changing of address.

The Memory System is completely compatible with the other cards in the Micro-Designer System.

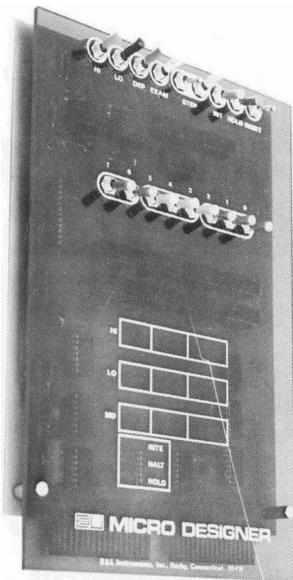


### MAXIMUM CURRENT REQUIREMENTS

+	5V	- 1.4A
+	15V	- NC
	15V	- NC

# MICRO-COMPUTER CONTROL PANEL

**MCP-80/B**



Eight data and nine control switches, plus 27 indicator LED's, are used for control and visual indication of address data (16 bits), memory data (8bits) and three control signals, INT, HALT, HOLD.

Among the functions included are:

1. Loading or examining data in any of the R-W memory locations or examining any of the PROM locations.
2. Provide constant readout of address, memory and status data.
3. Place the computer in the HOLD mode for loading data or checking hardware.
4. Manual RESET to reset the computer to start the program at location O.
5. Single step through a program. The user can have the computer perform single functions, one step per switch actuation. This may be used for testing and debugging programs.
6. External single step for a TTL clock input to control the frequency of the single step feature; used for educational demonstrations or testing programs. Frequency can be DC to full 2 MHz clock rate.
7. Interrupt or "jam" an instruction into the computer. This allows generation of and checking interrupts from the control panel. All eight interrupts "vector" instructions can be generated from the control panel.

MAXIMUM CURRENT REQUIREMENTS: + 5 1.4A

+15 -NC-

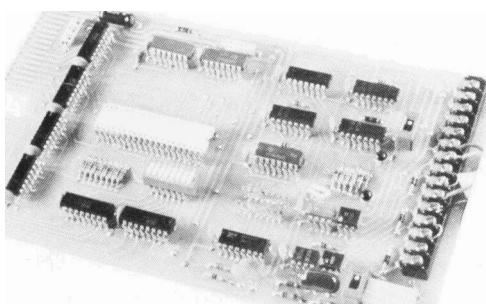
- 15 -NC-

The Control Panel provides complete user control of the operation of the micro-computer. It is not controlled by software, so a program is not needed to use the control panel; it is completely independent of software and can be used for teaching, debugging and testing. The computer is also completely independent of the control panel and will run just as well without it connected to the system. Once the computer is being used routinely with PROMS, the front panel can be disconnected.

The MCP-80/B board is used when power is first applied to get the computer up-and-running from a cold start. A unique hardware feature also gives the control panel priority over any other input-output device or interrupting peripheral. This is a great asset when debugging a system.

## UNIVERSAL ASYNCHRONOUS COMMUNICATIONS INTERFACE

**ASB-80/B**



This plug-in, circuit board supplies the necessary interface for communicating with terminals, teletypewriters or other computers. It contains the necessary paper tape reader control for ASR-33 teletypewriters.

The ASB-80/B uses standard 20MA current loops or RS232 voltages. The card is completely optically coupled and isolated. It uses the standard UART type I.C. and all functions on the UART are programmable. Data rates are selectable from 110 to 9600 bits per second.

MAXIMUM CURRENT REQUIREMENTS: + 5V 250MA

+15V 45MA

- 15V 15MA



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Our TELEX number is 963536  
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### NEW MD-I MICROCOMPUTER PRICE SHEET

#### DOMESTIC RESALE PRICE

E & L announces major reductions in the costs of its microcomputer systems including many new items and options. Potential users can now make up their own systems without paying a substantial premium for unique requirements.

Item	<u>Individual Circuit Boards</u>	<u>PRICE</u>	<u>NOTES</u>
1	CPIC-80B Central Processor Board	\$305.00	
2	MB-80B PROM/RAM Board with 256 PROM and 1024 RAM	250.00	
3	MCP-80B Micro Computer Control Panel and Circuit Board	260.00	
4	ASB-80B Asynchronous Board teletype. CRT interface	175.00	Note 2
	<u>Mother Board</u>		
5	IF-101 MD Micro Designer interconnect/ breadboard	157.00	
	<u>Power Supplies</u>		
6	COP-5 Power Supply +5v, + 15v. ± 24	295.00	
7	CDP-6 Utility supply +5,-- 15v	140.00	NEW
	<u>Additional Memory</u>		
8	PROM-80B Additional 256 x 8 PROM	40.00	
9	RAM-80B Additional 1024 RAM	50.00	
	<u>Systems</u> - order complete systems and save		
10	MD-0 The complete system <u>without</u> power supply 1,2,3,4 and 5	1125.00	
11	MD-1 The complete system with standard supply 1,2,3,4,5 and 6	1395.00	
12	MD-2 The complete system <u>except</u> no asy- chronous board or power supply 1,2,3 and 5	975.00	NEW
13	MD-3 The reduced system above, but with the utility power supply 1,2,3,5 and 7	1095.00	NEW

NOTE 1: Bugbook III and IV (when available) included at no charge

NOTE 2: Bugbook IIa included at no charge

Discounts: 1-3 list 4 and up - less 5%

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