

Department of Information and Communication Engineering

CSE-3102: Microprocessor and Interfacing Lab

Experiment No. 01:

Familiarization with MDA-8086 microprocessor kit and its operation in “Machine Code” mode.

Objectives:

1. To familiarize with MDA-8086 system configuration.
2. To operate MDA-8086 in “Machine Code” mode.

1. MDA-8086 System Configuration:

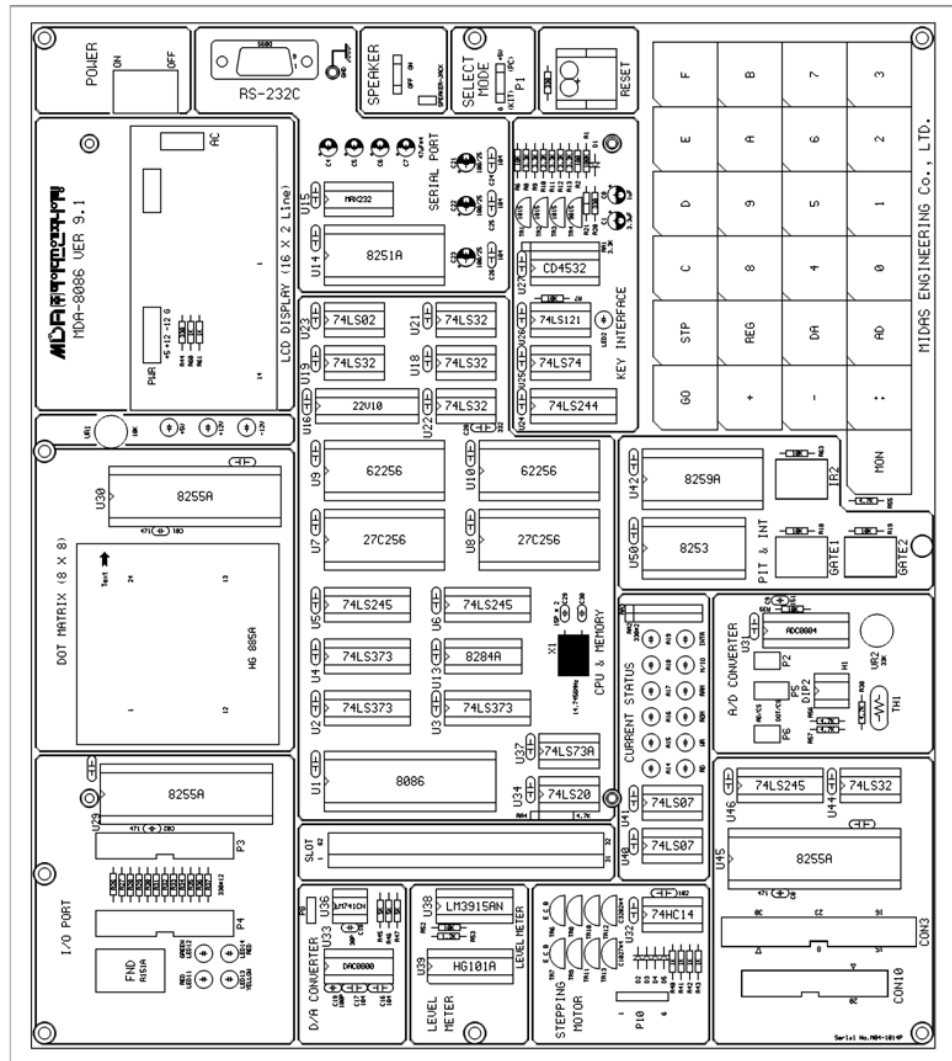


Figure 1: MDA-8086 System Configuration

The functions of ICs at Figure 1 are:

1. **CPU (Central processing unit):** Using Intel 8086, Using 4.9152Mhz.
2. **ROM (Read Only Memory):** It has program to control user's key input, LCD display, user's program. 64K Byte, it has data communication program. Range of ROM Address is F0000~FFFFFH.
3. **SRAM (Static Random Access Memory):** Input user's program & data. Address of memory is 00000H~0FFFFH, totally 64 KByte .
4. **DISPLAY:** It is LCD, 16(Character) × 2(Line).

5. KEY BOARD: It is used to input machine language and has 16 of hexa-decimal keys and 8 of function keys.

6. SPEAKER: Able to test sound using with speaker and further more able to test synthesizer.

7. RS-232C: It is ready to do data communication with IBM compatible personal computer.

8. DOT MATRIX LED: To understand & test of dot matrix structure and principle of display it is interfaced to 8255A (PPI).

9. A/D CONVERTER: Convert analog signal to digital signal using with ADC0804.

10. D/A CONVERTER: Convert digital signal to analog signal using with DAC0800 and it is interfaced so as to more Level meter.

11. STEPPING MOTOR INTER FACE: So as to control stepping motor driver circuit of stepping motor is interfaced.

12. POWER: AC 110~220V , DC +5V 3A , +12V 1A , -12V 0.5A SMPS.

2. Memory map:

ADDRESS	MEMORY	DESCRIPTION
00000H ~ 0FFFFH	RAM	PROGRAM & DATA MEMORY
F0000H ~ FFFFFH	ROM	MONITOR ROM
10000H ~ EFFFFH	USER'S RANGE	

Figure 2: Memory map

3. I/O address map:

LCD-Liquid Crystal Display

ADDRESS	I/O PORT	DESCRIPTION
00H ~ 07H	LCD & KEYBOARD	<u>LCD Display</u> 00H : INSTRUCTION REGISTER 02H : STATUS REGISTER 04H : DATA REGISTER KEYBOARD 01H : KEYBOARD REGISTER (Only read) 01H : KEYBOARD FLAG (Only write)
08H ~ 0FH	8251 / 8253	8251(Using to data communication) 08H : DATA REGISTER 0AH : INSTRUCTION / STATUS REGISTER 8253(TIMER/COUNTER) 09H : TIMER 0 REGISTER 0BH : TIMER 1 REGISTER 0DH : TIMER 2 REGISTER 0FH : CONTROL REGISTER
10H ~ 17H	8259/SPEAKER	8259(Interrupt controller) 10H : COMMAND REGISTER 12H : DATA REGISTER SPEAKER → 11H : SPEAKER
18H ~ 1FH	8255A-CS1/ 8255A-CS2	8255A-CS1(DOT & ADC INTERFACE) 18H : A PORT DATA REGISTER 1AH : B PORT DATA REGISTER 1CH : C PORT CONTROL REGISTER 8255-CS2(LED & STEPPING MOTOR) 19H : A PORT DATA REGISTER 1BH : B PORT DATA REGISTER 1DH : C PORT CONTROL REGISTER 1FH : CONTROL REGISTER
20H ~ 2FH	I/O EXTEND CONNECTOR	
30H ~ FFH	USER'S RANGE	

LED-Light Emitting Diodes

Figure 3: I/O address map

4. Kind and Function of Key:

MDA-8086 has high performance 64K-byte monitor program. It is designed for easy function. After power is on, the monitor begins to work. In addition to all the key function the monitor has a memory checking routine.

The following is a simple description of the key functions.

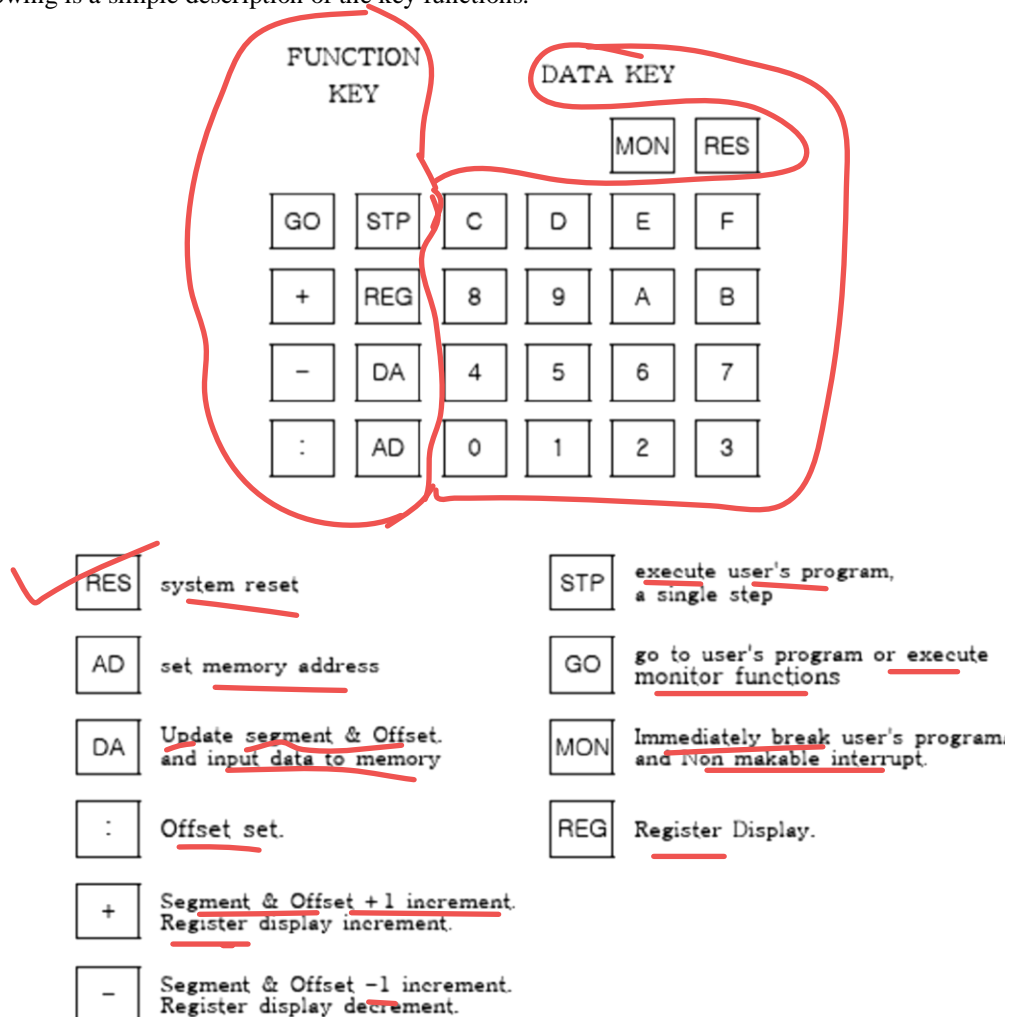


Figure 4: Keys and Functions

5. Basic Operation:

On a power-up, following message will be displayed on a LCD.

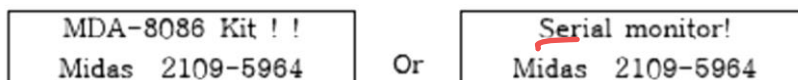
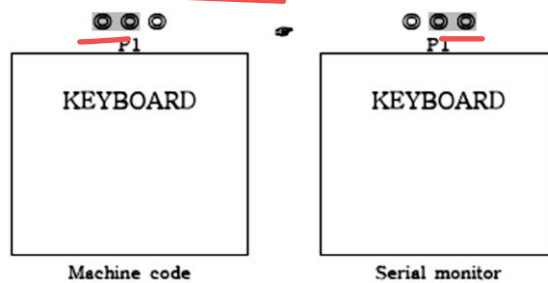


Figure 5: Power on monitor

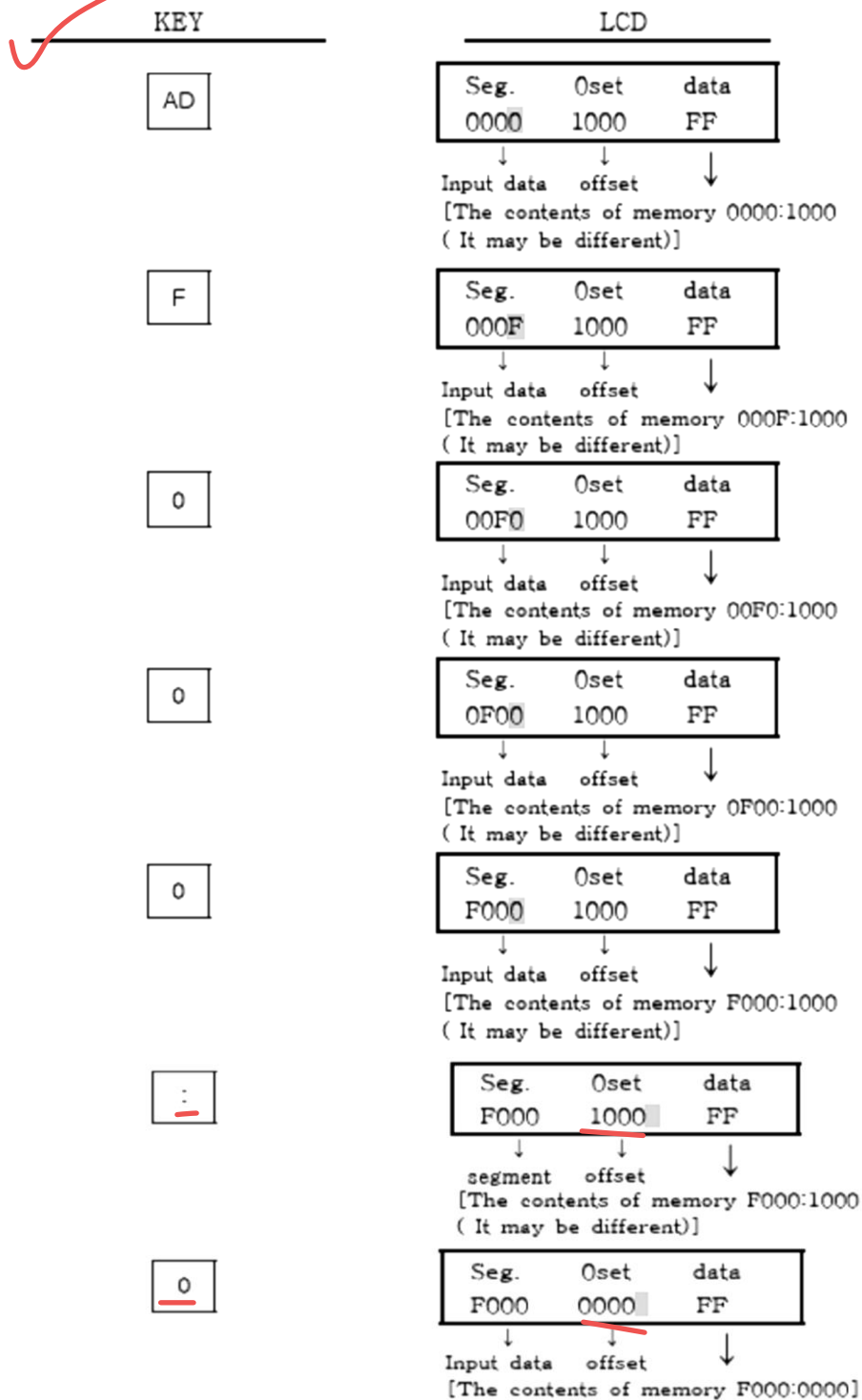
To use "Machine Code" mode, move jumper P1 which located on the PCB like this.



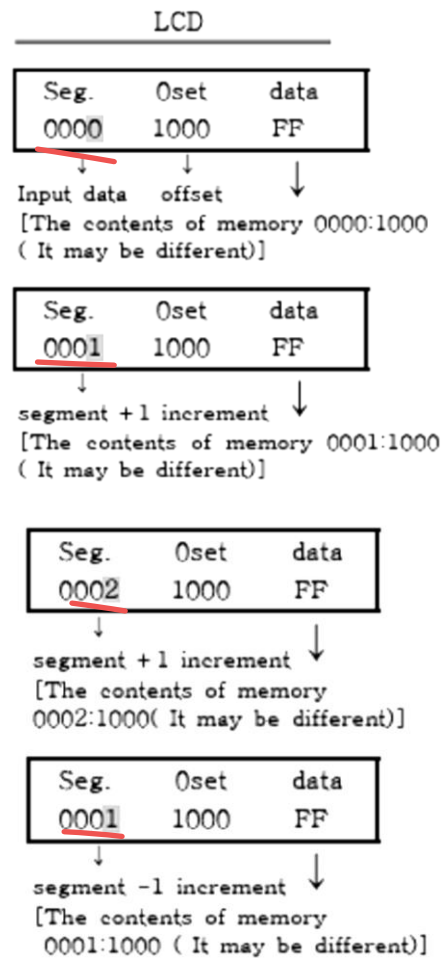
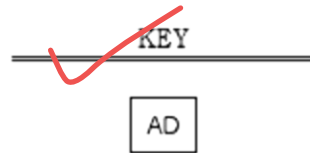
Whenever RES is pressed, the display becomes Figure 5 and user can operate keyboard only in this situation.

AD , : HEXA-DIGIT KEY: Substitute to segment & offset address.

Example 1: Check the contents in memory.



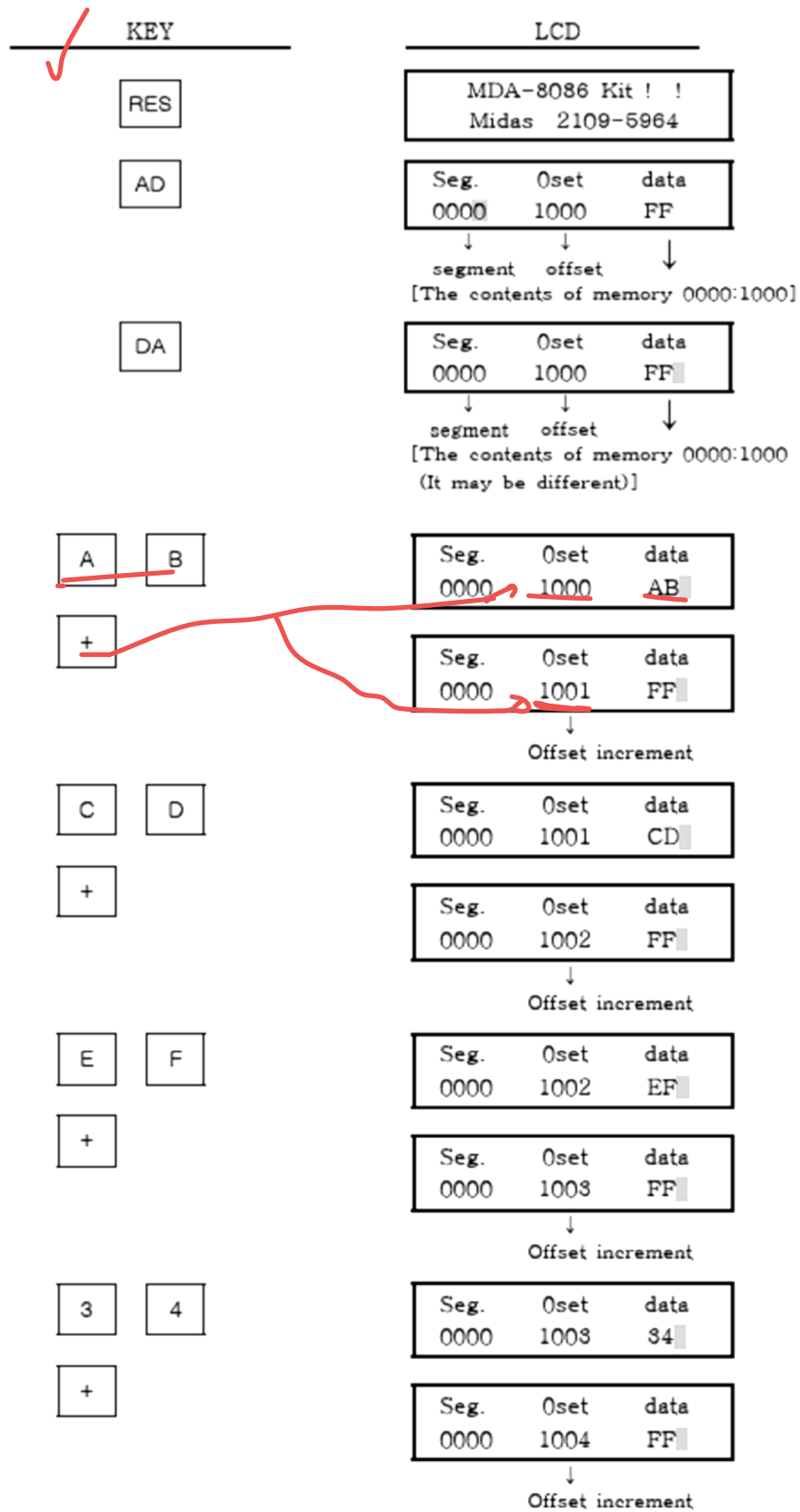
AD , + , - KEY : Increment and decrement to segment & offset address.



HEXA-DIGIT KEY: Update to memory contents.

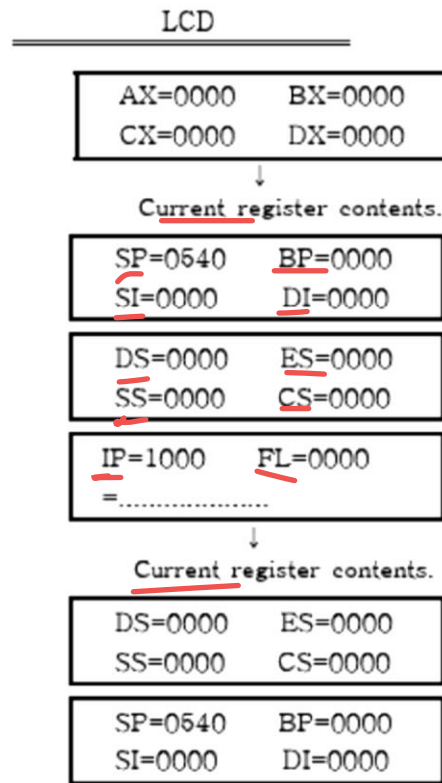
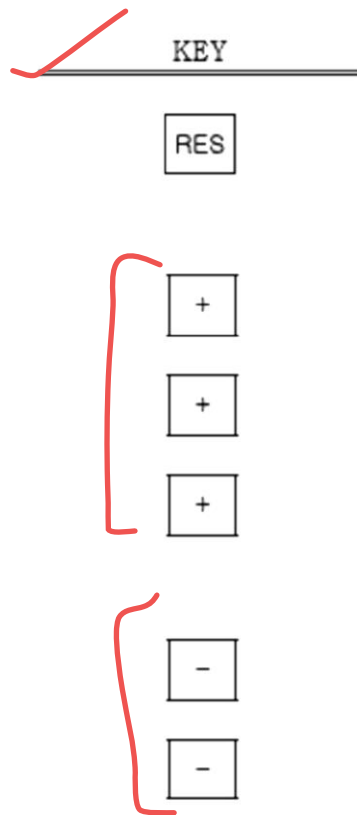
Example 2: Let's store the following like to 01000H ~ 01003H contents.

ADDRESS	DATA
01000	AB
01001	CD
01002	EF
01003	34



Example 3: Display the register contents.

REG , + , - KEY: Display to register contents.



Lab Exercise: Store the following data to the specified memory location:

ADDRESS	DATA
01050	C0
01081	6F
01022	EF
01073	DA

References:

1. User's manual of MDA-8086 microprocessor kit, Midas Engineering, www.midaseng.com.

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