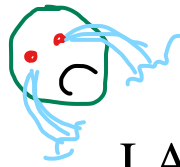


With
LOVE & PAIN
Dona



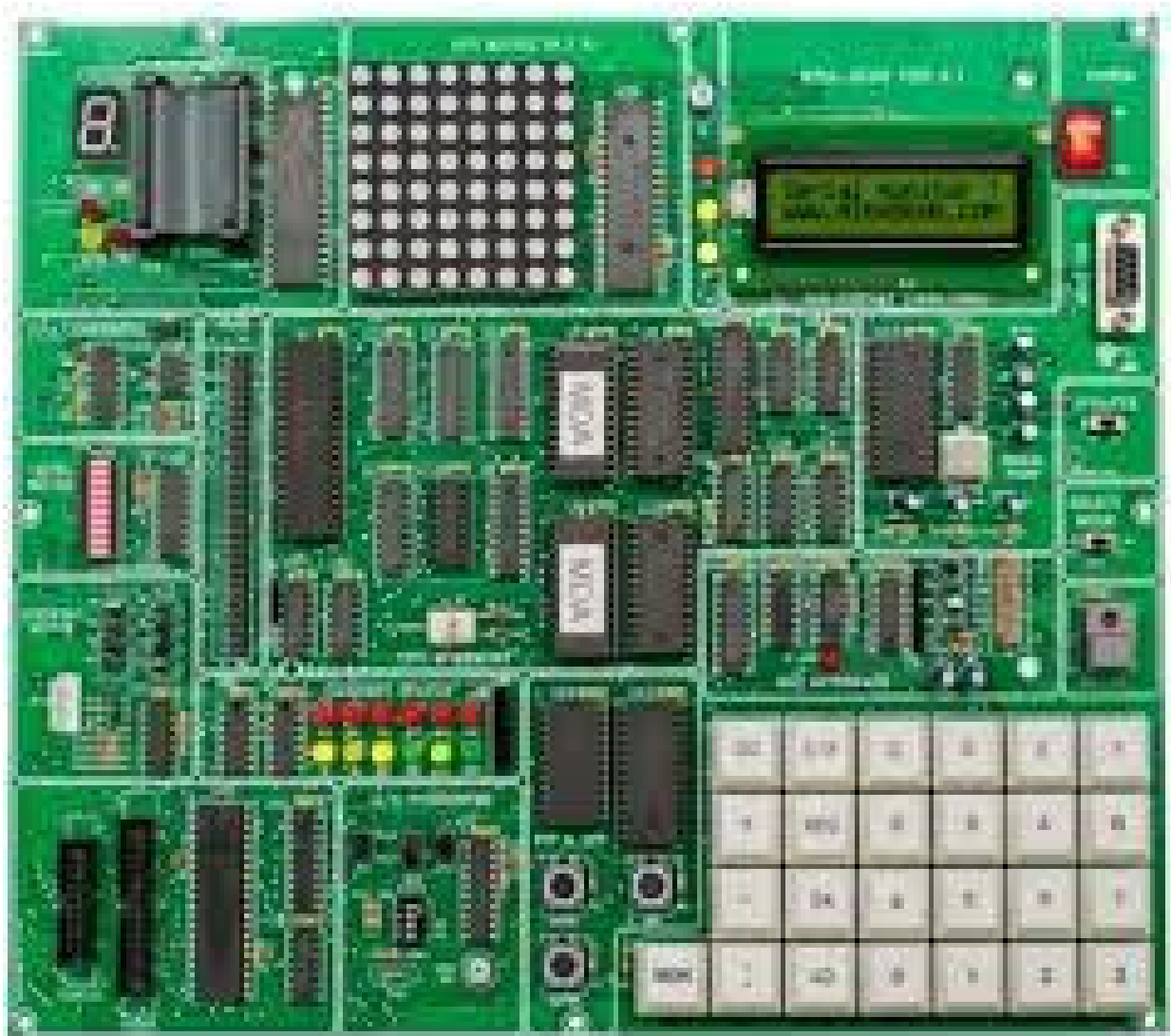
LABORATORY 1

Familiarization with the MDA-8086 Microprocessor Trainer and EMU8086 Microprocessor Emulator

Objectives:

- Understand the component of 8086 trainer board.
- Understand the EMU8086 Microprocessor Emulator.

Task-1.1: Familiarization with the Components Layout of MDA-8086 Trainer





- 1) Look at the PCB (Printed Circuit Board) of the trainer and component layout.
- 2) Now look at the PCB, locate the circuit designated U1. This is 8086 microprocessor chip. Using 14.7456 Mhz.
- 3) Locate the keypad (Keyboard) on the trainer. The KBIC (Key Board Interface Controller) is under the keypad and thus it is not visible.
- 4) Locate the output devices of the trainer:
 - (a) The LCD (Liquid Crystal Display) unit. The interface controller of the LCD device (LCDIC) is within the LCD device itself. 16(Characters)×2(Lines).

- (b) The 7-segment display device, 7SDD. This is a common anode type 7-segment display device (CA7SDD). The interface controller for this device is the chip U29 (8255). 8255 is a programmable I/O device that acts as interface between peripheral devices and the microprocessor for parallel data transfer.
- (c) The LED (Light Emitting Diode) assembly as LED11-LED13. The interface controller for these LEDs is the chip U29.
- (d) Locate two RAM (Random Access Read and Write Memory) chips U9 and U10 on the PCB. Capacity of each RAM is 32Kbyte (32x1024x8 bits) means 32x1024 byte locations inside the RAM.
Address of memory is 00000H~0FFFFH, totally 64K Byte.
- (e) Locate two EPROM (Ultra-violet Erasable Electrically Programmable Random Access Read Only Memory) chips U7 and U8 on the PCB. These chips have the Monitor Program of the MDA-8086 trainer. Capacity of each EPROM is 32Kbytes. A monitor is itself a program that provides an interface between the user and computer at the low level. In general, monitors provide a way of loading a program to primary memory (RAM), test memory, examine registers, move or copy memory, and run programs. It also provides all basic input and output (BIOS) functions.
Range of ROM Address is F0000H~FFFFFH.
- 5) A/D CONVERTER: ADC0804 to convert the analog signal to digital signal.
- 6) D/A CONVERTER : DAC0800 (8-bits D/A converter) to convert the digital signal to the analog signal and to control the level meter.
- 7) Getting familiar with the 26 keys Keypad of the trainer

✓ (a) MPU Control Key:

- (1) RES(MPU RESet): When this key is pressed down, the 8086 remains in the reset state and when the key is released, the 8086 enters into working state. A message similar to the following appears on the LCD monitor of the trainer. Note that the jumper(switch) must be set to the left position (called kit position).

MDE 8086 kit!!

Midas 335-0964/5

- (2) MON(Monitor)/NMI(Non Maskable Interrupt): When pressed the CPU receives an external interrupt signal via its NMI-pin. A non-maskable interrupt (NMI) is a type of hardware interrupt (or signal to the processor) that prioritizes a certain thread or process. Unlike other types of interrupts, the non-maskable interrupt cannot be ignored through the use of interrupt masking techniques. Example: Clicking RESET Button, Turn off power supply.

✓ (b) Command Keys:

- (1) AD (set memory ADress): This command key allows user to set the 20-bit address of a memory location in 'Segment:Offset =Seg:Oset' format. Pressing of the key brings the following message on the LCD panel with the cursor blinking at the Segment Field.

Seg. Oset Data

xxxx yyyy zz

Seg stands for Segment, Oset stands for Offset and data refers to the 8 bit content of the memory location pointed by Seg:Oset. The address of a memory location is 5-digit hex. It is obtained by placing digit-0 to the right of Seg and then adding it with Oset. For example: Given that Seg:Oset=0000:1002; the 5 digit address of memory location is: $00000 + 1002 = 01002$.

Let's examine the content of the memory location F000h(F000:0000) of the ROM area. We may use the data keys (0 to F) to change the segment value into F000h. Now to change offset press: key and then set the offset.

- (2) **DA (Data entry)**: this key brings cursor to the data field. Now the user may invoke the data key (0 to F) to enter new data.
- (3) **+(increment)**: This key allows moving to the address of the next memory location.
- (4) **-(decrement)**: This key allows moving to the address of the previous memory location.
- (5) **GO (Go to the beginning point of the program)**: This key allows executing a prog.
- (6) **REG**: Checking and examining the contents of the 8086 internal registers.
- (7) **STP**: Single step, executing one instruction at a time.

✓ (c) Data Keys: 0-9 and A-F are the hexadecimal data keys.

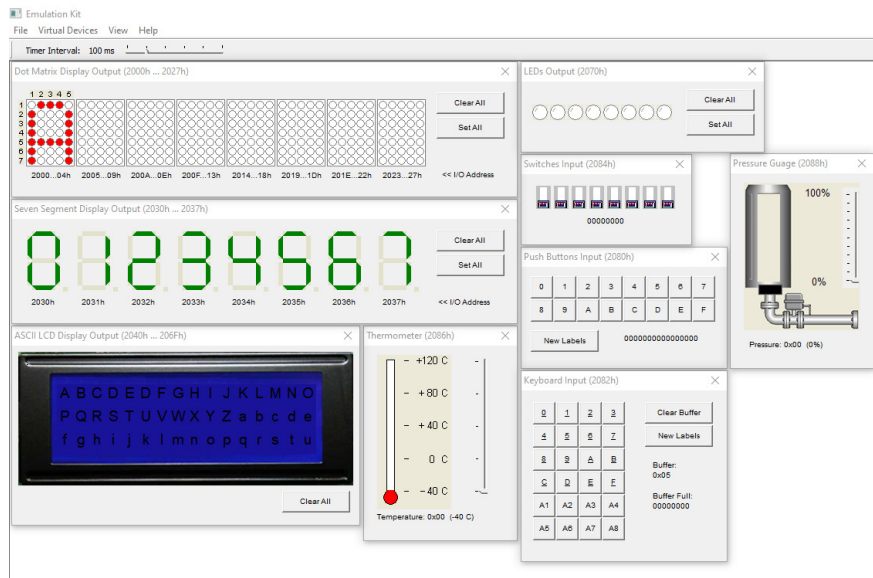
Emulation Kit

Emu8086 is a software emulation of Intel's 8086 microprocessor, and I/O Emulation Kit is a software emulation of a group of hardware devices that can be controlled by Emu8086 virtual central processing unit (CPU).

Available hardware devices in I/O Emulation Kit include: Dot Matrix Display, Seven Segment Display, ASCII LCD Display, Group of LEDs, Push Buttons Input, Keyboard Input, Switches Input, Thermometer Input and Pressure Gauge Input.

Download the I/O Emulation Kit with Help Files and Source Code (Version 1.75b) from the below link:

<https://sites.google.com/site/hawawebsite/more/emulation-kit>



You can use the following video link to install the software:
<https://www.youtube.com/watch?v=nA5GAshhe18>

Table 1. Available Devices

Device	I/O Addresses	Number of Addresses	Register Type
Dot Matrix Display Output	2000h ... 2027h	40	8 bit
Seven Segment Display Output	2030h ... 2037h	8	8 bit
ASCII LCD Display Output	2040h ... 206Fh	48	8 bit
LEDs Output	2070h	1	8 bit
Push Buttons Input	2080h	1	16 bit
Keyboard Input	2082h ... 2083h	2	8 bit
Switches Input	2084h	1	8 bit
Thermometer Input	2086h	1	8 bit
Pressure Gauge Input	2088h	1	8 bit