# *Experiment No:- 1*

**Object:-** Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.

**Apparatus:-** 8085 Microprocessor Kit

**THEORY-**

## SYSTEM INTRODUCTIONS

GENERAL DESCRIPTION

8085 Micro Processor is a single board Microprocessor training/ Development Kit configured around the most widely used Microprocessor of todays world. Based on 8085 Microprocessor, it can be used to train engineers to control any industrial process and to develop software for 8080 and 8085 based systems.

The **8085** communicates with the outside world through a key board having 28 keys and seven segement hexadecimal display. The kit also has the capability of interacting with CRT Terminal and IBM PC compatible computer system through the serial interface provided on the board. The **8085** model has an extra on board facility of audio cassette interface.

**8085** provides 8K/32K bytes of RAM and 8K bytes of EPROM. The total on board memory can be very easily expanded to 64K bytes in an appropriate combination of RAM and ROM. The monitor is incorporated from 0000 - 1FFF and the necessary 8K bytes of RAM has an address of 2000 - 3FFF.

The Input / Output structure of **8085** provides 24 programmable I/O lines using 8255. It has got 16 bit programmable Timer/Counter for generating any type of counting etc.

The on board residents system monitor software is very powerful and provides various software utilities. The kit provides various powerful software commands like, INSERT,

DELETE, BLOCK MOVE, RELOCATE, STRING FILL & MEMORY COMPARE etc. which are very helpful in debugging/developing the software.

**8085** is configured around the internationally adopted STD Bus, which is the most popular bus for process control and real time applications. All the address, data and control lines are available at the edge connector. The kit is fully expandable for any kind of application.

## SYSTEM SPECIFICATION

| | |
|---|---|
| CPU | - 8 bit Microprocessor, the 8085 |
| MEMORY | - Total on board capacity of 64K bytes |
| RAM | - 8K/32K bytes and space for further expansion |
| ROM | - 8K bytes of EPROM loaded with powerful program |
| TIMER | - 16 bit programmable timer / counter using 8253 |
| I/O | - 24 I/O lines using 8255 |
| KEYBOARD | - 10 keys for command<br>16 keys for hexadecimal data entry<br>1 key for vector interrupt & 1 key for reset |
| LED DISPLAY | - 6 seven segment deisplay<br>4 for address field & 2 for data field |
| BUS | - All data, address and control signals (TTL compatible available at FRC connector) |
| INTERFACE (optional) | - RS - 232 - C through SID/SOD lines with auto baud rate |
| POWER SUPPLY | - +5v, 1.5Amp for the kit |
| REQUIREMENT | - $\pm$12V + 5%, 250mA for CRT/PC interface |
| OPERATING TEMPERATURE | - 0 to 50$^{o}$C |

## SYSTEM CAPABILITIES (KEYBOARD MODE)

## SYSTEM CAPABILITIES (SERIAL MODE)

Most of the commands mentioned above can also be used in the serial mode.

## HARDWARE DISCRIPTION

### GENERAL

The system has got 8085 as the Central Processing Unit. The clock frequency for the system is 3.07 MHz and is generated from a crystal of 6.14 MHz.

8085 has got 8 data lines and 16 address lines. The lower 8 address lines and 8 bit data lines are multiplexed. Since the lower 8 address bits appear on the bus during the first clock cycle of a machine cycle and the 8 bit data appears on the bus during the 2nd and 3rd clock cycle, it becomes necessary to latch the lower 8 address bits during the first clock cycle so that the 16 bit address remains available in subsequent cycles. This is achieved using a latch 74 -LS 373

### MEMORY

**8085** provides 8/32K bytes of RAM using 6264/62256 chip and 8K bytes of EPROM for monitor. There is one memory space provided on **8085**. This one space can be defined any address slots from 8000 - DFFF depending upon the size of the memory chip to be used. Total on board memory can be extended to 64k bytes.

### I/O DEVICES

The various I/O chips used in **8085** are 8279, 8255 & 8253. The functional role of all these chips is given below:

### 8279 (KEYBOARD & DISPLAY CONTROLLER)

8279 is a general purpose programmable keyboard and display I/O interface device designed for use with the 8085 microprocessor. It provides a scanned interface to 28

contact key matrix provided in **8085** and scanned interface for the six seven segment displays. 8279 has got 16 x 8 display RAM which can be loaded or interrogated by the CPU. When a key is pressed, its corresponding code is entered in the FIFO Queue of 8279 and can now be read by the microprocessor. 8279 also refreshes the display RAM automatically.

**8255 (PROGRAMMABLE PERIPHERAL INTERFACE)**

8255 is a Programmable Peripheral Interface (PPI) designed to use with 8085 Microprocessor. This basically acts as a general purpose I/O device to interface peripheral equipments to the system bus. It is not necessary to have an external logic to interface with peripheral devices since the functional configuration of 8255 is programmed by the system software. It has got three Input/Output ports of 8 lines each (PORT - A, PORT - B & PORT - C). Port C can be divided into two ports of 4 lines each named as Port C upper and Port C lower. Any Input/Output combination of Port A, Port B and Port C upper and lower can be defined using the appropriate software commands. The port addresses for these port are given in Chapter - 6. **8085** provides 24 Input/Output ports using 8255 chips.

**INSTALLATION OF 8085 KIT**

1. Connect +5V and GND to the 8085 Kit.
2. Switch on the power supply.
3. 'UP 85' message will come on the display.

**Note:** Supply connection should be proper according to the connector details C3.

```
2001        DATA                                ;2nd no. to be added
2002        RESULT                              ;Result
Step-1
2003    21 00 20    START  LXI      H,2000     ;Point to 1st no.
```

***Step-2***

| | | | | |
|---|---|---|---|---|
| 2006 | 7E | MOV | A,M | ;Load the accumulator |

***Step-3***

| | | | | |
|---|---|---|---|---|
| 2007 | 23 | INX | H | ;Advance pointer |

***Step-4***

| | | | | |
|---|---|---|---|---|
| 2008 | 86 | ADD | M | ;Add IInd number |
| 2009 | 23 | INX | H | ;Advance pointer |
| 200A | 77 | MOV | MA | ;Store result |

***Step-5***

| | | | |
|---|---|---|---|
| 200B | EF | RST | 5 |

***Example***

| **Address** | **Data** |
|---|---|
| 2000 | 1A |
| 2001 | 18 |
| 2002 | 32 Data in Hex Number |

# *Experiment No:- 2*

**Object:-** Write a program to perform integer division

**Apparatus:-** Vinytics VMC8509 Microprocessor Kit

## Program:

| Memory Address | Mnemonics | Label | Hex Code |
|---|---|---|---|
| 2000 | LXI H,2500 | | 21 |
| 2001 | | | 0 |
| 2002 | | | 25 |
| 2003 | MOV A,M | | 7E |
| 2004 | INX H | | 23 |
| 2005 | MVI C,00 | | 0E |
| 2006 | | | 0 |
| 2007 | CMP M | L1 | BE |
| 2008 | JC 2010 | L2 | DA |
| ;2009 | | | 10 |
| 200A | | | 20 |
| 200B | SUB M | | 96 |
| 200C | INR C | | 0C |
| 200D | JMP 2007 | | C3 |
| 200E | | | 7 |
| 200F | | | 20 |
| 2010 | INX H | | 23 |
| 2011 | MOV M,A | | 77 |
| 2012 | INX H | | 23 |
| 2013 | MOV M,C | | 71 |
| 2014 | HLT | | 76 |

## Result:-

Before Execution:-

| |
|---|
| 2500-09 |
| 2501-02 |
| 2503- Reminder |
| 2504-Questioned |

AFTER EXECUTION:-

| |
|---|
| 2502:- 01 |
| 2503:-04 |

## *Experiment No:- 3*

**Object:-** Write a program to transfer a block of data placed in one memory location to another memory location in forward order.

**Apparatus:-** Vinytics VMC8509 Microprocessor Kit

## Program:

| Memory Address | Mnemonics | Label | Hex Code |
|---|---|---|---|
| 2000 | LXI H 2500 | | 21 |
| 2001 | | | 00 |
| 2002 | | | 25 |
| 2003 | LXI D 3500 | | 11 |
| 2004 | | | 00 |
| 2005 | | | 35 |
| 2006 | MVI C,05 | | 0E |
| 2007 | | | 05 |
| 2008 | MOV A,M | L1 | 7E |
| 2009 | STAX D | | 12 |
| 200A | INX H | | 23 |
| 200B | INX D | | 13 |
| 200C | DCR C | | 0D |
| 200D | JNZ 2008 | | C2 |
| 200E | | | 08 |
| 200F | | | 20 |
| 2010 | HLT | | 76 |

Result:-

| Before Execution | |
|---|---|
| LOCATION | DATA |
| 2500 | 11 |
| 2501 | 12 |
| 2502 | 13 |
| 2503 | 14 |
| 2504 | 15 |

| After Execution | |
|---|---|
| LOCATION | DATA |
| 3500 | 11 |
| 3501 | 12 |
| 3502 | 13 |
| 3503 | 14 |
| 3504 | 15 |

## *Experiment No:-4*

**Object:-** Write a program to searching a no. in array & find the occurance of that data.

**Apparatus:-** Vinytics VMC8509 Microprocessor Kit

## Program:

| Memory Address | Mnemonics | Label | Hex Code |
|---|---|---|---|
| 2000 | MVI D,00 | | 16 |
| 2001 | | | 00 |
| 2002 | LXI H 2500 | | 21 |
| 2003 | | | 00 |
| 2004 | | | 25 |
| 2005 | MOV C,M | | 4E |
| 2006 | INX H | | 23 |
| 2007 | MOV A,M | | 7E |
| 2008 | INX H | L1 | 23 |
| 2009 | CMP M | | BE |
| 200A | JNZ 200E | | C2 |
| 200B | | | 0E |
| 200C | | | 20 |
| 200D | INR D | | 14 |
| 200E | DCR C | L2 | 0D |
| 200F | JNZ 2008 | | C2 |
| 2010 | | | 08 |
| 2011 | | | 20 |
| 2012 | HLT | | 76 |

**Result:-**

| Before Execution | |
|---|---|
| LOCATION | DATA |
| 2500 | 05 |
| 2501 | 02 |
| 2502 | 01 |
| 2503 | 02 |
| 2504 | 08 |
| 2505 | 02 |
| 2506 | 02 |
| | |

OUTPUT :- D=03

## *Experiment No:-5*

**Object:-**write a Program to sort an arrary in ascending Order.

**Apparatus:-** Vinytics VMC 8509 Microprocessor Kit

**Program:-**

| Memory Adderess | Mnemonics | Label | Hex Code |
|---|---|---|---|
| 2000 | LXI H,2500 | | 21 |
| 2001 | - | | 00 |
| 2002 | - | | 25 |
| 2003 | Mov C,M | | 4E |
| 2004 | MOV D,C | | 51 |
| 2005 | INX H | @ | 23 |
| 2006 | MOV A,M | | 7E |
| 2007 | INX H | # | 23 |
| 2008 | MOV B,M | | 46 |
| 2009 | CMP B | | B8 |
| 200A | JNC ($) | | D2 |
| 200B | | | 13 |
| 200C | | | 20 |
| 200D | DCX H | | 2B |
| 200E | MOV M,A | | 77 |
| 200F | MOV A,B | | 78 |
| 2010 | JMP* | | C3 |
| 2011 | | | 15 |
| 2012 | | | 20 |

| | | | |
|---|---|---|---|
| 2013 | DCX H | ($) | 2B |
| **Memory Adderess** | **Mnemonics** | **Label** | **Hex Code** |
| 2014 | MOV M,B | | 70 |
| 2015 | INX H | * | 23 |
| 2016 | DCR D | | 15 |
| 2017 | JNZ# | | C2 |
| 2018 | | | 07 |
| 2019 | | | 20 |
| 201A | MoV M,A | | 77 |
| 201B | DCR C | | 0D |
| 201C | JNZ@ | | C2 |
| 201D | | | 05 |
| 201E | | | 20 |
| 201F | HLT | | 76 |

Result:-

| **Before Execution** | |
|---|---|
| **Location** | **Data** |
| 2500 | 05 |
| 2501 | 09 |
| 2502 | 03 |
| 2503 | 04 |
| 2504 | 07 |
| 2505 | 02 |

| **After Execution** | |
|---|---|
| **Location** | **Data** |
| 2500 | 02 |
| 2501 | 03 |
| 2502 | 04 |
| 2503 | 05 |
| 2504 | 07 |
| 2505 | 09 |

## *Experiment No:-6*

**Object:-** An Assembly Language Program to arrange an array of data in descending order using 8085.

**Apparatus: -** 8085 Microprocessor Kit

**Program:-**

**Algorithm**

1) **Initialize HL pair as memory pointer.**
2) **Get the count at 4200 in to C register.**
3) **Copy it in D register.**
4) **Get the first vale in Accumulator.**
5) **Compare it with the value at next location.**
6) **If they are out of order, exchange the contents of accumulator and memory.**
7) **Decrement D register's content by 1.**
8) **Repeat steps 5 and 7 till the value in D register become zero.**
9) **Decrement C register's content by 1.**
10) **Repeat steps 3 to 9 till the value in C register becomes zero.**
11) **Terminate the program.**

## Program

| MEMORY | LABEL | MNEMONIC | HEX CODE | COMMENT |
|---|---|---|---|---|
| **4400** | | LXI H,4200 | 21 | Load the array size to the HL pair |
| **4401** | | | 00 | |
| **4402** | | | 42 | |
| **4403** | | MOV C,M | 4E | Copy the array size to C register |
| **4404** | | DCR C | 0D | Decrement C by 1 |
| **4405** | REPEAT | MOV D,C | 51 | Copy content of C to D register |
| **4406** | | LXI H,4201 | 21 | Load the first data to the HL pair |
| **4407** | | | 01 | |
| **4408** | | | 42 | |

| | | | | |
|---|---|---|---|---|
| **4409** | LOOP | MOV A,M | 7E | Copy the data to the accumulator |
| **440A** | | INX H | 23 | Increment memory by 1 |
| **440B** | | CMP M | BE | Compare accumulator and memory content |
| **440C** | | JNC SKIP | DA | Jump on no carry to the label SKIP |
| **440D** | | | 14 | |
| **440E** | | | 44 | |
| **440F** | | MOV B,M | 46 | Copy memory content to B register |
| **4410** | | MOV M,A | 77 | Copy accumulator content to memory |
| **4411** | | DCX H | 2B | Decrement memory by 1 |
| **4412** | | MOV M,B | 70 | Copy B register's content to memory |
| **4413** | | INX H | 23 | Increment memory by 1 |
| **4414** | SKIP | DCR D | 15 | Decrement D by 1 |
| **4415** | | JNZ LOOP | C2 | Jump on non-zero to the label LOOP |
| **4416** | | | 09 | |
| **4417** | | | 44 | |
| **4418** | | DCR C | 0D | Decrement C by 1 |
| **4419** | | JNZ REPEAT | C2 | Jump on non-zero to the label REPEAT |
| **441A** | | | 05 | |
| **441B** | | | 44 | |
| **441C** | | HLT | 76 | Program ends |

## Observation

**Input at 4200 : $05_H$ ---------- Array Size**
**4201 : $01_H$**
**4202 : $02_H$**
**4203 : $03_H$**
**4204 : $04_H$**
**4205 : $05_H$**

**Output at 4200 : $05_H$ ---------- Array Size**
**4201 : $05_H$**
**4202 : $04_H$**
**4203 : $03_H$**
**4204 : $02_H$**
**4205 : $01_H$**

***EXPERIMENT NO.:-7***

**Object:-** Write a program to perform BCD to Hexadecimal conversion.

**Apparatus:-** VINYTICS VMC 8509 Microprocessor Kit

**Program:-**

| Memory Adderess | Mnemonics | Label | Hex Code |
|---|---|---|---|
| F000 | LXI H,F500 | | 21 |
| F001 | | | 00 |
| F002 | | | F5 |
| F003 | MOV A,M | | 7E |
| F004 | ANI ,OF | | E6 |
| F005 | | | 0F |
| F006 | MOV B,A | | 47 |
| F007 | MOV A,M | | 7F |
| F008 | ANI F0 | | E6 |
| F009 | | | F0 |
| F00A | RRC | | 0F |
| F00B | RRC | | 0F |
| F00C | RRC | | 0F |
| F00D | RRC | | 0F |
| F00E | MOV D,A | | 57 |
| F00F | MVI C,09 | | 0E |
| F010 | | | 09 |
| F011 | ADD D | # | 82 |
| F012 | DCR C | | 0D |
| F013 | JNZ # | | C2 |

| | | | |
|---|---|---|---|
| F014 | | | 11 |
| F015 | | | F0 |
| F016 | ADD B | | 80 |
| F017 | INX H | | 23 |
| F018 | MOV M,A | | 77 |
| F019 | HLT | | 76 |

RESULT:-

INPUT:- OUTPUT:-

F500:-25 F501:-19H

# *Experiment No:-8*

Object:- Wirte a program to generate the Fibonicci No.

**Apparatus:-** Vinytics VMC8509 Microprocessor Kit

## Program:

| Memory Address | Mnemonics | Label | Hex Code |
|---|---|---|---|
| 2000 | LXI H,2500 | | 21 |
| 2001 | | | 0 |
| 2002 | | | 25 |
| 2003 | MOV C,M | | 4E |
| 2004 | INX H | | 23 |
| 2005 | MOV A,M | | 0E |
| 2006 | INX H | | 23 |
| 2007 | ADD M | L1 | BE |
| 2008 | INX H | L2 | DA |
| ;2009 | MOV M,A | | 10 |
| 200A | DCX H | | 20 |
| 200B | MOv A, M | | 96 |
| 200C | DCR C | | 0C |
| 200D | JNZ | | C2 |
| 200E | | | 06 |
| 200F | | | 20 |
| 2010 | HLT | | 76 |

***EXPERIMENT No.:9***

**OBJECT:-** Write a program to generate 15 Fibbonacci Number and sum of 15 Fibbonacci

**APPARATUS :-** Vinytics VMC 8509 Microprocessor Kit

**PROGRAM:-**

| Memory Adderess | Mnemonics | Label | Hex Code |
|---|---|---|---|
| 2000 | LXI H,2500 | | 21 |
| 2001 | | | 00 |
| 2002 | | | 25 |
| 2003 | MOV C,M | | 4E |
| 2004 | INX H | | 23 |
| 2005 | MOV A,M | | 7E |
| 2006 | INX H | | 23 |
| 2007 | MVI B,01 | | 06 |
| 2008 | | | 01 |
| 2009 | ADD M | @ | 86 |
| 200A | MOV D,A | | 57 |
| 200B | ADD B | | 80 |
| 200C | MOV B,A | | 47 |
| 200D | INX H | | 23 |
| 200E | MOV M,D | | 72 |
| 200F | DCX H | | 2B |
| 2010 | MOV A,M | | 7E |
| 2011 | INX H | | 23 |
| 2012 | DCR C | | 0D |

| | | | |
|---|---|---|---|
| 2013 | JNZ @ | | C2 |
| 2014 | | | 09 |
| 2015 | | | 20 |
| 2016 | MOV A,B | | 78 |
| 2017 | STA 2600 | | 32 |
| 2018 | | | 00 |
| 2019 | | | 26 |
| 201A | HLT | | 76 |

**RESULT:-**

***INPUT:-***

2500:- COUNT

2501 – 00

2501 – 01

***OUTPUT:-***

2501 -00

2502 - 01

2503 -01

2504 – 02

2505 – 03

2506 – 05

2507 – 08

2508 – 0D

***EXPERIMENT No.10***

**OBJECT:-** Write a program for rolling disply of message " INDIA"

**APPARATUS :-** Vinytics VMC 8509 Microprocessor Kit

**PROGRAM:-**

| Memory Adderess | Mnemonics | Label | Hex Code |
|---|---|---|---|
| F000 | LXI H, F500 | # | 21 |
| F001 | | | 00 |
| F002 | | | F5 |
| F003 | PUSH H | @ | E5 |
| F004 | XRA A | | AF |
| F005 | MOV B,A | | 47 |
| F006 | CALL (O/P) | | CD |
| F007 | | | B7 |
| F008 | | | 02 |
| F009 | MVI A,01 | | 3E |
| F00A | | | 01 |
| F00B | MVI B.00 | | 06 |
| F00C | | | 00 |
| F00D | CALL (O/P) | | CD |
| F00E | | | B7 |
| F00F | | | 02 |
| F010 | LXI D, FFFF H | | 11 |
| F011 | | | FF |
| F012 | | | FF |
| F013 | CALL (Delay) | | CD |

| | | | |
|---|---|---|---|
| F014 | | | 70 |
| F015 | | | F5 |
| F016 | MOV A,M | | 7E |
| F017 | CPI FF | | FE |
| F018 | | | FF |
| F019 | POP H | | E1 |
| F01A | INX H | | 23 |
| F01B | JNZ @ | | C2 |
| F01C | | | 03 |
| F01D | | | F0 |
| F01E | JMP # | | C3 |
| F01F | | | 00 |
| F020 | | | F0 |

**Delay Subroutine**:-

| Memory Adderess | Mnemonics | Label | Hex Code |
|---|---|---|---|
| F570 | DCX D | @ | 1B |
| F571 | MOV A,D | | 7A |
| F572 | ORA E | | B3 |
| F573 | JNZ @ | | C2 |
| F574 | | | 70 |
| F575 | | | F5 |
| F576 | RET | | C9 |

## ***EXPERIMENT No.11***

**OBJECT:-** Programme to multiply two 8-bit numbers

| Address | Mnemonics | Operand | Opcode | Remarks |
|---|---|---|---|---|
| 2000 | LXI | H, 3000H | 21 | Load H-L pair with address 3000H. |
| 2001 | | | 00 | Lower-order of 3000H. |
| 2002 | | | 30 | Higher-order of 3000H. |
| 2003 | MOV | B, M | 46 | Move the 1st operand from memory to reg. B. |
| 2004 | INX | H | 23 | Increment H-L pair. |
| 2005 | MOV | C, M | 4E | Move the 2nd operand from memory to reg. C. |
| 2006 | MVI | A, 00H | 3E | Initialize accumulator with 00H. |
| 2007 | | | 00 | Immediate value 00H. |
| 2008 | ADD | B | 80 | Add B with A. |
| 2009 | DCR | C | 0D | Decrement reg. C (counter). |
| 200A | JNZ | 2008H | C2 | Jump back to address 2008H if C ≠ 0. |
| 200B | | | 08 | Lower-order of 2008H. |
| 200C | | | 20 | Higher-order of 2008H. |
| 200D | INX | H | 23 | Increment H-L pair. |
| 200E | MOV | M, A | 77 | Move the result from accumulator to memory. |
| 200F | HLT | | 76 | Halt. |

**Output:**

**Before Execution:**

3000H: 02H

3001H: 05H

**After Execution:**

3002H: 0AH