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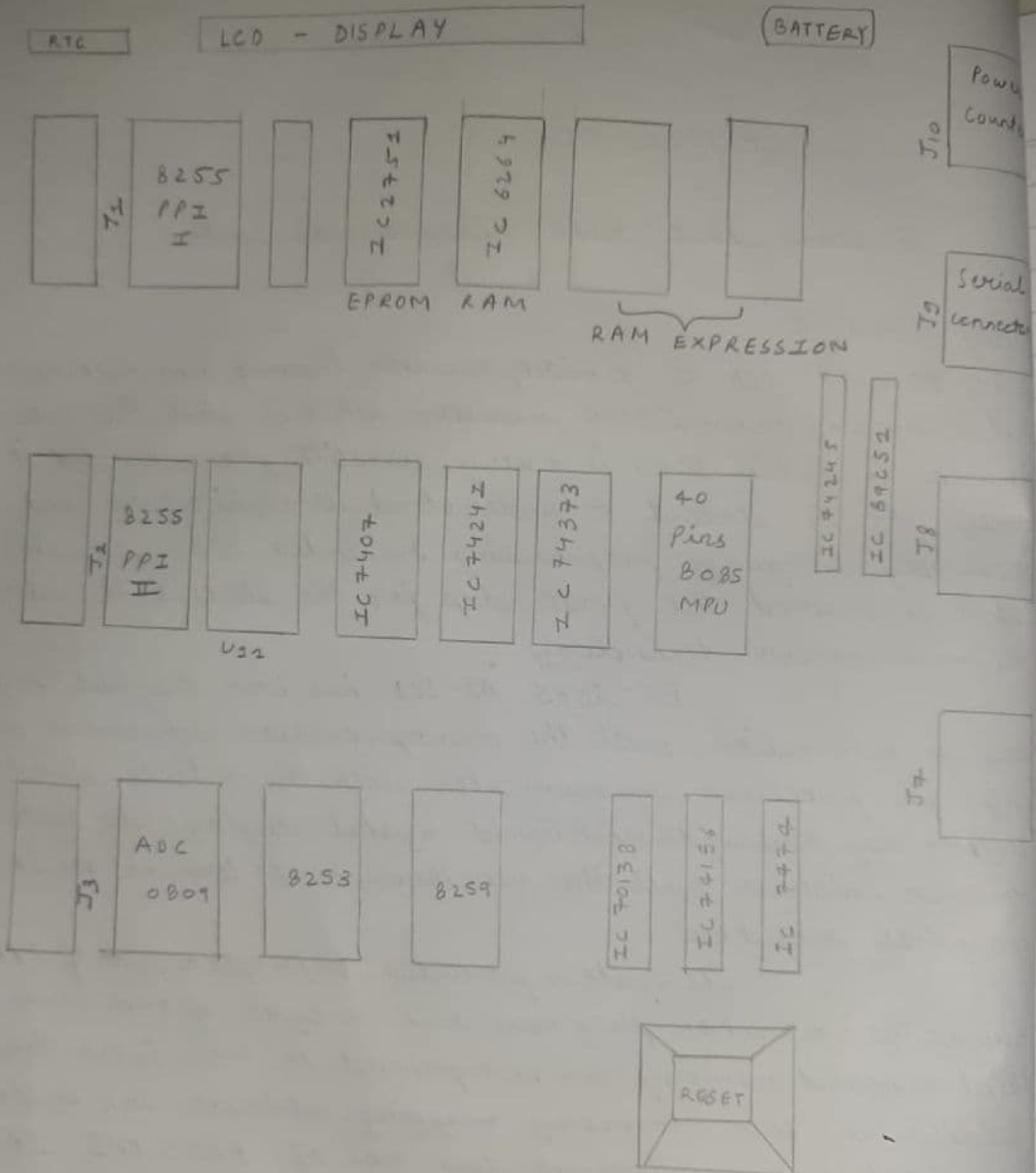
EXPERIMENT-1

AIM →
To study about 8085 microprocessor system

BRIEF INTRODUCTION →
ET-8085 AD-LCD is a microprocessor training cum development kit designed around 8085 processor which is still the most popular in India. 8085 is a very verstile processor and it is easy for the student to understand its architecture and assembly language programming. In India, 8085 processor is still considered the first step for the ~~step~~ student to ~~st~~ understand the microprocessor Technology.

ET-8085.AD-LCD has been designed to provide ease in interaction with the microprocessor and various peripheral chips. The processor communicates with the outside world through ~~a~~ 101/104 Key keyboards and Liquid Crystal displays. The system can also interact with the user through CRT terminal or IBM PC compatible computer. The system provides 8K/16K/32K byte of EPROM having the monitor program and 8K byte of RAM areas. The total on board memory can be expanded to 64K bytes through additional two memory mapping address. The system



RTC
LCD - DISPLAY
BATTERY
J10
8255 PPI I
J1
IC 6264
EPROM
RAM
RAM EXPRESSION
Serial
J9
IC 74245
IC 89C52
J8
8255 PPI II
J2
IC 7407
IC 74373
40 Pins 8085 MPU
J7
ADC 0809
J3
8253
8259
IC 74156
IC 7474
RESET

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provided 48 I/O through two no's of 8255 PPI. It has three 16 bit Timer/Counter using 8253. An Interface for CRT terminal or IBM compatible PC/AT is provided through serial interface.
An optional real time clock interface is also provided on board for the student to understand the RTC.

SYSTEM SPECIFICATIONS (HARDWARE) →

CPU	8 bit microprocessor the 8085
XTAR frequency	6.0144 MHz
RAM	8K / 32K byte with provision for battery backup for RAM
EPROM	16K / 32K byte of EPROM with the provision for expansion.
MEMORY	Total onboard capacity of 64K bytes
TIMER	Three 16 bit programmable counter using 8253.
I/O LINES	24 I/O lines expandable to 48 I/O using two no's of 8255
SERIAL INTERFACE	RS 232 through SID & SOD Lines
OTHER INTERFACE	Real time clock (optional)
KEYBOARD	101/104 keys IBM PC compatible ASCII keyboard
DISPLAY	16X2 LCD Display (20X2 LCD Display - optional)

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BUS — All data, address, controll signals Available at 50 pin FRC connecter

POWER SUPPLY REQUIREMENT — (Optional) +5 V, 102 amp for the kit & Serial I/F

OPERATING TEMPERATURE — 0 to 50°C

INTRODUCTION TO HARDWARE

a) GENERAL →

The system has got 8085 as the CPU. The clock frequency for the system is 3.07 MHz and is generated from the crystal of 6014 4MHz

8085 has got 8 data lines and 16 address lines. The lower 8 address lines and 8 bit data lines are multiplied. Since the lower 8 address bit appears on the bus during the first clock cycle; it becomes necessary to catch the lower 8 bit (address) during the first clock cycle so that 16 bit address remains available is subsequent cycles. This is achieved using the latch 74-LS-373

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b) MEMORY →

ET-8085 LCD provides 2K/8K/32K byte of RAM using 6116/6264/62256 chips and 8K/16K/32K bytes EPROM for monitor using 2764/27128 or 27256. There are two extra memory sockets provide on the board of ET-8085 LCD for expansion. These socket can be defined any address slot from 400-DFFF depending upon the size of memory chip to be used The memory socket MEM-2 can be used to define 6264 (8K) 62256(32K) where as MEM J can be defined to have 2764/128/256 EPROM. The detail about these sockets and the way to select the mapping is explained in detail.

c) I/O DEVICES →

ET-8085 LCD uses 8255 and 8253 peripheral chips. The function of each of these chips is explained below –

i) 8255 (programmable peripheral interface)

8255 is programmable peripheral interface (PPI) designed to use with 8085 microprocessor. This basically acts ~~with~~ as a general purpose I/O device to interface with peripheral devices Since the function configuration of 8255 is programmd

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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 parts of 4 lines each namely port-C upper, the port-C lower. Any I/O line combination of PORT-A, PORT-B, PORT-C upper and PORT-C lower can be define using the appropriate software command. The port address for these ports. ET-8085 LCD provides 48 I/O port using 8255 chips.

ii) 8253 (programmable interval timer) can be used for the generation of accurate time delays under software control. This chips has got three independent 16 bit counter each having count rate of 2KHz. The first timer counter (i.e. counter 0) is being used for single step operation. However is connection are also brought to at connector spare I3. For single step operation Clk 0 signal of counter 0 is getting a clock a frequency of 105.35 MHz counters 1 & counter 2 are free for the user clock for the Clk 1, Clk 2 is to be given externally.

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d) DISPLAY → ET-8085 LCD provides 16 * 2 LCD Display. The Display device has a microcontroller sitting inside it. The system can also provide an optional 20 * LCD Display.

e) BUFFERS → The kit has all the address, data and control lines being buffered and brought the 50 pin connector to allow the user to further expand the system. The various study cards like 8255, 8257, 8253 - — etc. available from exel can be connected to this bus.

f) BATTERY BACKUP →
An optional battery backup circuit is provide-d on the board of the kit. The user can select the battery backup for the RAM by a jumper J9 as explained here.

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EXPERIMENT-2

AIM → TO study about 8086 microprocessor system.

BRIEF INTRODUCTION → ET-8086 is a single board advance microprocessor training configured around Intels 16-bit microprocessor 8086. This kit has been designed to operate in the war mode. The required co-processor 8087 and input output processor 8089 can be added on board. 8086 CPU can also be replaced by 8088 CPU.

Software commands like block move, Examine if substitute Memory / Register, Fill, Breakpoint single step etc. which are useful in debugging / developing software.

SYSTEM SPECIFICATION (HARDWARE)

→ CPU - 8086 16 bit Microprocessor operating in war mode or 8088, 8 bit Microprocessor.
→ Co-Processor - 8087 Numeric Data Processor
→ I/O - 8089 I/O processor
→ EPROM - 64K Byte of EPROM loaded with monitor expandable further using 27010
→ RAM - 32 K bytes of CMOS RAM expandable to 128K Bytes using 62256. 48 I/O lines.
→ I/O lines - 48 I/O lines
→ Serial - ETA Rs - 232-C through 8251
→ Interrupt - 8 ~~bit~~ different level interrupt through 8259.

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SYSTEM SPECIFICATIONS (HARDWARE)

- CPU - 8086 16 bit MP operating in max mode or 8086, 8 bit microprocessor
- Co-processor - 8087 Numeric Data Processor
- I/O - 8089 I/O Processor
- EPROM - 64K bytes of EPROM loaded with monitor expandable further 27010
- RAM - 32K bytes of CMOS RAM expandable to 128K bytes using 62256
- I/O lines - 48 I/O lines
- Serial - EIA RS-232-C through 8251
- Interrupts - 8 different level interrupt through 8254
  - Maskable - 1
  - Non-Maskable - 8
- TIMER/COUNTER - Three 16 bits timer/counter through 8253 other interfaced EPROM PROGRAMMER for 2764/27128/27256

  Analog to Digital ~~comput~~ converter on board

  Digital to Analog converter on board

  O/P relay

  O/P to Isolated Input

  Printer Interface (optional)

  Real time clock interface

  Speaker & logic probe Interface (option)

  cassette interface (optional

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- Keyboard and display - 104 keys ASCII Keyboard (IBM compact) 16*2 LCD Display by default or 20×4

- BUS - All address, data and control signal are available at edge ~~corner~~ connector as per MultiBus
- Power supply - 5V, 2.0 amp for kit and serial operation
- Temperature - 0 - 50°C

INTRODUCTION TO HARDWARE

a) Microprocessor - 8086 is a 16-bit, third generation microprocessor and is suitable for an ~~Expe~~ exceptional wide spectrum of micro-computer applications. This flexibility is one of its most outstanding characteristics.

8086 has got 16 data lines and 20 address line

The INTER, TEST & Hold inputs to 8086 are pulled down & are brought out at PCB FRC connector

b) Co-Processor 8087 - The 8087 co-processor 'hooks' have been designed into the 8086 and 8088 so that this type of processor can be accomodated in the future. A co-processor differ from an independent processor in that it obtains its instructions from another processor

called no xl.

c) I/O PROCESSOR 8089: The 8086 and 8088 are designed to be used with the 8089 in high performance I/O application. The 8089 is conceptually ressemble a microprocessor with two DMA channels. and an instructions set specifically tailed for I/O operation

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EXPERIMENT-3

AIM- WAP to add two nos

APPARATUS - 8085 AD LCD MPU, Keyboard

PROGRAM-

Memory Address	Label	Mnemonics	Operand	Comments
2000		MVI	A23H	Load 23H to Accumulator
2002		MVI	A44H	Load 44H to Register B
2004		ADD	B	Add the content of B to A and store in A
2005		RST	5	Software interrupt
2006		HLT		Terminate the Instruction in user program

Observation

Input - A ← 23H B ← 44H

Output - A ← 67H flag ← 00H

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EXPERIMENT-4

AIM → WAP to subtract two hexadecimal unsigned no.

APPARATUS – 8085 AD LCD MPU, Keyboard

PROGRAM –

Memory Address	Label	Mnemonics	Operands	Comments
2000		MVI	A67H	Load 67H to accumulator
2002		MVI	B23H	Load 23H to register B
2004		SUB	B	Subtract the content of B from A and Start in A
2005		RST	5	Software Interrupt
2006		HLT		terminate the instruction in user program

Observation –

Input : A ← 67H ; B ← 23H

Output : A ← 44H ; flag ← 144

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EXPERIMENT-5

AIM → WAP to add two unsigned no. which is stored in memory location and result should be stored in next location

APPARATUS → 8085 AD LCD MPU, Keyboard

PROGRAM

Memory Address	Mnemonics	Operand	Comments
2000	LXI	H2050	Load the address 2050 into the reg. pair H-L
2003	MOV	A, M	Copy the data from mem. location to accumulator
2004	INX	H	increment mem. location
2005	ADD	m	Add the content of mem. location to content of A and store it back into A
2006	DAA		Convert the content of Accumulator to decimal
2007	INX	H	increment mem. location
2008	MOV	m, A	copy the content

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2009	RST	5	Of A to memory location program interrupt
200A	HLT		End

Observation

Input — [2050] ← 99, [2051] ← 99

Output - [2052] ← 198 flag ← B3

Byte code

2000	21, 50, 20
2003	7E
2004	23
2005	86
2006	27
2007	23
2008	77
2009	EF
200A	22

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EXPERIMENT-6

AIM → To find the largest no. among 3 data which is stored in consecutive memory location using loop technique, result should be stored in consecutive memory location.

PROGRAM →

Memory Address	Mnemonics	Operand	Comments
2000	LXI	H2070	load the address 2070 into register pair HL
2003	MVI	C02	copy immediate data to C
2005	MOV	A,m	move the value from memory to Accumulator
LOOP 2006	INX	H	increment the memory address of HL pair
2007	CMP	m	compare the memory value to accumulator value.
2008	JNC	200C	Jump to address 200C if carry is 0
200B	MOV	A,M	move memory value to accumulator
AHEAD 200C	DCR	C	Decrement the value of register C
200D	JNZ	2006	Jump to 2006 is Zero flag is reset

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2010	INK	H	Increment the memory address.
2011	MOV	M, A	move accumulator value to memory
2012	RST	5	Program interrupt
2013	END		end Program

Input - 2070; 23H 2071: 52H 2072: 33H

Output - flag 54 2072: 52 using DB
↓
data bit

Byte	code
2000	21, 60, 20
2003	06 02
2005	7F
2006	23
2007	BE
2008	DA 0C 20
200B	7F
200C	05
200D	C2 06 20
2010	23
2011	23
2012	17

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EXPERIMENT - 7

AIM → To find the smallest number among 3 store in consecutive memory location

APPARATUS → 8085 AD, LCD, MPU, Keyboard.

PROGRAM →

Memory Address	Mnemonics	Operand	Comment
2000	LXI	2070H	Load the address 2070 Into register pair H-L
2003	MVI	02	Copy immediate data to register C
2005	MOV	A,M	move value from memory to Accumulator
2006	INX	H	increment the memory Value
2007	CMP	M	compare the memory value to A
2008	JC	200C	Jump to address 200C if carry flag is set.
200B	MOV	A,M	move memory value to A.
200C	DCR	C	Decrement the value of Register C

Byte	code
2000	21 50 20
2003	06 02
2005	7E
2006	23
2007	BE
2008	02 0C 20
200B	7E
200C	05
200D	C2 06 2D
2010	23
2011	77
2012	EF

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200B	JNZ	200C	Jump to 200B if Zero flag is reset
2010	INX	H	Increment the memory address
2011	MOV	M, A	Move A value to memory
2012	RST	5	program interrupt
2013	END		End Program

Observation

Input → 2070: 23H 2071: 52H 2072: 33H

Output → flag 2073: 23H

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EXPERIMENT -8

AIM → WAP to write three no. in ascending number

APPARATUS → 8085AD, LCD, MPU, Keyboard.

PROGRAM →

Memory Address	Label	Mnemonics	Operand	Comments
2000	START	LXI	H 2050	Load 2050 in H-L pair
200		MVI	D00	Move 00H to register D
2005	CHECK	MVI	C02	Move 02H to register C
2007		MOV	A,M	Move value from memory to A
2008		INX	H	Increment memory address
2009		CMP	m	Compare memory to A
200A		JC	FORWARD	Jump to forward if carry flag set
200D		MOV	B,M	Move memory value to B register
200E		MOV	M,A	move A toward A

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200F	DCX	H	Decrement memory address
201A	JC	2000	Jump to 2000 on carry
201D	RST	5	restart 5
201E	End	5	End

Observation

Input 2050 16 2501
2051 End

Output 2050 01
2051 25

Byte

2000 → 21
2001 → 50
2002 → 20
2003 → 16
2004 → 00
2005 → 0E
2006 → 02
2007 → 7E
2008 → 23
2009 → BE
200C → 14
200A → 0A
200D → 46
200E → 77
200F → 2B
2010 → 70
2011 → 23
2012 → 01
2013 → 01
2014 → 00
2015 → C2
2016 → 17
2017 → 20
2018 → 7F
2019 → 0F
201A → BA
201B → DO
201E → 20
201E → 22

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EXPERIMENT-9

AIM → WAP to find the smallest no. among three data which is stored on consecutive memory.

Apparatus - 8085 ; Excel Tech Training Kit

Program →

Memory Address	LABEL	Menomics	Operand	Comments
2000		LXI	H2070	Load 2070 in H-L
2003		MVI	B,02	Load 02 to B
2005		MOV	A,M	Load the data of 2000 in A
2006	LOOP	INX	H	increment the value of H-L
2007		CMP	M	compare data at memory location
2008		JC	200C	Jump at 2000 if carry generated
~~200B~~		~~MOV~~	~~200C~~	
200B		MOV	A,M	Load data to A
200C	AHEAD	DCR	B	Decrement B
		JNZ	2006	Jump on 2006 if zero
2010		INX	H	increment H-L
2011		MOV	M,A	Copy content of A in memory

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2012 RST 5 Restart 5

2013 END End program

Observation

Input → 2070 → 23
2071 → 52

Output → 2072 → 33
2073 → 23
flag → 54H

Byte	Code
2000	21 50 20
2003	06 07
2005	7E
2006	23
2007	BE
2008	02 0C 20
200B	7E
200C	05
200D	02 06 20
2010	23
2011	23
2012	EF

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EXPERIMENT - 10

AIM → WAP to sort n no in ascending order

APPARATUS → E-T - 8085 - LCD

PROGRAM →

mory dress	Label	Mnemonics	Operand	Comment
00	START	LXI	H2050	Move 2050 to H-L
003	S	MVI	D00	Move 00 to D
005		MVI	C02	Move 02 to C
007	CHECK	MOV	A,M	move M to A
2008		INX	H	Increment H-L
2009		CMP	M	Compare the content of M with A
200A		IC	2014	Jump to 2014 in Carry
200D		MOV	B,M	Move M to B
200E		MOV	M,A	Move A to M
200F		DCX	H	Decrement H-L
2010		MOV	M,B	move M to B
2011		INX	H	Increment H-L
2012		MVI	D01	Move 01 to D
2014		DCR	C	Decrement C
2015		JNZ	2007	Jump to 2007 on non-Zero
2018		MOV	A,D	Move D to A
2019		RRC		Restart Right with carry

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2010		MOV	M,B	move value to B from memory
2011		INX	H	increment memory
2012		MVI	D01	Move 01 to D
2014	FORWARD	DCR	C	Decrement C
2015		JNZ	Check	Jump 2007 to non-zero
2018		MOV	A,D	move D to A
2019		RRC		Right state with carry
201A		JC	START	Jump to 2000 on carry
2010		RST	5	Restart 5
201E		END		End

Observation

Input - 2050 0625 01
2051 END

Output - 2050 01
2051 25

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Byte	Code
2000	21
2001	50
2002	20
2003	16
2004	00
2005	DE
2006	02
2007	7E
2008	23
2009	BE
200A	OD
200C	14
200D	46
200E	77
200F	2B
2010	70
2011	23
2012	16
2013	01
2014	00
2015	C2
2016	17
2017	20
2018	7A
2019	0A
201A	00
201B	20
201C	21
201E	22