INSTITUTE OF ENGINEERING

ADVANCED COLLEGE OF ENGINEERING AND MANAGEMENT
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ADVANCED COLLEGE
OF ENGINEERING & MANAGEMENT

LAB REPORT

SUBJECT : Instrumentation (II)

LAB NO : 03

SUBMITTED BY:

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DATE :

SUBMITTED TO:

Department of Computer and Electronics

TITLE: Seven Segment Display Interface with 8255 PPI.

OBJECTIVE:

-> To interface the seven segment display with 8255 PPI using 8085 microprocessor.

THEORY

Interfacing a 7-segment display with the 8255 Programmable Peripheral Interface (PPI) using an 8085 microprocessor is a common task in microcontroller-based projects. The 8255 PPI acts as an I/o expander and allows us to connect peripheral devices, such as the 7-segment display, to the microprocessor. The 7-segment display is used to display numeric digit from 0 to 9.

A 7-Segment display is a common type of electronic display device that can represent decimal numbers and some basic alphanumeric characters using seven individually controllable segment. Each segment is typically labelled a, b, c, d, e, f, and g. The eighth segment is sometimes referred to as decimal point, and the display is called a 7-segment plus decimal point display.

The segments of a 7-segment display are arranged in a pattern that allows us to create digits and some letters by selectively turning on or off the individual segments. To display a specific digit, we need to activate the corresponding segments by providing appropriate control signals.

There are two common types of 7-segment displays based on how the segments are connected:

1) Common Cathode (CC) 7-Segment display

2) Common Anode (CA) 7-Segment display

Common ~~Cathode~~ Anode

In this type, all the anodes (positive terminals) of the LEDs are connected together and usually connected to a positive voltage (V_{cc}). To turn on a particular segment, we need to apply Low voltage (GND) to its corresponding Cathode. (negative terminal).

Common Cathode

In this type, all the ~~anodes~~ cathodes (~~positive~~ negative terminals) of the LEDs are connected together and usually connected to ground (GND). To turn on the particular segment, we need to apply ~~High~~ HIGH voltage to its corresponding anode (positive terminal).

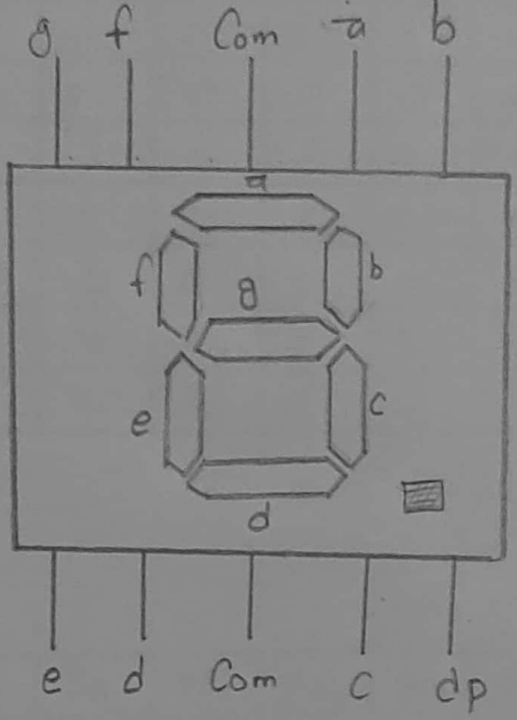


Fig: 7-Segment Display

PA	PPI- Pin	7-Segment
0	21	a
1	22	b
2	19	c
3	20	d
4	17	e
5	18	f
6	15	g
7	16	Com

* Common Anode : logic 1
* Common Cathode : logic 0

Common Cathode

Digit	PA_7	PA_6	PA_5	PA_4	PA_3	PA_2	PA_1	PA_0	Hex
	Com.	g	f	e	d	c	b	a	Value
0	0	0	1	1	1	1	1	1	3F
1	0	0	0	0	0	1	1	0	06
2	0	1	0	1	1	0	1	1	5B
3	0	1	0	0	1	1	1	1	4F
4	0	1	1	0	0	1	1	0	66
5	0	1	1	0	1	1	0	1	6D
6	0	1	1	1	1	1	0	1	7D
7	0	0	0	0	0	1	1	1	07
8	0	1	1	1	1	1	1	1	7F
9	0	1	1	0	1	1	1	1	6F

Common Anode

Digit	PA_7	PA_6	PA_5	PA_4	PA_3	PA_2	PA_1	PA_0	Hex
	Com.	g	f	e	d	c	b	a	Value
0	1	1	0	0	0	0	0	0	C0
1	1	1	1	1	1	0	0	1	F9
2	1	0	1	0	0	1	0	0	A4
3	1	0	1	1	0	0	0	0	B0
4	1	0	0	1	1	0	0	1	99
5	1	0	0	1	0	0	1	0	92
6	1	0	0	0	0	0	1	0	82
7	1	1	1	1	1	0	0	0	F8
8	1	0	0	0	0	0	0	0	80
9	1	0	0	1	0	0	0	0	90

Q) WAP to display 8 in 7-Segment display.

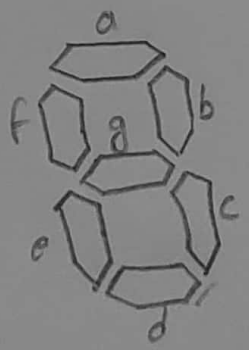
Memory Address	Instruction	Opcode / Operand
8000	MVI A, 80 H;	3E
8001		80
8002	OUT 83H ;	D3
8003		83
8004	MVI A, 7F H;	3E
8005		7F
8006	OUT 80 H;	D3
8007		80
8008	RST 5;	EF

OUTPUT / REMARKS

Control Word → 80 H

7-Segment Display Type → Common Cathode type

The program demonstrated effective interfacing of 7-segment display, accomplishing the desired task of displaying the digit 8. The display type and the control word are mentioned above.



All segment LED glowed.

Q) WAP to display 0 to 9 and then 9 to 0 in 7-Segment display. Introduce delay between two numbers.

Memory Address	Hex. Values
C050	3F
C051	06
C052	5B
C053	4F
C054	66
C055	6D
C056	7D
C057	07
C058	7F
C059	6F
~~C05A~~	

* Table containing the Hex Codes for the 7-Segment-display

Memory Address	Instruction	Opcode / Operand
8019	MVI E, FFH;	1E
801A	.	FF
801B	MVI D, FFH;	16
801C	.	FF
801D	DCR D;	15
801E	JNZ 801D;	C2
801F	.	1D
8020	.	80
8021	DCR E;	1D
8022	JNZ 801B;	C2
8023	.	1B
8024	.	80
8025	RET	C9

* Submodule for the delay

* Main program

Memory Address	Instruction	Opcode/ Operand.
9000	MVI A, 80H;	3E
9001	.	80
9002	OUT 83H;	D3
9003	.	83
9004	LXI H, C050H;	21
9005	.	50
9006	.	C0
9007	MVI C, 0AH;	0E
9008	.	0A
9009	MOV A, M;	7E
900A	OUT 80H;	D3
900B	.	80
900C	CALL 8019;	CD
900D	.	19
900E	.	80
900F	DCR C;	0D
9010	JZ 9017;	CA
9011	.	17
9012	.	90
9013	INX H;	23
9014	JMP 9009;	C3
9015	.	09
9016	.	90
9017	MVI C, 0AH;	0E
9018	.	0A
9019	MOV A, M;	7E
901A	OUT 80H;	D3
901B	.	80
901C	CALL 8019;	CD
901D	.	19
901E	.	80
901F	DCR C;	0D

9020	JZ 9007;	CA
9021	.	07
9022	.	90
8023	DCX H;	2B
9024	JMP 9019;	C3
9025	.	19
9026	.	90
9027	RST 5;	EF

OUTPUT / REMARKS

Control WORD → 80H

7-Segment Display type → Common Cathode type

The program sucessfully displays the numbers 0 to 9 and then counts back down from 9 to 0 on a 8.7-Segment display. Each number is displayed with a short delay between them, creating a visually perceptible sequence. The program demonstrate an efficient way to control the segments of 7-segment display to represent different digits.

We first saved the hex-codes of the 7-segment in memory location starting from C050H, the delay subroutine starts from 8019 H meanwhile the mainprogram from 9000 H. The following was the output:

0 1 2 3 4 5 6 7 8 9 8 7 6 5 4 3 2 1

DISCUSSION AND CONCLUSION

With the reference to the theoretical knowledge regarding 8085 microprocessor, 8255 PPI and 7-segment display, we were able to meet our objective of interfacing them. We demonstrated the capabilities of interfaced setup by executing different programs.

Throughout the experiment, we sucessfully established the necessary connection between the 8085 microprocessor, 8255 PPI, and the 7-segment display. We used appropriate current-limitting resistors for each segment to ensure the longevity and safety of the display unit. Additionally, the correct addressing of the PPI ports was meticulously carried out to enable communication with 7-segment display. Moreover the type of 7-segment display used dictated the polarity of the signals we needed to apply to the segments. Careful attention was given to ensure that we connected the display correctly and appropriate adjustments were made in the program as necessary.

Overall, this lab was a valuable learning experience, providing us with hands-on knowledge of interfacing 7-segment displays and programmable peripheral interfaces with microprocessors. The skills acquired here will undoubtedly be instrumental in future projects involving microcontroller-based systems and further solidify our foundation.