SEVEN SEGMENT DISPLAY INTERFACE USING ALS KIT

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OBJECTIVE

To write an assembly language program to Interface a Seven Segment Display with the 8085 Microprocessor kit to perform various modes of display such as Still Display, Blinking Display and Moving Display

APPARATUS REQUIRED

- 8085 Microprocessor trainer kit.
- Display circuitry.
- Power supply.
- Flat Ribbon Cable.

DESCRIPITION

- Hexadecimal data corresponding to the Segment which has to glow latched using 8bit latch 74LS273.
- A logic`0` will turn `ON` the Segment specified and logic`1` will turn `OFF` the segment.
- BCD data for turning `ON` the display is latched through a 4bit latch 74LS175.
- The control bits A, B and C are decoded using 3 to 8 decoder 74LS138.

STILL DISPLAY

ALGORITHM

1.Initialize the port B and C as output ports by sending 80_H to the control word register.

2.Initialize HL register pair.

3.Move 00_H to accumulator and output it through port A.

4.Move 04_H to C register and 08_H to B register.

5.Move memory content to accumulator and output it through port C complement accumulator content and output it through port C. Decrement B register content by 1. It zero flag is set, go to step 5.

6.Increment HL register pair, decrement C register by 1. If zero flag is reset, go to step 4.

7.Stop the execution.

ASSEMBLY LANGUAGE PROGRAM

ADDRESS	LABEL	MNEMONICS	OPCODE/ OPERAND	COMMENT
C100		**MVI A,80 $_H$**	3E 80	Initialize all the ports as o/p ports.
C102		**OUT CWR**	D3 DB	Write contol word in CWR.
C104		**LXI H,C150 $_H$**	21 50 C1	Load the input sequence to

				be displayed.
C107		**MVI A,00 $_H$**	3E 00	Clear the accumulator and output it.
C109		**OUT PORTC**	D3 DA	
C10B		**MVI C,04 $_H$**	0E 04	Initialize number of characters (letters).
C10D	**YY**	**MVI B,08 $_H$**	06 08	Initialize the number of segments in the seven segment display for single character.
C10F	**XX**	**MOV A,M**	7E	Move the loaded memory content i.e. the recent data to accumulator .
C110		**OUT PORTB**	D3 D9	Output it through Port B.
C112		**RRC**	0F	Rotate the accumulator content right.
C113		**MOV M,A**	77	Move the accumulator content to memory.
C114		**MVI A,10 $_H$**	3E 10	Initialize accumulator and output it .
C116		**OUT PORTC**	D3 DA	
C118		**MVI A,00 $_H$**	3E 00	Clear the accumulator and output it.
C11A		**OUT PORTC**	D3 DA	
C11C		**DCR B**	05	Decrement the segment.
C11D		**JNZ XX**	C2 0F C1	Until all the segments are correspondingly enabled/disabled for a single character, continue looping.
C120		**INX H**	23	Get the next input character.
C121		**DCR C**	0D	Decrement the character count.
C122		**JNZ YY**	C2 0D C1	Until all the characters are inputted & displayed, continue looping.
C125		**HLT**	76	Stop the execution.

EXECUTION

LETTER	a	b	c	d	e	f	g	h	MEMORY LOCATION	HEX CODE
E	0	1	1	0	0	0	0	1	C150 $_H$	61 $_H$
S	0	1	1	0	0	0	1	1	C151 $_H$	63 $_H$
C	0	1	1	0	0	0	0	1	C152 $_H$	61 $_H$

S	0	1	0	0	1	0	0	1	C153 $_H$	49 $_H$

OUTPUT

S	C	S	E

MOVING DISPLAY

ALGORITHM

1.Initialize stack pointer.
2.Initialize the control word for 8255.
3.Initialise HL register pair.
4.Move 05 to C register and 08 to B register.
5.Output accumulator content through port B.
6.Rotate accumulator right through carry.
7.Move accumulator content to memory.
8.Clear accumulator content and output it through port C.
9.Complement accumulator content and decrement B register content.
10.Jump if no zero to step 4.
11.Call delay subroutine and decrement C register content.
12.Jump if no zero to step 2 and jump to step 3.

ASSEMBLY LANGUAGE PROGRAM

ADDRESS	LABEL	MNEMONICS	OPCODE/ OPERAND	COMMENT
C000		**LXI SP,C100 $_H$**	31 60 C1	Initialize the stack pointer.
C003		**MVI A,80 $_H$**	3E 80	Initialize all the ports as o/p ports.
C005		**OUT CWR**	D3 DB	
C007	**ZZ**	**LXI H,C150 $_H$**	21 50 C1	Load the input sequence to be displayed.
C00A		**MVI A,00**	3E 00	Clear the accumulator and output it.
C00C		**OUT PORTC**	D3 DA	
C00E		**MVI C,08 $_H$**	0E 08	Initialize number of characters (letters).
C010	**YY**	**MVI B,08 $_H$**	06 08	Initialize the number of segments in the seven segment display for single character.
C012	**XX**	**MOV A,M**	7E	Move the loaded memory content i.e. the recent data to accumulator .
C013		**OUT PORTB**	D3 D9	Output it through Port B.

C015		**RRC**	0F	Rotate the accumulator content right.
C016		**MOV M,A**	77	Move the accumulator content to memory.
C017		**MVI A,01**	3E 01	Initialize accumulator and output it .
C019		**OUT PORTC**	D3 DA	
C01B		**MVI A,00 $_H$**	3E 00	Clear the accumulator and output it.
C01D		**OUT PORTC**	D3 DA	
C01F		**DCR B**	05	Decrement the segment.
C020		**JNZ XX**	C2 12 C0	Until all the segments are correspondingly enabled/disabled for a single character, continue looping.
C023		**INX H**	23	Get the next input character.
C024		**CALL DELAY**	CD 2E C0	Call delay subprogram in order to make the display visible.
C027		**DCR C**	0D	Decrement the character count.
C028		**JNZ YY**	C2 10 C0	Until all the characters are inputted & displayed, continue looping.
C02B		**JMP ZZ**	C3 07 C0	Repeat the process.
C02E	**DELAY**	**PUSH B**	C5	Delay subprogram is used to create a time delay in order to make the display visible.
C02F		**MVI B,05 $_H$**	06 05	
C031	**DEL2**	**LXI D,FFFF $_H$**	11 FF FF	
C034	**DEL1**	**DCX D**	1B	
C035		**MOV A,E**	7B	
C036		**ORA D**	B2	
C037		**JNZ DEL1**	C2 34 C0	
C03A		**DCR B**	05	
C03B		**JNZ DEL2**	C2 31 C0	
C03E		**POP B**	C1	
C03F		**RET**	C9	

EXECUTION

LETTER	a	b	c	d	e	f	g	h	MEMORY LOCATION	HEX CODE
C	0	1	1	0	0	0	1	1	C150 $_H$	63 $_H$
E	0	1	1	0	0	0	0	1	C151 $_H$	61 $_H$
P	0	0	1	1	0	0	0	1	C152 $_H$	31 $_H$

A	0	0	0	1	0	0	0	1	C153 $_{H}$	11 $_{H}$
	1	1	1	1	1	1	1	1	C154 $_{H}$	FF $_{H}$
	1	1	1	1	1	1	1	1	C155 $_{H}$	FF $_{H}$
	1	1	1	1	1	1	1	1	C156 $_{H}$	FF $_{H}$
	1	1	1	1	1	1	1	1	C157 $_{H}$	FF $_{H}$

OUTPUT

A	P	E	C
	A	P	E
		A	P
			A
C			
E	C		
P	E	C	
A	P	E	C

BLINKING DISPLAY

ALGORITHM

1.Initialize stack pointer.
2.Intialise the control word for 8255.
3.Initialise HL register pair,
4.Move 05 to C register and 08 to B register.
5.move memory content to accumulator and Output accumulator content through port B.
6.clear accumulator content and output it.
7.Complement accumulator content and output it through port C .
8.Decrement B register content and jump if no zero to step 6.
9.Increment HL pair and call delay subroutine.
10.Decrement C register content and jump if no zero to step 5.
11.Jump to step 3.

ASSEMBLY LANGUAGE PROGRAM

ADDRESS	LABEL	MNEMONICS	OPCODE/ OPERAND	COMMENT
C100		**MVI A,80 $_H$**	3E 80	Initialize all the ports as o/p ports.
C102		**OUT CWR**	D3 DB	
C104	**REP**	**LXI H,C150 $_H$**	21 50 C1	Load the input sequence to be displayed.
C107		**MVI E,03 $_H$**	1E 03	Initialize alternative sequence for blinking.
C109	**LP3**	**MVI C,04 $_H$**	0E 04	Initialize number of characters (letters).
C10B	**LP2**	**MVI B,08 $_H$**	06 08	Initialize the number of segments in the seven segment display for single character.
C10D	**LP1**	**MVI A,00 $_H$**	3E 00	Clear the accumulator and output it.
C10F		**OUT PORTC**	D3 DA	
C111		**MOV A,M**	7E	Move the loaded memory content i.e. the recent data to accumulator .
C112		**OUT PORTB**	D3 D9	Output it through Port B.
C114		**RRC**	0F	Rotate the accumulator content right.
C115		**MOV M,A**	77	Move the accumulator content to memory.
C116		**MVI A,01 $_H$**	3E 01	Initialize accumulator and output it .
C118		**OUT PORTC**	D3 DA	
C11A		**DCR B**	05	Decrement the segment.
C11B		**JNZ LP1**	C2 0D C1	Until all the segments are correspondingly enabled/disabled for a single character, continue looping.
C11E		**INX H**	23	Get the next input character.
C11F		**DCR C**	0D	Decrement the character count.
C120		**JNZ LP2**	C2 0B C1	Until all the characters are inputted & displayed, continue looping.
C123		**CALL DELAY**	C2 2D C1	Call delay subprogram.

C126		**DCR E**	1D	Decrement the alternative sequence display.
C127		**JNZ LP3**	C2 09 C1	Loop until not zero.
C12A		**JMP REP**	C3 04 C1	Repeat the process.
C12D	**DELAY**	**PUSH D**	05	Delay subprogram.
C12E		**LXI D,FFFF$_H$**	11 FF FF	
C131	**DEL1**	**DCX D**	1B	
C132		**MOV A,F**	7B	
C133		**ORA D**	B2	
C134		**JNZ DEL1**	C2 31 C1	
C137		**POP D**	D1	
C138		**RET**	C9	

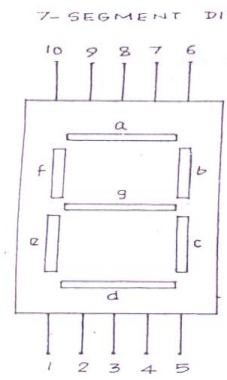
EXECUTION

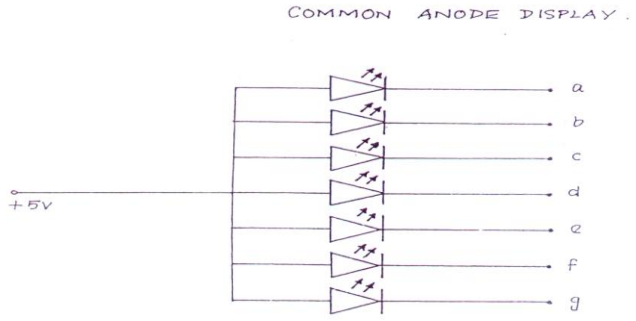
LETTER	a	b	c	d	e	f	g	h	MEMORY LOCATION	HEX CODE
C	0	1	1	0	0	0	1	1	C150 $_H$	63 $_H$
E	0	1	1	0	0	0	0	1	C151 $_H$	61 $_H$
P	0	0	1	1	0	0	0	1	C152 $_H$	31 $_H$
A	0	0	0	1	0	0	0	1	C153 $_H$	11 $_H$
E	0	1	1	0	0	0	0	1	C154 $_H$	61 $_H$
S	0	1	1	0	0	0	1	1	C155 $_H$	63 $_H$
C	0	1	1	0	0	0	0	1	C156 $_H$	61 $_H$
S	0	1	0	0	1	0	0	1	C157 $_H$	49 $_H$
D	1	0	0	0	0	1	0	1	C158 $_H$	85 $_H$
O	0	0	0	0	0	0	1	1	C159 $_H$	03 $_H$
O	0	0	0	0	0	0	1	1	C15A $_H$	03 $_H$
G	0	1	0	0	0	0	1	1	C15B $_H$	43 $_H$

OUTPUT

A	P	E	C
S	C	S	E
G	O	O	D
A	P	E	C

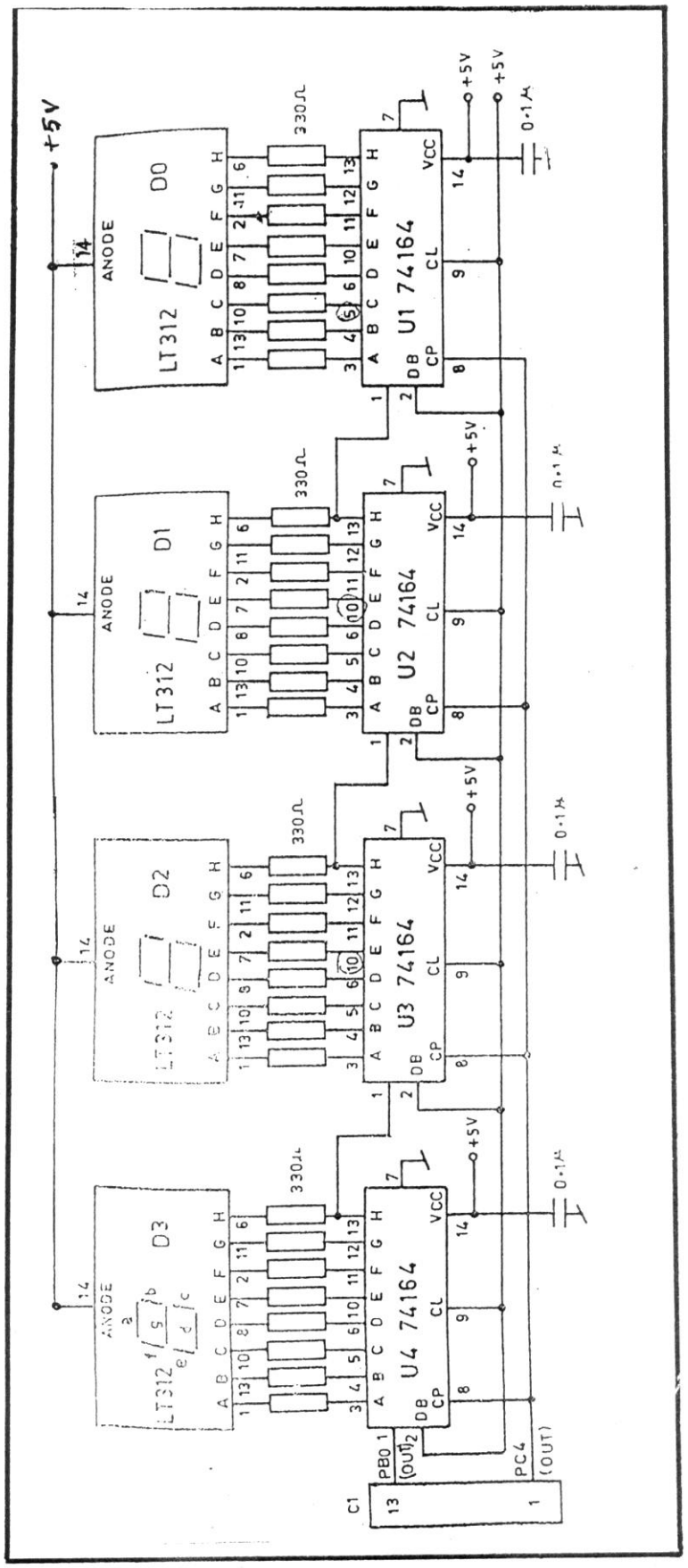
DISPLAY





CIRCUIT DIAGRAM

SEVEN SEGMENT DISPLAY INTERFACE



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