User's Manual

FOR

ET-DIS
SEVEN SEGMENT DISPLAY

SEVEN SEGMENT DISPLAY INTERFACE

The display interface module will demonstrate to the student as have a display device can be connected to a Microprocessor based system through I/O line. The various other techniques used for interfacing the displays are also discussed in brief.

GENERAL

In most of the Microprocessor based systems certain Input devices are required for the man and machine communication. The various output devices used are displays, printer plotters etc. Seven-segment display is used quite offtenlly to display the information processed by Microprocessor. There are various ways to connect; the seven segment displays to the Microprocessor based systems. Some of these methods are explained here.

A) Direct Drive of Seven Segment Displays.

In this technique the Microprocessor outputs the data for each seven segment LED to an Output port. This data is given to the displays through a BCD to 7 segment decoder driver. This method involves excessive hardware cost when the number of display is large in number.   \   \

B) DECODER TECHNIQUE

Using a latch decoder driver for each digit of display can reduce the disadvantage of the above technique. The data input lines of each latch decoder driver are connected parallel to 8 output lines of the Microprocessor. An address decoder enables each latch decoder driver. A digit can thus be set by sequentially outputting the digit and address, enabling and thus disabling the decoder.

C) Multiplexing Technique: -

Multiplexing can be done in the two ways. Software multiplexing and hardware multiplexing. A multiplexing technique brings the advantage of hardware reduction. In This technique, all the seven segments of the displays are connected in parallel to the output of BCD to 7-segment decoder driver. A decoder who gets I. E (digit address) from the Microprocessor enables the anode points of these displays.

A mono shot CKT generates a pulse, which interrupts the Microprocessor, and at the same time latches the digit address. In the interrupt subroutine the address of the next digit the corresponding digit as well as a pulse of triggering the mono shot are outputted. One major disadvantage of this method is that the Microprocessor must service the display every milli sec. The interrupt must therefore be given a high priority.

This condition may not be possible in the cases where real time processing is required.

D) Display using shift Registers.

In this method, the data to be displayed is shifted through shift register using software. The circuit diagram attached shows technique clearly.

This method has the advantage that the hardware is relatively simple and only four lines are required for the interface. Moreover any segment combination can be displayed since the coding is done by software.

EXERCISE: -

The student can perform following experiments using this module.

1. Interface the display circuit with the Microprocessor through I/O lines. The display information should be stored in the RAM area in the from of HEX code.

2. Repeat the above exercise with the display information stored in The RAM area in the from of seven segment code.

3. Solve any other problem in which information has flashed on the display.

EXERCISE -I

The first of the three exercises listed above is solved here.

SETUP FOR THE EXPERIMENT

This explanation as well as the explanation of the Program under the heading " Description of the Program" is for 8085 LED Kit. However if you are interfacing the Display Module to other Kits, then also refer to the specific instruction before the program listing for that particular Kit also

1) Connect the ET-DIS interfacing module to the 8255-1 port connector of the kit using 26-pin flat FRC cable. The pin No.1 of the connector on the module as well as the kit is marked. Please ensure that the pin no. 1 of the connector is connected to pin no. 1 of the module.

2) Connect the +5V,GND to the Module either through the Kit or Externally.

3) Enter the program given below from the memory location mentioned in the program.

4) Execute the program.

5) The message **GOOD** is displayed in the seven segment Display

DESCRIPTION OF THE PROGRAM:-

Port B and port C are defined as output ports. The information to be displayed is stored in the RAM area location 2100 onwards in the hexadecimal from. The data displayed is " G, O, O, D". The data (32 bits of information) is sent serially at 0 bit of port B. In order to light any segment of the seven-segment display a 0 is to be sent at PB0 for the corresponding bit. The control signal in the from of clock is sent through the PC0 line of port C. Any segment combination can be displayed since the coding is done by software. In order to give feeling of how the data is shifted through register a delay of 0.5 sec is given after the transfer of every 8 bit (ie. Each character).

NOTE: - Listing of program for various models of Microprocessor and Micro controller kits is given below. Please select the model of kit being used before entering the program into the kit.

LISTING OF THE PROGRAM FOR SEVEN SEGMENT DISPLAY MODULE (ET-DIS) TO INTERFACE **WITH 8085 KIT HAVING LED DISPLAY**

ADDRESS	OBJECT	LABEL	MNEMONICS	REMARKS
2000	3E 80		MVI A, 80	
2002	D3 03		OUT 03	Specify the ports (all ports being output).
2004	16 20	BLCNT	MVI D, 20	Initialize counter for Blanking.
2006	3E 00	LOOP	MVI A, 00	
2008	D3 02		OUT 02	
200A	3E FF		MVI A, FF	Blank code in ACC.
200C	D3 01		OUT 01	
200E	3E 01		MVI 01	Positive triggering (CLK going high). At CLK input.
2010	D3 02		OUT 02	
2012	15		DCR D	Decrement the counter.
2013	C2 06 20		JNLOOP	Check counter (BLCNT) not zero continue looping.
2016	C3 19 20		JMP 2019	ELSE Go to 2019
2019	21 00 21		LXI D, 2100	Load HL with character counter.
201C	0E 04	CHCNT	MVI 04	Initialize the character counter.
201E	06 08	BTCNT	MVI B. 08	Initialize counter. Initialize the bit counter.
2020	56		MOV A. M	Bring the first character code in ACC.

2021	3E 00		MVI A, 00	Clock is initialized low.
2023	D3 02		OUT 02	
2025	7A		MOV A, D	Character is outputted.
2026	07		RLC	
2027	57		MOV D, A	
2028	17		RAL	
2029	D3 01		OUT 01	
202B	3E 01		MVI 01	CLK is made high from low state (positive triggering)
202D	D3 02		OUT 02	
202F	05		DCR B	BTCNT Decrement.
2030	C2 21 20		JNZ 2021	Check BTCNT not zeros - continue looping. Else follow the rest instruction.
2033	11 00 00		LXI D	
2036	CD BC 03		CALL Delay	Delay of 0.5 sec.
2039	23		INX H	Next character code is pointed
203A	0D		DCR C	Decrement the CHCXT
203B	C2 1E 20		JNJ BICNT	Check CHCNT, not zero- continue looping
203E	EF		RST 5	Back to monitor.
Now enter the data for displaying at address 2100 onward				

2100	A1	2101	C0
2102	C0	2103	82

Note: - On executing the program from Address 2000, the Message GOOD is displayed on the seven segment. The Data enters the display from left hand side and moves to the RHS

LISTING OF THE PROGRAM FOR SEVEN SEGMENT DISPLAY MODULE (ET-DIS) TO INTERFACE WITH 8085 KITS HAVING LCD DISPLAY

Connect the J1 of the Kit to the Module through 26 Pin FRC Cable. Ensure that the pin-1 of the J1 at the Kit end is connected to the pin-1 of the Module connector. Enter the program from address 2000. Execute the program from address 2000.

ADDRESS	OBJECT	LABEL	MNEMONICS	REMARKS
2000	3E 80		MVI A, 80	
2002	D3 03		OUT 03	Specify the ports (all ports being output).

2004	16 20	BLCNT	MVI D, 20	Initialize counter for Blanking.
2006	3E 00	LOOP	MVI A, 00	
2008	D3 02		OUT 02	
200A	3E FF		MVI A, FF	Blank code in ACC.
200C	D3 01		OUT 01	
200E	3E 01		MVI 01	Positive triggering (CLK going high). At CLK input.
2010	D3 02		OUT 02	
2012	15		DCR D	Decrement the counter.
2013	C2 06 20		JNLOOP	Check counter (BLCNT) not zero continue looping.
2016	C3 19 20		JMP 2019	ELSE Go to 2019
2019	21 00 21		LXI D, 2100	Load HL with character counter.
201C	0E 04	CHCNT	MVI C04	Initialize the character counter.
201E	06 08	BTCNT	MVI B, 08	Initialize counter, Initialize the bit counter.
2020	56		MOV A, M	Bring the first character code in ACC.
2021	3E 00		MVI A, 00	Clock is initialized low.
2023	D3 02		OUT 02	
2025	7A		MOV A, D	Character is outputted.
2026	07		RLC	
2027	57		MOV D, A	
2028	17		RAL	
2029	D3 01		OUT 01	
202B	3E 01		MVI 01	CLK is made high from low state (positive triggering)
202D	D3 02		OUT 02	
202F	05		DCR B	BTCNT Decrement.
2030	C2 21 20		JNZ 2021	Check BTCNT not zeros - continue looping. Else follow the rest instruction.
2033	11 00 00		LXI D	
2036	CD A6 03		CALL Delay	Delay of 0.5 sec.
2039	23		INX H	Next character code is pointed
203A	0D		DCR C	Decrement the CHCNT
203B	C2 1E 20		JNZ Btcnt	Check CHCNT, not zero- continue looping
203E	EF		RST 5	Back to monitor.

Now enter the data for displaying at address 2100 onward

2100	A1	2103	82
2101	C0	2104	----
2102	C0	2105	----

Note: - On executing the program from Address 2000, the Message GOOD is displayed on the seven segment. The Data enters the display from left hand side and moves to the RHS.

LISTING OF THE PROGRAM FOR SEVEN SEGMENT DISPLAY MODULE (ET-DIS) TO INTERFACE **WITH 8086 KITS HAVING LCD DISPLAY**

Connect the J2 of the Kit to the Module through 26 Pin FRC Cable. Ensure that the pin-1 of the J2 at the Kit end is connected to the pin-1 of the Module connector. Enter the program from address 1000:0100. Execute the program from address 1000:0100.

This program when executed will display characters 0,1,2,3 on the Display. If the Data at location 0000:1300 is changed , then the display will change accordingly

ADDRESS	OP-CODE	LABEL	MNEMONICS	COMMENT
1000:0100	8C D8	START	MOV AX,DS	Initialize 8255 Port's
102	8E D8		MOV DS,AX	B & C as O/P
104	B0 80		MOV AL,80	
106	BA 07 88		MOV DX,8807	
109	EE		OUT DX,AL	
10A	B7 04		MOV BH,04	No of Digits to be displayed
10C	BE 00 13		MOV SI,1300	Pointer of Data
10F	B1 08	NEXTDIGIT	MOV CL, 08	Move 08 in CL as no. of segments
111	8A 04		MOV AL,[SI]	Get the 1st Data
113	D0 C0	NEXTBIT	ROL AL,1	
115	88 C5		MOV CH,AL	
117	BA 03 88		MOV DX,8803	
11A	EE		OUT DX,AL	
11B	B9 01		MOV AL,01	
11D	BA 05 88		MOV DX,8805	One clock pulse sent
120	EE		OUT DX,AL	
121	FE C8		DEC AL	
123	BA 05 88		MOV DX,8805	
126	EE		OUT DX,AL	
127	88 E8		MOV AL,CH	
129	FE		DEC CL	

12A	C9 75 E6		JNZ 0113	Go to out next Bit
12D	46		INC SI	Point to Next Data
12E	FE CF		DEC BH	
130	75 DD		JNZ 010F	
132	CD A3	END	INT A3	GO TO COMMAND MODE
Now Enter the Data at Address 0000:1300 onward				
0000:1300	C0 F9 A4 B0			Data for displaying 0123

Note: - On executing the program from Address 1000:0100, the Message 0123 is displayed on the seven segment.

PROGRAM FOR SEVEN SEGMENT DISPLAY INTERFACE WITH 8031/8051 LCD / AD-LCD BASED MICROCONTROLLER KIT

Connect the Interfacing Module to 8255-I of the Kit through the 26 Pin FRC Cable. Make sure that the Pin -1 of the Kit connector is connected to Pin-1 of the Module Connector. Enter the program from Address 6000 onward and Execute from Address 6000.

ADDRESS	CODES	LABEL	MNEMONICS	COMMENTS
6000	90 28 0B	START:	MOV DPTR,#280BH	; initialize all ports as o/p
6003	74 80		MOVA,#80H	
6005	F0		MOVX @DPTR,A	
6006	79 20		MOV R1,#20H	; Clear the display
6008	15 82		DEC 82	
600A	74 00	LOOP1:	MOVA,#00H	
600C	F0		MOVX @DPTR,A	; CLK goes low
600D	74 FF		MOVA,#FFH	
600F	15 82		DEC 82	
6011	F0		MOVX @DPTR,A	
6012	A3		INC DPTR	
6013	74 01		MOVA,#01H	
6015	F0		MOVX @DTPR,A	; CLK goes high
6016	D9 F2		DJNZ R1,F2	; LOOP1
6018	79 04		MOV R1,#04H	; Display the characters
601A	78 50		MOV R0,#50H	
601C	90 60 60		MOV DPTR,#6060H	
601F	E0	LOOP2:	MOVX A,@DPTR	; Read the display code
6020	F6		MOV @R0,A	
6021	08		INC R0	

6022	A3		INC DPTR	
6023	D9 FA		DJNZ R1,FA	; LOOP2
6025	79 04		MOV R1,#04H	
6027	78 50		MOV R0,#50H	
6029	7B 08	LOOP6:	MOV R3,#08H	
602B	90 28 0A		MOV DPTR,#280AH	
602E	74 00	LOOP3:	MOVA,#00H	
6030	F0		MOVX @DPTR,A	
6031	E6		MOVA,@R0	
6032	03		RR A	
6033	F6		MOV @R0,A	
6034	23		RL A	
6035	15 82		DEC 82	
6037	F0		MOVX @DPTR,A	; Send segment one by one
6038	A3		INC DPTR	
6039	74 01		MOVA,#01H	
603B	F0		MOVX @DPTR,A	; CLK goes high
603C	DB F0		DJNZ R3,F0	; LOOP.3
603E	08		INC R0	
603F	7F 02		MOV R7,#02H	; Create delay
6041	7E FF	LOOP5:	MOV R6,#FFH	
6043	7D FF	LOOP4:	MOV R5,#FFH	
6045	DD FE		DJNZ R5,FE	
6047	DE FA		DJNZ R6,FA	
6049	DF F6		DJNZ R7,F6	
604B	D9 DC		DJNZ R1,DC	; Continue for 4 characters
604D	80 FE		SJMP FE	

DESCRIPTIONS:-

Now enter the data at location 6060 - 6063 as given below:

ADDRESS	DATA
6060	85
6061	03
6062	03
6063	41

After executing the program from address location 6000 the output on the display module will be as below:-

G O O D

However, Delay can be varied by changing data at location 6040H

One can change the data of location 6060 - 6063. E.g.

ADDRESS	DATA
6060	0D
6061	25
6062	9F
6063	03

After executing the program from address location 6000 the output on the display module will be as below:-

0   1   2   3