

ET-REM8 & ET-DSP14SEG & ET-DSP4

ET-REM8 is 8-digit 7-segment display. This board consists of much small equipment for easy using such as 4 patterns of driver circuit of parallel port, real time clock, serial EEPROM memory unit and automatically scan display circuit that uses MCS51 micro-controller CPU control the board. The board includes regulate power supply. In addition, the board can calculate, process data and check condition before display. It is the multi-purpose board with because it can be changed or edited the program.

Specification

1. Main processing unit uses AT89C1051/AT89C2051 with flash memory.
2. Display uses chips support MAX7219 to scan display in particular adjust 16 brightness levels of screen and choose display code either BCD code or default. It uses command one time since MAX7219 scans automatically display until the user wants to change new display value and sends the new value to MAX7219 again. The following below is functions of signal pin to connect CPU.

- DIN is the input signal pin used for receiving data from CPU. Data at DIN is shifted into the internal 16-bit shift register (D15...D0) of MAX7219 with each rising edge of CLK.
- CLK is clock pulse signal sent from CPU to sync data between CPU and MAX7219. When data is in the rising edge, data at DIN is shifted into the internal shift register of MAX7219. And when the data is in the falling edge, data at shift register of MAX7219 (D15) is shifted into DOUT.
- LOAD is the input signal to load data already shifted into shift register of MAX7219 into memory unit for display MAX7219 to scan display. Data is loaded in the rising edge.

- DOUT is the output signal of MAX7219, signal shifted from the internal shift register of MAX7219. This signal is connected to DIN pin of MAX7219 in case of connecting parallel port to add more digit of display.
3. The user can write program into CPU to receive and send asynchronous data. The following driver circuit is also included in ET-REM8.
- RS-232 Full Duplex
 - RS422 Full Duplex
 - RS485 Half Duplex
 - Control Loop 20mA

The ET-REM8 can receive and send data in a multiplexed manner. So, the user can extremely apply to the display with unaltered circuit. For example, the remote control that receives data from parallel port to display such as to display weight of measurement or to display the value of many counter sets.

4. Serial EEPROM can be used with various numbers of serial data EEPROM.
- 93x46 with reading/writing as 128 Byte/8-Bit or 64 Byte/16-Bit
 - 93x56 with reading/writing as 256 Byte/8-Bit or 128 Byte/16-Bit
 - 93x66 with reading/writing as 512 Byte/8-Bit or 256 Byte/16-Bit
5. Chip support DS1202 (Dallas) is real time clock that has completely program: second, minute, hour, date, month, day and year. Moreover the user can program to use 12 hour or 24 hour a day and

automatically change date of month: 28 day/ 29 day/ 30 day or 31 day.
There is also RAM 24 byte/8-bit in DS1202.

6. Watchdog is counter circuit for controlling reset CPU. If no any signal from CPU sent out, watchdog sends reset signal into CPU to restart. The user can use watchdog to control CPU in board by adding counting program of watchdog into other parts of program. The board ET-REM8 uses either watchdog DS1232 (Dallas) or MAX1232 (Maxim).
7. Power supply includes Bridge and regulate 7805 rectifier can be directly used with alternating current 9-12VAC.

Display Code

Controlling ER-REM8 display by means of BCD code or making code can determine from program. To display by BCD code is to send BCD code value with display format. To make 7-segment display code, replace with number "0" and "1".

Data Bit	D7	D6	D5	D4	D3	D2	D1	D0
Display	Dot	A	B	C	D	E	F	G

Display	Display Code	Display	Display Code
0	7EH	8	7FH
1	30H	9	7BH
2	6DH	A	77H
3	79H	B	1FH
4	33H	C	4EH
5	5BH	D	3DH
6	5FH	E	4FH
7	70H	F	47H

Example of Making Display Code of 7-Segment

DSP14SEG is another multi-purpose board as ET-REM8. The difference is display section of board that is 14-segment/ 8-digit. The board must use CPU to scan display by 2 pieces of IC 74HC574 to pay current into all display section. The advantage is it is displayed in a multiplexed manner such as number, English character, or other signs.

Display Scan

From the circuit, port-P0 sends signal to control display and P1.1 and P1.2 latches data from port-P0 of CPU into 74HC574. Port-P2 controls the number of display digit.

To scan display, select 2 data sets to control display function.

Data Bit 1	D7	D6	D5	D4	D3	D2	D1	D0
Display	H	G	F	E	D	C	B	A

Data Bit 2	D7	D6	D5	D4	D3	D2	D1	D0
Display	DOT	x	N	M	L	K	J	I

Display	Data Set 2	Data Set 1	Display	Data Set 2	Data Set 1
0	0CH	3FH	I	12H	09H
1	00H	06H	J	00H	1EH
2	08H	8BH	K	24H	70H
3	00H	8FH	L	00H	38H
4	00H	E6H	M	05H	36H
5	20H	69H	N	21H	36H
6	00H	FDH	O	00H	3FH
7	0CH	01H	P	00H	F3H
8	00H	FFH	Q	20H	3FH
9	00H	EFH	R	20H	F3H
A	00H	F7H	S	00H	EDH
B	12H	8FH	T	12H	01H
C	00H	39H	U	00H	3EH
D	12H	0FH	V	0CH	30H
E	00H	79H	W	28H	36H
F	00H	71H	X	2DH	00H
G	00H	BDH	Y	15H	00H
H	00H	F6H	Z	0CH	09H

Example of Making Display Code of 14-Segment

When got data value, scan display.

1. Close all output enable (P1.3=1)
2. Send the first data into port-P0 of CPU and make Pulse at P1.1 to latch signal from port-P0 to the first 74574.
3. Send the second data into port-P0 of CPU and make Pulse at P1.2 to latch signal from port-P0 to the second 74574.
4. Open signal to select display of first digit.
5. Open output enable of 74574 (P1.3=0)

6. Delay time
7. Restart the first step. Change data set of next digit and change signal of display digit in the number 4 as next digit. Repeat all 8 digit and then scan display.

Example of Scan Display

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DISPLAY1 EQU P1.1 ; Latch Display1
DISPLAY2 EQU P1.2 ; Latch Display2
GATE_DSP EQU P1.3 ; Enable Display
          ORG 20H ; Internal RAM of CPU
DSP_BUFF: DS 8 ; Display Buffer
STACK: DS 32
          ORG 0000H ; Reset Vector of CPU
MAIN: MOV SP,#STACK ; Initial Stack 32 Byte
      MOV P0,#000H
      MOV P1,#0FFH
      MOV P2,#000H
      MOV DSP_BUFF+0,#0 ; Display Number 0
      MOV DSP_BUFF+1,#1 ; Display Number 1
      MOV DSP_BUFF+2,#2 ; Display Number 2
      MOV DSP_BUFF+3,#3 ; Display Number 3
      MOV DSP_BUFF+4,#4 ; Display Number 4
      MOV DSP_BUFF+5,#5 ; Display Number 5
      MOV DSP_BUFF+6,#6 ; Display Number 6
      MOV DSP_BUFF+7,#7 ; Display Number 7
SCAN_DSP: MOV R0,#DSP_BUFF ; Buffer Display Code
          MOV R1,#00000001B ; Data For Scan Digit
          MOV R2,#8 ; 8 Digit Count Scan Display
SCAN_DS1: SETB GATE_DSP ; Disable Data Display
          MOV P2,#00H ; Disable Colum Display
          MOV DPTR,#TAB_14SEG
          MOV A,@R0

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MOV    B,#2                ; 2 Byte / 1 Code
MUL    AB
MOV    B,A                 ; Save Pointer
MOVC   A,@A+DPTR          ; Get High Byte
From Table

MOV    P0,A
CLR    DISPLAY2           ; Latch High Byte
Display

SETB   DISPLAY2
MOV    A,B                ; Get Pointer
INC    A                  ; Adjust to Low Byte
MOVC   A,@A+DPTR         ; Get Low Byte
From Table

MOV    P0,A
CLR    DISPLAY1           ; Latch Low Byte
Display

SETB   DISPLAY1
MOV    P2,R1              ; Scan Display
CLR    GATE_DSP           ; Enable Scan
Display

MOV    R3,#0              ; Delay Scan Display
INC    R0                 ; Next Digit Data
Code

MOV    A,R1
RL     A                  ; Next Digit Display
MOV    R1,A
DJNZ   R2,SCAN_DS1
SJMP   SCAN_DSP           ; Loop Scan
Display

TAB_14SEG:  DB    00CH,03FH,000H,006H    ; 0 1

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DB 008H,08BH,000H,08FH ; 2 3

DB 000H,0E6H,020H,069H ; 4 5

DB 000H,0FDH,00CH,001H ; 6 7

DB 000H,0FFH,000H,0EFH ; 8 9

END

ET-DSP4 is the same as ET-REM8 and ET-DSP14SEG. The good point is it uses 4 digit of large 7-segment display (4.7 x 7 cm.) that can be clearly seen in long distance. The board uses Latch circuit (8-Bit Serial Shift to Parallel no. 74HC595) that connects with 4 parallels to write program smoothly.

Display Control

The following is control signal.

- Serial-In is input data signal sending control signal from CPU and it sends from the significant data (MSB) first and other bit. Shift clock controls data of each bit to shift into register chip 74HC595.
- Shift clock is used to shift data bit from serial-in into the internal register chip 74HC595 at rising edge of shift clock.
- Latch clock is the signal from CPU to latch data already shifted into a register chip out to output signal pin at the rising edge of latch-clock.

*** Other functions are the same as the board stated above. ***