Microprocessor Lab 2.3 Report

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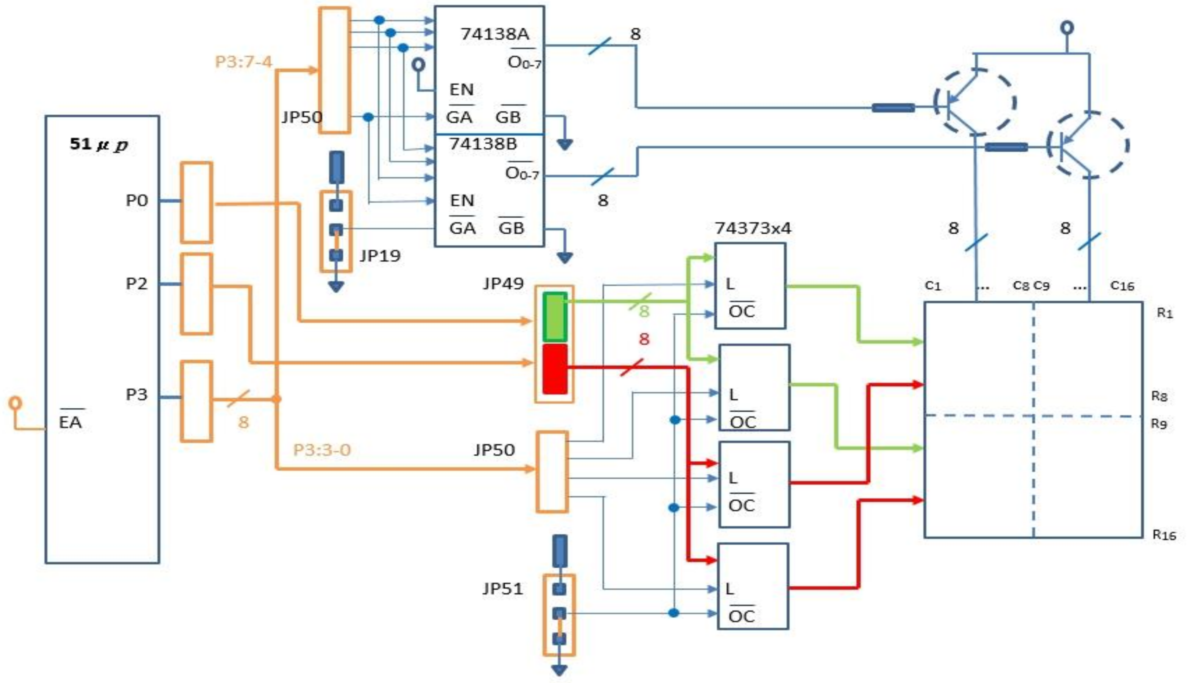
Subject and Goal:

This lab is about using µ-Vision 51IDE residing on MegaWin82G516 to:

- The access of every individual LED-dot for ON/OFF and color control when operating with the 16x16 tri-colored dot-matrix LED module.
- Organize display patterns in static or dynamic form as required.



Preparations:

- Power cable and required connection from the output to the led input is established. The color of LED-dot is controlled by the output of port P0 and P2 that is connected to JP49.
- Check the correctness and check if there are any defective on the board by activating all the 16x16 LED using static/dynamic pattern display.
- Knowing the operational limit of the 16x16 LED module that can only operate interchangeably from left and right part of the LED module to be controlled at the same time. However, this is not a big problem due to the inability for human eye to perceive small delay difference between left and right and the latency for the input to be implemented is quite small.

Operating Procedure:

- Jumper-wiring for circuit setup
- Check the 16x16 LED module to see if it's working or not by running code to turn all the light on.

- Code preparation
- Task execution:
  - Start IDE51 emulation,
  - Start execution and troubleshooting if necessary.

Code Preparation:

```
        org   0
mov  SP, #50H
        mov  P3, #0
        ;call delay
        mov  P0, #0FFH
        mov  P2, #0FFH
        mov  P3, #5H
        mov  P3, #0
start:
        mov  R6, #250
green_2:
        mov  P3, #0
        mov  P0, #0H
        mov  A, #1H
        mov  P3, A
        call   delay       ; col1 done
        anl   P3, #0F0H   ; ==XXX==
        mov  P0, #7aH
        add  A, #10H
        mov  P3, A      ; A:= ???
        call   delay      ; col2 done

        mov  R7, #4
g2_loop:
        anl   P3, #0F0H   ; ==XXX==
        mov  P0, #4AH
        add  A, #10H
        mov  P3, A      ; A:= ???
        call   delay      ; col3-6 done in sequence
        djnz  R7, g2_loop
        anl  P3, #0F0H   ; ==XXX==
        mov  P0, #4EH
        add  A, #10H
        mov  P3, A
        call   delay      ; col7 done
```

```
        anl   P3, #0F0H   ; ==XXX==
        mov  P0, #0H
        add   A, #10H    ; A:= ???
        mov  P3, A
        call   delay       ; col8 done
        djnz  R6, green_2
        anl   P3, #0F0H   ; ==AA==
        mov  P0, #0FFH   ; ==AA==
        mov  P3, A       ; ==AA==
        call   delay

redd:
        mov  R6, #250
red_2:
        mov  P3, #0
        mov  P2, #0H
        mov  A, #4H
        mov  P3, A
        call  delay      ; col1 done
        anl  P3, #0F0H   ; ==XXX==
        mov  P2, #7AH
        add  A, #10H   ; A:= ???
        mov  P3, A
        call  delay       ; col2 done
        mov  R7, #4
r2_loop:
        anl   P3, #0F0H   ; ==XXX==
        mov  P2, #4AH
        add  A, #10H     ; A:= ???
        mov  P3, A
        call  delay        ; col3-6 done
        djnz  R7, r2_loop

        anl   P3, #0F0H   ; ==XXX==
        mov  P2, #4EH
```

```
    add  A, #10H     ; A:= ???
    mov  P3, A
    call   delay       ; col7 done
    anl   P3, #0F0H   ; ==XXX==
    mov  P2, #0H
    add  A, #10H      ; A:= ???
    mov  P3, A
    call   delay        ; col8 done
    djnz  R6, red_2
    anl  P3, #0F0H    ; ==BB==
    mov  P2, #0FFH   ; ==BB==
    mov  P3, A       ; ==BB==
    call  delay
    mov  R6, #250
yellow_2:
    mov  P0, #0H
    mov  P2, #0H
    mov  A, #5H
    mov  P3, A
    call  delay        ; col1 done
    anl   P3, #0F0H   ; ==XXX==
    mov  P0, #7AH
    mov  P2, #7AH
    add  A, #10H     ; A:= ???
    mov  P3, A
    call   delay       ; col2 done
    mov  R7, #4
y2_loop:
    anl  P3, #0F0H   ; ==XXX==
    mov  P0, #4AH
    mov  P2, #4AH
    add  A, #10H      ; A:= ???
    mov  P3, A
    call  delay         ; col3-6 done
    djnz  R7, y2_loop
    anl   P3, #0F0H   ; ==XXX==
    mov  P0, #4EH
    mov  P2, #4EH
    add  A, #10H      ; A:= ???
    mov  P3, A
    call  delay        ; col7 done
    anl   P3, #0F0H   ; ==XXX==
    mov  P0, #0H
    mov  P2, #0H
    add  A, #10H     ; A:= ???
    mov  P3, A
    call  delay        ; col8 done
    djnz  R6, yellow_2
    anl   P3, #0F0H     ; ==CC==
    mov  P0, #0FFH     ; ==CC==
    mov  P2, #0FFH     ; ==CC==
    mov  P3, A         ; ==CC==
    call  delay
    jmp  start
delay:  push  2
    push  3
    mov  R2, #2
dd1:   mov  R3, #250
    djnz  R3, $
    djnz  R2, dd1
    pop  3
    pop  2
    ret
    end
```

Observation:

- The code is running well, however there are some issue for some of the existing boards (including the one used by our group) that cause the initialization at the beginning of the code being overrun by another signal in the middle of the operation. The way to solved this is to regularly initialize P0, P2, P3 to the wanted value
- When the ==AA== code line is omitted, the supposedly blank off LED area that formed the ‘2’ character turn into yellowish color due to lack of re-initialization of P0 and P3 before redoing the loop.

- When the ==BB== code line is omitted, there are no change that can be observed, the reason is due to the coincidence where the last value suited the need for the initial value for the next iteration.
- When the ==CC== code line is omitted, the green phase for the LED module change into orange phase, which let the entire code has 2 orange phase and 1 red phase. The new orange phase is the result of failing the initialization and let the green color combined with red, which represent orange / yellow color. This also affected the supposedly blank portion of the LED when failure for initialization happen into red color.
- For the code presented above, we observe no change whatsoever in the behavior of the LED module.
- For every value moved into P3 port, which control the on/off of the LED, we can handle the power for the right half of the 16x16 LED module.
- The part of code that is quite similar can be moved to a function that is ready to be called by using the parameter that has the value of pointer to the wanted initial argument that slightly differ for the wanted color phase showed.

Comprehensive evaluation:

- It is possible to let any combination part of the LED module to look as if being turned on simultaneously. However, this is actually implemented by interchangeably controlling and handling the power for left and right part of the LED module in a very fast way without being noticed by the user.
- To turn on one column of the LED module by manual jumper wiring, we can let the corresponding signal that value wanted to be sent into the corresponding pin. The area of J45 can be set to the wanted value while connected to the JP50, which control the LED on/off
- We can displayed the decimal ‘2’ on the upper right 8x8 LED module by manual wiring plus the code used in driving the LED in upper left of the LED module, by using the same method of connecting J45 wire to the JP50 and set the wanted value to moved the activation the right side.

Designated Assignment:

K = mod(19,3) == 1 (lower left 8x8 LED module)

```
org   0
mov  SP, #50H
      mov  P3, #0
      ;call delay
      mov  P0, #0FFH
      mov  P2, #0FFH
      mov  P3, #5H
      mov  P3, #0

start:
greenn:
      mov  R6, #250
green_2:
      mov  P3, #0
      mov  P0, #0H
      mov  A, #2H //#1H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P0, #7aH
      add  A, #10H
      mov  P3, A
      call   delay

      mov  R7, #4
g2_loop:
      anl   P3, #0F0H
      mov  P0, #4AH
      add  A, #10H
      mov  P3, A
      call   delay
      djnz  R7, g2_loop
      anl  P3, #0F0H
      mov  P0, #4EH
      add  A, #10H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P0, #0H
      add   A, #10H
      mov  P3, A
      call   delay
      djnz  R6, green_2
      mov  P0, #0FFH
      mov  P2, #0FFH
      mov  P3, #5H
      mov  P3, #0
      call   delay

redd:
      mov  R6, #250
```

```
red_2:
      mov  P3, #0
      mov  P2, #0H
      mov  A, #08H //#4H
      mov  P3, A
      call  delay
      anl  P3, #0F0H
      mov  P2, #7AH
      add  A, #10H
      mov  P3, A
      call  delay

      mov  R7, #4
r2_loop:
      anl   P3, #0F0H
      mov  P2, #4AH
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R7, r2_loop
      anl   P3, #0F0H
      mov  P2, #4EH
      add  A, #10H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P2, #0H
      add  A, #10H
      mov  P3, A
      call   delay
      djnz  R6, red_2
      mov  P0, #0FFH
      mov  P2, #0FFH
      mov  P3, #5H
      mov  P3, #0
      call  delay

yelloww:
      mov  R6, #250
yellow_2:
      mov  P0, #0H
      mov  P2, #0H
      mov  A, #0AH //#5H
      mov  P3, A
      call  delay
      anl  P3, #0F0H
      mov  P0, #7AH
      mov  P2, #7AH
      add  A, #10H
      mov  P3, A
      call   delay

      mov  R7, #4
y2_loop:
      anl  P3, #0F0H
      mov  P0, #4AH
      mov  P2, #4AH
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R7, y2_loop
      anl   P3, #0F0H
      mov  P0, #4EH
      mov  P2, #4EH
      add  A, #10H
      mov  P3, A
      call  delay
      anl   P3, #0F0H
      mov  P0, #0H
      mov  P2, #0H
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R6, yellow_2
      mov  P0, #0FFH
      mov  P2, #0FFH
      mov  P3, #5H
      mov  P3, #0
      call  delay
      jmp  start

delay:  push  2
      push  3
      mov  R2, #2
dd1:   mov  R3, #250
      djnz  R3, $
      djnz  R2, dd1
      pop  3
      pop  2
      ret
      end
```

Additional Testing:

The code below will be able to drive all 16x16 LED module to present the ‘2’ character in each 8x8 LED module area

```
 org   0
mov  SP, #50H
      mov  P3, #0
      ;call delay
      mov  P0, #0FFH
      mov  P2, #0FFH
      mov  P3, #5H
      mov  P3, #0

start:
greenn:
      mov  R6, #250
green_2:
      call foo_green1
   call foo_green2
      djnz  R6, green_2
      anl   P3, #0F0H
      mov  P0, #0FFH
      mov  P3, A
      call   delay

redd:
      mov  R6, #250
red_2:
      call foo_red1
   call foo_red2
      djnz  R6, red_2
      anl  P3, #0F0H
      mov  P2, #0FFH
      mov  P3, A
      call  delay

yelloww:
      mov  R6, #250
yellow_2:
      call foo_yellow1
   call foo_yellow2
      djnz  R6, yellow_2
      anl   P3, #0F0H
      mov  P0, #0FFH
      mov  P2, #0FFH
      mov  P3, A
      call  delay
      jmp  start

delay:  push  2
      push  3
      mov  R2, #1 //#2
dd1:   mov  R3, #250
      djnz  R3, $
      djnz  R2, dd1
      pop  3
      pop  2
      ret

foo_green1:
   mov  P3, #0
      mov  P0, #0H
      mov  A, #3H //#1H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P0, #7aH
      add  A, #10H
      mov  P3, A
      call   delay

      mov  R7, #4
g2_loop1:
      anl   P3, #0F0H
      mov  P0, #4AH
      add  A, #10H
      mov  P3, A
      call   delay
      djnz  R7, g2_loop1
      anl  P3, #0F0H
      mov  P0, #4EH
      add  A, #10H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P0, #0H
      add   A, #10H
      mov  P3, A
      call   delay
   ret

foo_green2:
   mov  P3, #0
      mov  P0, #0H
      mov  A, #083H //#1H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P0, #7aH
      add  A, #10H
      mov  P3, A
      call   delay

      mov  R7, #4
g2_loop2:
      anl   P3, #0F0H
      mov  P0, #4AH
      add  A, #10H
      mov  P3, A
      call   delay
      djnz  R7, g2_loop2
      anl  P3, #0F0H
      mov  P0, #4EH
      add  A, #10H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P0, #0H
      add   A, #10H
      mov  P3, A
      call   delay
   ret

foo_red1:
   mov  P3, #0
      mov  P2, #0H
      mov  A, #0CH //#4H
      mov  P3, A
      call  delay
      anl  P3, #0F0H
      mov  P2, #7AH
      add  A, #10H
      mov  P3, A
      call  delay

      mov  R7, #4
r2_loop1:
      anl   P3, #0F0H
      mov  P2, #4AH
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R7, r2_loop1
      anl   P3, #0F0H
      mov  P2, #4EH
      add  A, #10H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P2, #0H
      add  A, #10H
      mov  P3, A
      call   delay
   ret

foo_red2:
   mov  P3, #0
      mov  P2, #0H
      mov  A, #08CH //#4H
      mov  P3, A
      call  delay
      anl  P3, #0F0H
      mov  P2, #7AH
      add  A, #10H
      mov  P3, A
      call  delay

      mov  R7, #4
r2_loop2:
      anl   P3, #0F0H
      mov  P2, #4AH
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R7, r2_loop2
      anl   P3, #0F0H
      mov  P2, #4EH
      add  A, #10H
      mov  P3, A
      call   delay
      anl   P3, #0F0H
      mov  P2, #0H
      add  A, #10H
      mov  P3, A
      call   delay
   ret

foo_yellow1:
mov  P0, #0H
      mov  P2, #0H
      mov  A, #0FH //#5H
      mov  P3, A
      call  delay
      anl   P3, #0F0H
      mov  P0, #7AH
      mov  P2, #7AH
      add  A, #10H
      mov  P3, A
      call   delay

      mov  R7, #4
y2_loop1:
      anl  P3, #0F0H
      mov  P0, #4AH
      mov  P2, #4AH
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R7, y2_loop1
      anl   P3, #0F0H
      mov  P0, #4EH
      mov  P2, #4EH
      add  A, #10H
      mov  P3, A
      call  delay
      anl   P3, #0F0H
      mov  P0, #0H
      mov  P2, #0H
      add  A, #10H
      mov  P3, A
      call  delay
   ret

foo_yellow2:
mov  P0, #0H
      mov  P2, #0H
      mov  A, #08FH //#5H
      mov  P3, A
      call  delay
      anl   P3, #0F0H
      mov  P0, #7AH
      mov  P2, #7AH
      add  A, #10H
      mov  P3, A
      call   delay

      mov  R7, #4
y2_loop2:
      anl  P3, #0F0H
      mov  P0, #4AH
      mov  P2, #4AH
      add  A, #10H
      mov  P3, A
      call  delay
      djnz  R7, y2_loop2
      anl   P3, #0F0H
      mov  P0, #4EH
      mov  P2, #4EH
      add  A, #10H
      mov  P3, A
      call  delay
      anl   P3, #0F0H
      mov  P0, #0H
      mov  P2, #0H
      add  A, #10H
      mov  P3, A
      call  delay
   ret
      end
```