Lab 8
Implementation of counter using Timer:

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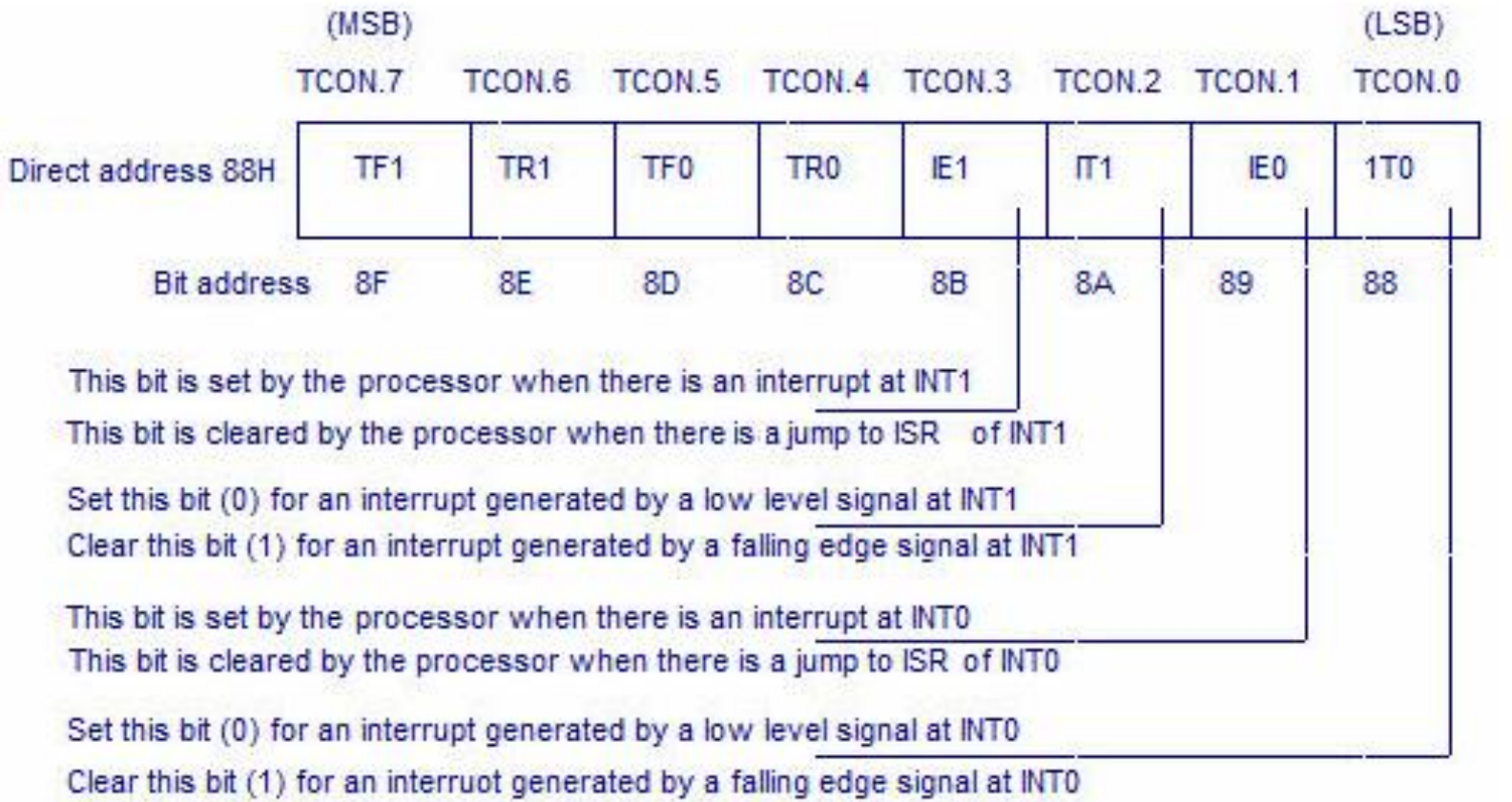
- Timer can also be used as counters counting events happening out-side the 8051.
- When we use timer as counter it is a pulse outside the 8051 that increments the TH, TL registers.
- When C/T=1, the timer is used as a counter and gets its pulse from outside the 8051.
- The pulses are fed from pins 14 (T0) and 15(T1).

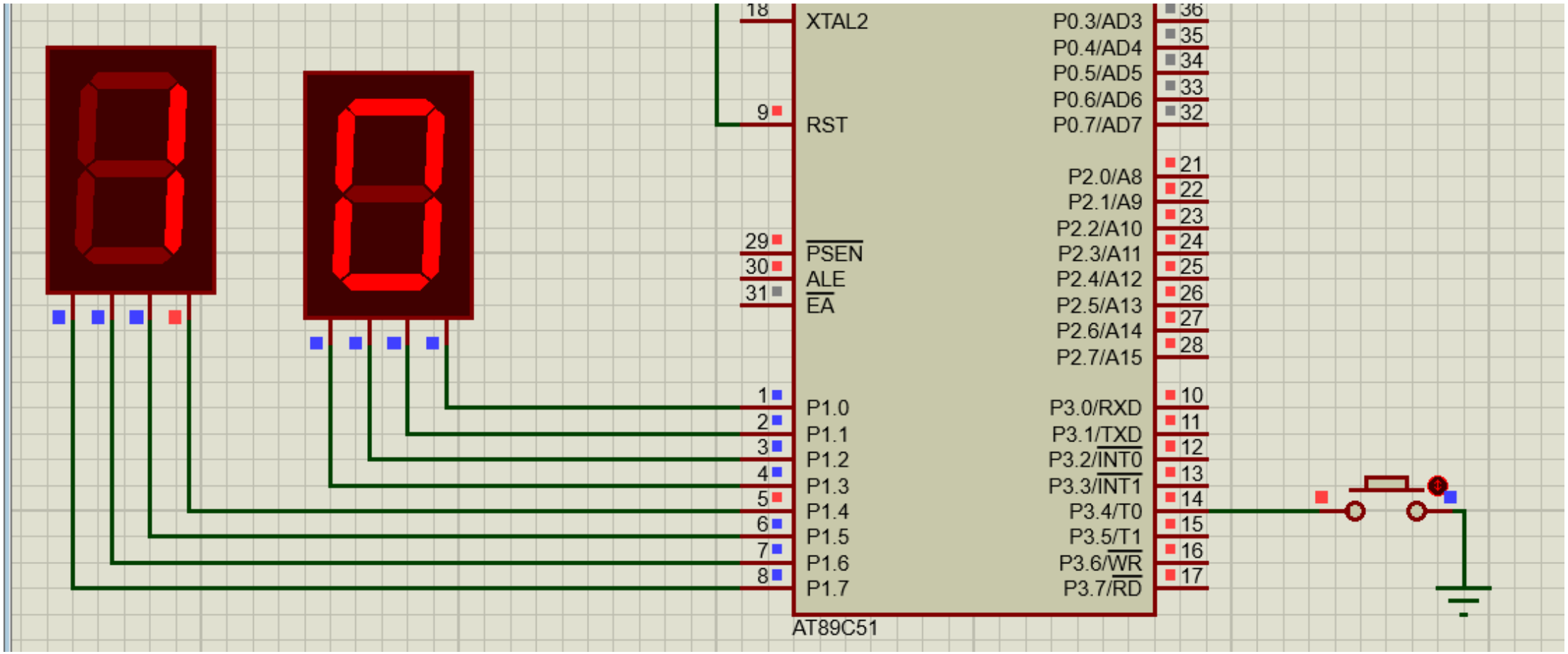
Port 3 pins used for Timers 0 and 1

Pin	Port Pin	Function	Description
14	P3.4	T0	Timer/counter 0 external input
15	P3.5	T1	Timer/counter 1 external input


(MSB)
(LSB)
TCON.7
TCON.6
TCON.5
TCON.4
TCON.3
TCON.2
TCON.1
TCON.0
Direct address 88H
TF1
TR1
TF0
TR0
IE1
IT1
IE0
1T0
Bit address
8F
8E
8D
8C
8B
8A
89
88
This bit is set by the processor when there is an interrupt at INT1
This bit is cleared by the processor when there is a jump to ISR of INT1
Set this bit (0) for an interrupt generated by a low level signal at INT1
Clear this bit (1) for an interrupt generated by a falling edge signal at INT1
This bit is set by the processor when there is an interrupt at INT0
This bit is cleared by the processor when there is a jump to ISR of INT0
Set this bit (0) for an interrupt generated by a low level signal at INT0
Clear this bit (1) for an interruot generated by a falling edge signal at INT0

```c
#include<reg51.h>
#include<stdio.h>
sbit I_P = P3^4;
void start_timer()
{
  TR0=1;
}
void init_timer()
{
  TMOD = 0x06; // Timer 0 8-bit auto reload mode
  TH0=0;
  I_P=1;

}
void main()
{
  start_timer();
  init_timer();
  while(1)
  {
    P1=TL0;
  }
}
```


18
XTAL2
9
RST
29
PSEN
30
ALE
31
EA
1
P1.0
2
P1.1
3
P1.2
4
P1.3
5
P1.4
6
P1.5
7
P1.6
8
P1.7
P0.3/AD3
P0.4/AD4
P0.5/AD5
P0.6/AD6
P0.7/AD7
P2.0/A8
P2.1/A9
P2.2/A10
P2.3/A11
P2.4/A12
P2.5/A13
P2.6/A14
P2.7/A15
P3.0/RXD
P3.1/TXD
P3.2/INT0
P3.3/INT1
P3.4/T0
P3.5/T1
P3.6/WR
P3.7/RD
36
35
34
33
32
21
22
23
24
25
26
27
28
10
11
12
13
14
15
16
17
AT89C51

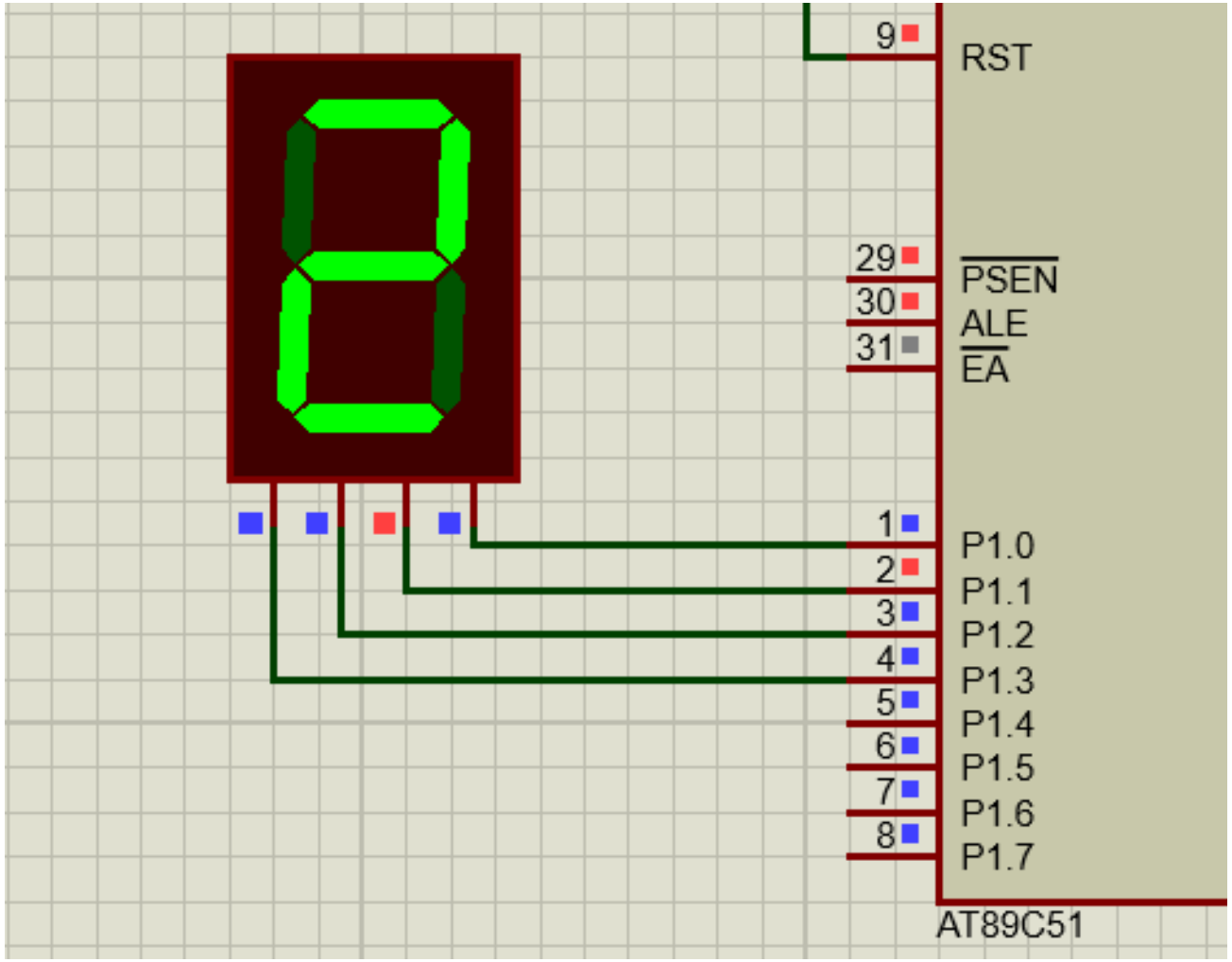
```c
#include<reg51.h>

unsigned int i, j;

void delay(int time){
  unsigned int k, l;
  for(k = 0; k < time; k++)
    for(l = 0; l < 1225; l++);
}

void main(void){
  while(1) {
    // Loop 0 - 4
    for(i = 0; i <= 4; i++) {
      P1 = i;
      delay(100);

    }
  }
}
```


9
RST
29
PSEN
30
ALE
31
EA
1
P1.0
2
P1.1
3
P1.2
4
P1.3
5
P1.4
6
P1.5
7
P1.6
8
P1.7
AT89C51

TASKS:

- 1) Implement Counter using Timer that take pulses from P3^4
- 2) Implement Counter that counts from 0 to 9.
- 3) Implement Counter that counts from 00 to 99