Laboratory Session 3

Course:	Diploma in Robotics and Mechatronics
Module:	EGR204 Microcontroller Applications
Experiment:	3
Title:	Programming The 8051 Parallel Ports

Objective:

❑ The students will learn how to write 'C' program for the 8051 microcontroller to control the 8051 parallel port in order to display numbers on a 4-digit 7-segment LED display panel.

Learning Objectives:

❑ Understand how the multiplexing circuit work.

❑ Write 'C' programs to display any numbers on the 4-digit 7-segment LED.

❑ Write 'C' programs which make a single digit number run upward and downward.

❑ Write 'C' program to make a single digit run upward when the push button is pressed.

1. Introduction

The 8051 port 2 (P2) is connected together with the CD4511 BCD-to-7 segment decoder to provide multiplexing operation to the 4-digit 7-segment LED. Figure 1-1 shows the circuit.

Figure 1-1
Multiplexing Circuit
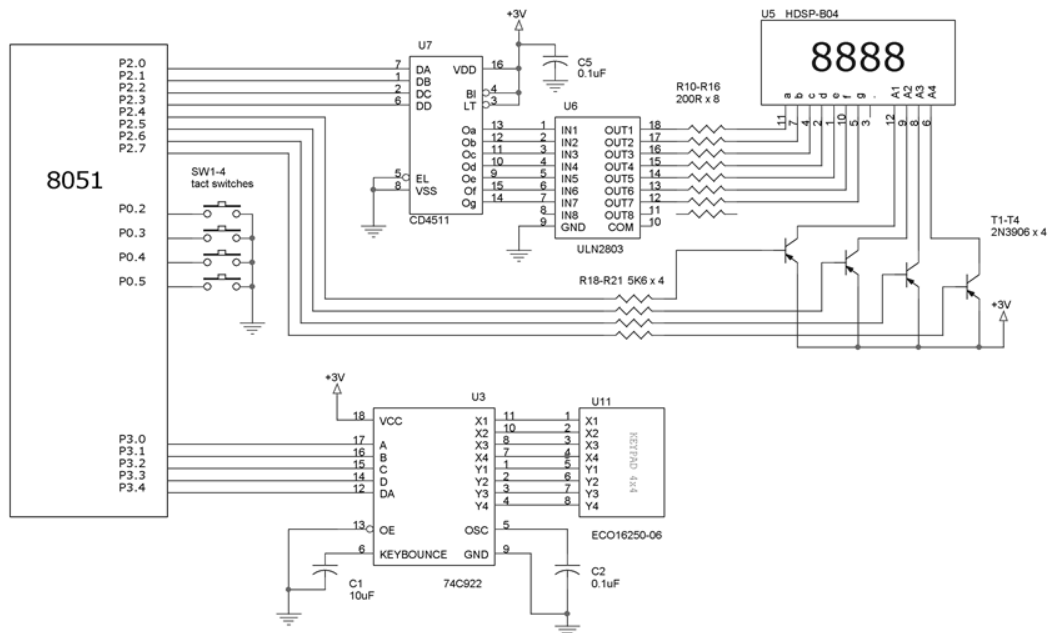
2.1 Exercise 1: Controlling The I/O Port for Display

Run the program in listing 2-1 on your target board. What do you see?

Modify the program so that the display shows "9" instead.

Listing 2-1

```c
#include <f200.h>

void delay(unsigned long duration)
{
    while((duration--)!=0);
}

void setSystem();

void main( )
{
    unsigned char x=3;
    setSystem();
    P1=0x00;
    P2 = 0xE0 | x;

    for(;;);
}
```

2.2 Exercise 2: Controlling The Display

Run the program in listing 2-2. What do you observed?

What does the instruction on "remark #2" do?

Change the instruction on "remark #1" to
P2 = 0xD8;

Run the modified program. What did you observed? Explain.

Listing 2-2

```c
#include <f200.h>

void delay(unsigned long duration)
{
    while((duration--)!=0);
}

void setSystem();

void main( )
{
    setSystem();

    for(;;)
    {
        P2 = 0xE8;    // remark #1
        delay(10000);
        P2 = 0xF8;     // remark #2
        delay(10000);
    }
}
```

Run the program in listing 2-3. What do you observe?

Change the value of the delay from 10000 to 100. What do you observe?

Listing 2-3

```c
void main( )
{
    for(;;)
    {
        P2 = 0xE1;
        delay(10000);
        P2 = 0xD2;
        delay(10000);
        P2 = 0xB3;
        delay(10000);
        P2 = 0x70;
        delay(10000);
    }
}
* add in all other necessary parts in the
program above.
```

3.1 Assignment 1

Complete the program in listing 3-1. You are require to make the 1st digit on the 4-digit 7-segment display run from "0" to "9" and then repeat itself.

Listing 3-1

```c
#include <f200.h>

void delay(unsigned long duration)
{
    while((duration--)!=0);
}

void setSystem();


void main( )
{
    unsigned char x;
```

3.2 Assignment 2

Modify the program you have completed in assignment 1 such that the number run downward instead, that is, run from "9" to "0" and then repeat itself. (Hint: Modify the "for" statement)

3.3 Assignment 3

Modify from your program in assignment 1 so that the number will run only when the push button on your target board is depressed and stop only when you let go the button. You can use the push button connected to P05 of the 8051. Your program should have something like:

```
for (;;)
{
  if (P05==0)
  {
     - - - - - - - - -
  }
}
```

```
setSystem():

for (;;)
{
  for(x=0;x<10;x++)
  {
     - - - - - - - -
     - - - - - - -
  }
}
}
```