NANYANG POLYTECHNIC
EGR204 Microcontroller Applications

Laboratory Session 2

Course:	Diploma in Robotics and Mechatronics
Module:	EGR204 Microcontroller Applications
Experiment:	2
Title:	Output Interfacing Using the 8051 Parallel Ports

Objective:

- ❑ The students will learn how to write ‘C’ program for the 8051 microcontroller to control the 8051 parallel port.

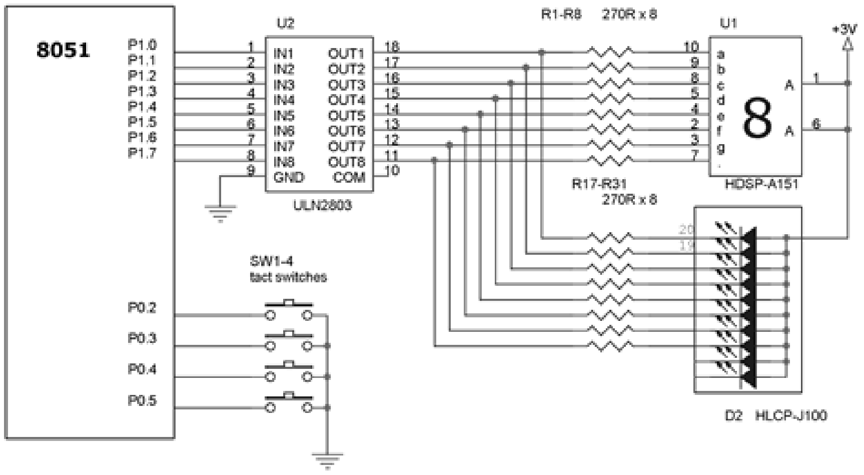
Learning Objectives:

- ❑ Write ‘C’ instruction to control the output port of the 8051.
- ❑ Know how the ‘C’ shift operator work.
- ❑ Analyse a 8051 ‘C’ program which makes the LEDs connected to the 8051 parallel port to run in one direction.
- ❑ Recognise the ‘C’ statement use to detect an input to the 8051.
- ❑ Use the ‘C’ shift operator to write two ‘C’ program to control the direction of how the LEDs run.

1. Introduction

In the hardware development kit provided in this laboratory, the 8051 port 1 (P1) is connected to eight LEDs and a 7-segment display through an inverting driver chip as shown in figure 1-1. The LED can be controlled by the logic output at port 1. A logic “1” at the port I/O turn on the respective LED.

Figure 1-1
Connection of LEDs to Port 1



2.1 Exercise 1: Controlling The I/O Port

Run the program given in listing 2-1. You will see the first LED light up. Modify the program to:

P1 = 0x32;

What do you observe?

Modify the program again to make the first four LEDs light up.

Listing 2-1

```
#include <f200.h>

void setSystem();

void main()
{
   setSystem();
    P1 = 0x01;

   for(;;);
}
```

2.2 Exercise 2: Using the Shift Operators

Run the program shown in listing 2-2. What do you see? Explain.

Modify the program to:

P1 = y << 3;

Listing 2-2

```
#include <f200.h>

void setSystem();

void main()
{
   unsigned char y=0x01;
   setSystem();
   P1 = y << 1;

   for(;;);
}
```

Explain what you observe when you run the program.

Run the program shown in listing 2-3. What do you see? Explain.

Modify the program to:

P1 = x >> 7;

Explain what you observe when you run the program.

Listing 2-3

```
#include <f200.h>

void setSystem();

void main()
{
   unsigned char x = 0x80;

   setSystem();
   P1 = x >> 2;

   for(;;);
}
```

2.3 Exercise 3: Programming running LEDs.

Run the program in listing 2-4. Observe what happen to the LEDs. Analyse the program to understand why the LEDs behave in this way.

Listing 2-4

```
#include <f200.h>

void setSystem();

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

void running_right()
{
   unsigned char led_pos;
    P1 = led_pos;
    delay(10000);
    led_pos = led_pos << 1;
    if (led_pos==0) led_pos = 0x01;
}

void main()
{
    setSystem();
    P1 = 0;        // Turn all LEDs off.
    for (;;)
    {
        running_right();
    }
}
```

3.1 Assignment 1

The program in Listing 2-4 creates a running LED on the LED bar. The LED runs in a rightward direction. Write a program that allow the user to select whether the LED will run right or left by pressing the switch SW1. When the switch is not press, the LED should run right. The routine should look like:

```
if (P02==0)
   running_right();
else
   running_left();
```

P02 represents a push button connected to the port P02 of the 8051. When the switch is depressed, a logic "0" is presented to the input of P02.

3.2 Assignment 2

Write a program that creates a running LED on the LED bar that run from left to right and then from right to left, and keep running.

4. Program Analysis

Analyse the program in listing 4-1. What do you expect to see if the program is executed?

Note:
Program is incomplete. Recommended that you fill in all the necessary parts to complete the program, test and verify your analysis.

Listing 4-1

```
void selector(unsigned char y)
{
        switch(y)
        {
             case 0: P1 = 0x18; break;
             case 1: P1 = 0x24; break;
             case 2: P1 = 0x42; break;
             case 3: P1 = 0x81; break;
        }
        delay(10000);
}

void main()
{
        char k;

        for(;;)
        {
             for(k=0;k<4;k++)
                selector(y);
             for(k=3;k>-0;k--)
                selector(y);
        }
}
```