# CO326: Industrial Networks
## Lab 01 - Parallel Port I/O (Part I)
Date - 26/02/2020

## Introduction

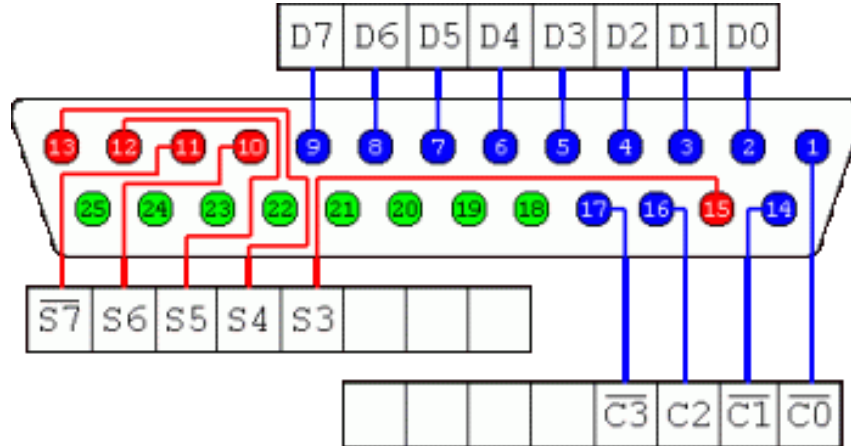Figure 01 shows the pin diagram of the parallel port



Figure 01 : Pin diagram of the parallel port

The D7..D1 Register is the data register and S7..S3 is the status register which we will be using to give outputs and inputs respectively.

As you can see, the pin numbers are not connected to the registers in consecutive order. Also, sometimes they are interchanged and sometimes they are inverted. You should pay attention carefully to these pins when you program and connect the port into a circuit. You may have to interchange wires and use shift operations/bitwise operations to handle inverted input/output.

## Programming the parallel port

This is a sample program which shows you how to use the parallel port. It reads the value of the status port register and directly writes that value to the data port register, without taking into consideration about bit inversions.

```c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <sys/io.h>

#define DATA_PORT 0x378              /* parallel port base address */
#define STATUS_PORT DATA_PORT+1
#define CONTROL_PORT DATA_PORT+2

unsigned char status, data;


void main(){

    if (ioperm(DATA_PORT, 1, 1)){
        fprintf(stderr, "Access denied to %x\n", DATA_PORT),
          exit(1);
```

```
    }

    if (ioperm(STATUS_PORT, 1, 1)){
        fprintf(stderr, "Access denied to %x\n", STATUS_PORT),
          exit(1);
    }

    status = inb(STATUS_PORT);
    data = status;
    outb(data, DATA_PORT);


}
```
*ioperm* function set port input/output permissions. *inb* does the port input and *outb* does the port output. Please refer to Linux man pages for more information about arguments and return values.

## 74LS47 IC and 7-Segment display

Figure 2 shows the 74LS47 IC connected to common anode 7-segment display. By giving binary representation to the input of the IC you can display numbers from 0-9 on the display. Refer to the attached datasheet for the IC for more details.
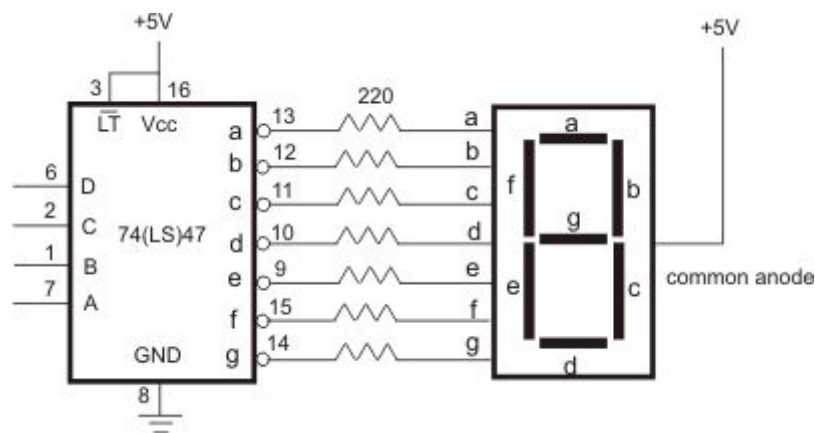


Figure 02: 74LS47 IC connected to common anode 7-segment display

## Lab Exercises

**Exercise 00:** Test if everything works fine

1.  Draw the circuit diagram that includes a 7-segment display and the data port of parallel port. **Make sure you connect a seperate resistor in series for each segment of SSD!**
2.  Write a program to light up each segment of SSD one by one.

**Exercise 01:** Display 0-9 numbers on a single 7 segment display

1.  Write a program to display characters from 0-9 in infinite loop with a delay of 1 second between each character.

**Exercise 02:** Display 0-9 numbers on a single 7 segment display using 74LS47 IC

1.  Draw the circuit diagram that includes 7-segment display, 74LS47 IC and the parallel port. Refer to the datasheet of the 74LS47 IC to find the least significant bit of the output.
2.  Write the program to display characters from 0-9 in infinite loop with a delay of 1 second between each character.