

# LAB 1-3

## BUTTON INTERFACE, MATRIX KEYPAD COMMUNICATION

---

### OBJECTIVE:

- Understand how to debounce a button.
- Understand how to communicate with an LCD.
- Understand how to communicate with a single button.
- Understand how to communicate with a matrix keypad.

### REFERENCE:

- Lab manual chapter 1, 2 , 3 ,6

### EXPERIMENT 1:

- a) Connect one AVR PORT to J33 (LCD control header) on the experimental kit.
- b) Use sample programs from the experiment guide, write a program to initialize the LCD and display the following on the LCD (XX is the group number):

EX VXL-AVR GROUP: XX
-------------------------

### EXPERIMENT 2:

- a) Connect a switch to a port pin of AVR, connect a BAR LED module to another AVR port, and connect an LCD to a port of AVR.
- b) Write a program to count the number of button presses and display the result on the BAR LED and LCD (without debouncing).
- c) Add button debounce functionality to the program.
- d) Execute the program, press/release the button, and observe the results.

### EXPERIMENT 3:

- a) Connect signals from one port of AVR to the matrix keypad module, and connect the BAR LED and LCD to two different ports of AVR.

## LAB 1-3

# BUTTON INTERFACE, MATRIX KEYPAD COMMUNICATION

---

- b) Write a subroutine SCANKEY to scan the matrix keypad and return a value from 0x0 to 0xF corresponding to the pressed key's code. If no key is pressed, return 0xFF. The returned value should be stored in R24.
- c) Using this subroutine, write a program to scan the keypad and display the read value on the BAR LED and LCD.
- d) Execute the program and observe the results

# LAB REPORT

*Class group:*

*Group:*  
*Subject:*

## EXPERIMENT 1:

1. Answer the following questions:
  - a. How does the LCD distinguish between command and data?
  - b. Besides checking the BUSY bit, what other method ensures that the LCD is ready to receive data/command?
  - c. Describe the connections on the experimental kit.
  - d. Source code for the program with comments.

.....

## EXPERIMENT 2:

2. Answer the following questions:
  - a. What happens when button debouncing is not implemented?
  - b. Describe the connections on the experimental kit.
  - c. Source code for the program without button debouncing and comments.

.....

- d. Source code for the program with button debouncing and comments.

.....

## EXPERIMENT 3:

1. Answer the following questions:
  - a. Describe the connections of the modules in the experiment.
  - b. Is there any button debounce issue with the matrix keypad? If so, how is it handled?
  - c. Present the source code of the program with comments.

.....