

LAB 9-B

INTERFACING AN NxM KEYBOARD TO STM32

OBJECTIVE:

- To interface a 4x4 keyboard (keypad) to the STM32 trainer.

REFERENCE:

- Mazidi & Naimi “The STM32F103 Arm Microcontroller and Embedded Systems,” Chapter 9.

MATERIALS:

- Blue Pill or any other STM32F103 trainer board
- ST-Link V2
- A text LCD or a USB-to-Serial converter
- 4x4 keyboard or any N x M matrix keyboard
- A computer
- Keil IDE or any other STM32 IDE

In many small projects, the use of a keyboard as an input device is unavoidable. In this lab we discuss the 4x4 matrix keyboard and then show how to interface it with the microcontroller. Although the keyboard that we use is 4x4, you can replace it with any other matrix keyboard.

ACTIVITY 1

The first step is to make a truth table for the keyboard. This truth table provides the row and column contacts by which a key is produced. Connect the ohmmeter leads, one to a row and one to a column terminal (lead) of the keyboard, and press the keys one at a time until you measure zero ohms. Repeat the process until all the keys are mapped.

ACTIVITY 2

After you have mapped your keypad set, connect the keypad to the trainer board as shown in Chapter 9 of the textbook. Write and run a program that scans your keyboard and displays any character pressed by the user on the LCD (or send it to the PC monitor). Your program must display keys 0 - 9 as numbers 0 - 9 on the PC screen while keys 10, 11, 12, 13, 14, and 15 (or you might say 0A - 0F in hex) are displayed as letters A, B, C, D, E, and F, respectively. (If you use a 5x4 keyboard, the choice of characters associated with key numbers beyond 0F is up to you.)

WORKSHEET

Name:
Last Name:

Class:
Lab#:

- 1) What is the purpose of generating the truth table for a given keyboard?

- 2) What is the purpose of grounding each row in keyboard interfacing?

- 3) What is the input to the microcontroller from column if no key is pressed?

- 4) True or false. In our $N \times M$ matrix keypad program we cannot press two keys at the same time.

- 5) In your program in Activity 2, how is the key press detected?

- 6) In your program in Activity 2, how is a key press identified?