Lab 4 – Interfacing Keypad

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Spring 2019

Lab 4 – Schedule and Objective

- **Pre-lab Assignment (10 points):**
  - **For Monday labs:** Due on April 22, 2019 (week 1).
  - **For Wednesday labs:** Due on April 24, 2019 (week 1).
- **Lab Demo Questions (10 points):**
  - **For Monday labs:** Due on April 29 2019 (week 2).
  - **For Wednesday labs:** Due on May 01, 2019 (week 2).

Lab 4 will take a total of TWO WEEKS!

- **First Objective (50 points):**
  - **Due date (on week 2):**
    - **For Monday labs:** April 29, 2019.
    - **For Wednesday labs:** May 01, 2019.
  - Write a C program to read which key is being pressed in the keypad and display it in the LCD (the code for the LCD is given to you).
- **Second Objective (14 points):**
  - **Due date (on week 2):**
    - **For Monday labs:** April 29, 2019.
    - **For Wednesday labs:** May 01, 2019.
  - See the Handout for Lab 4 for more information about the second obj.

Lab 4 – Schedule

Description	Points	Due date for Monday labs	Due data for Wednesday labs
Pre-lab assignment	10 points	Apr. 22	Apr. 24
Attendance and Class Participation	8 points	Apr. 22 and 29	Apr. 24 and May 01
Code organization	8 points	N/A	N/A
Lab demo questions	10 points	Apr. 29	May 01
First Objective	**50 points**	**Apr. 29**	**May 01**
Second objective	**14 points**	**Apr. 29**	**May 01**
Total:	**100 points**		

Lab Assignment – First Objective

- Use polling method to scan keypad and display the inputs on LCD **(50 points)**:
  - When a key is pressed, its value is then displayed on the LCD. The LCD should be able to display up to six digits.
  - For the first objective, you only need to display the numerical digits from the keypad. However, you can use the other keys to complete the second objective.
  - **Note:** For each key pressed only one digit should be displayed in the LCD. If your code keeps showing digits while your are pressing a key, your lab will not be considered complete!

Lab Assignment – First Objective

- **Write a C program to read which key is being pressed in the keypad and display it in the LCD (the code for the LCD is given to you).**
  - A startup code is provided on D2L under Lab 4 section (filename: ***Lab 4 – Startup Code.zip***) containing the following files: **main.c**, **LCD.c**, **keypad.c, LCD.h, keypad.h** and **stm32l476xx.h**.
    - **Download** and **extract** the startup code.
    - Create a new C Project using System Workbench for STM32 IDE.
    - **Delete** the **Utilities** folder that is automatically created by the IDE.
    - **Move all *.c* files** to your project's **src** folder.
    - **Move all *.h* files** to your project's **inc** folder.
  - **For the first objective, all your code should be written in the *keypad.c* file.**
  - **You are required to complete two functions:**
    - ***Keypad_Init***(): This is based on this and previous pre-labs (complete the missing masks to set up the GPIOs).
    - ***Keypad_Scan***(): You should complete this method by following the scanning algorithm found on **Figure 14-26** in the textbook. To help you, try following the comments located in the **keypad.c** file.

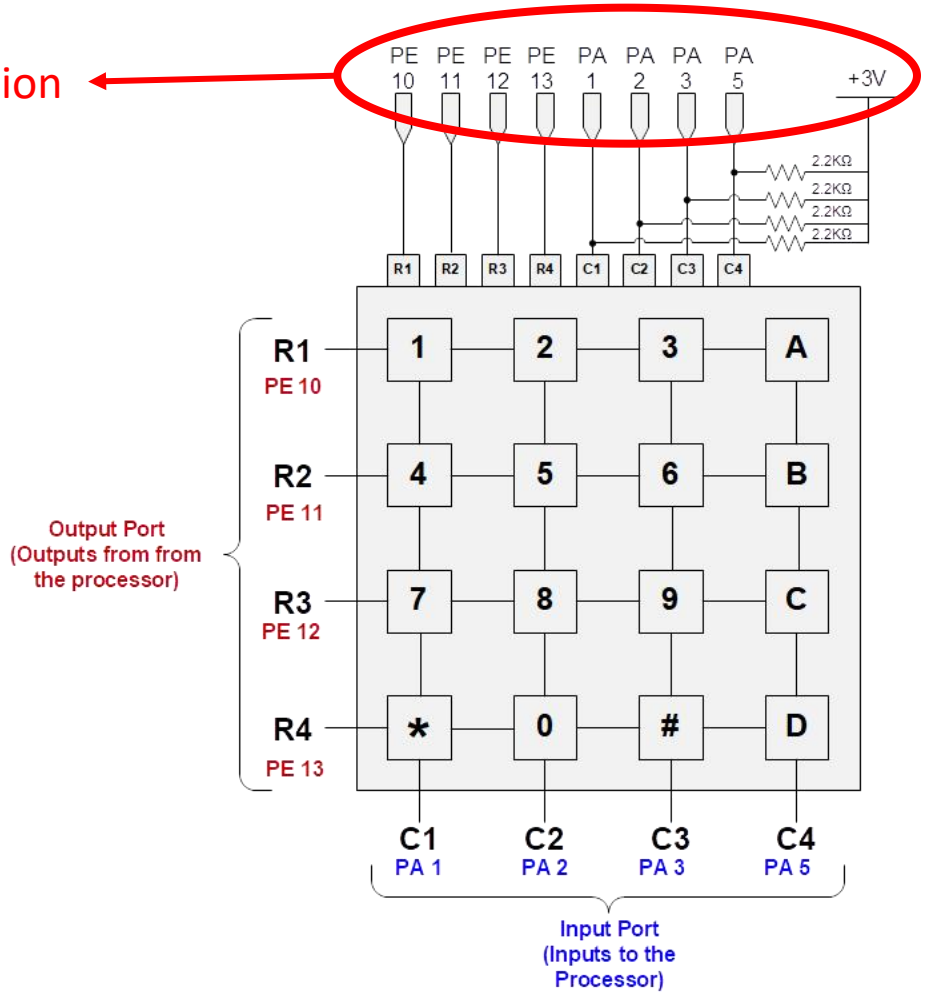
Lab Assignment – Second Objective

- **You <u>MUST CHOOSE TWO</u> of the following options (14 points):**
  - When a key is pressed for a long time, generate a periodical input with an interval of 2 seconds.
  - Use the "*" key to delete the previous input. Pressing "*" key again keeps deleting the previous input.
  - Use the "#" key to repeat the previous inputs.
  - Detect and recognize if multiple keys are pressed simultaneously.
- **Minimal help will be provide for the second objective!**

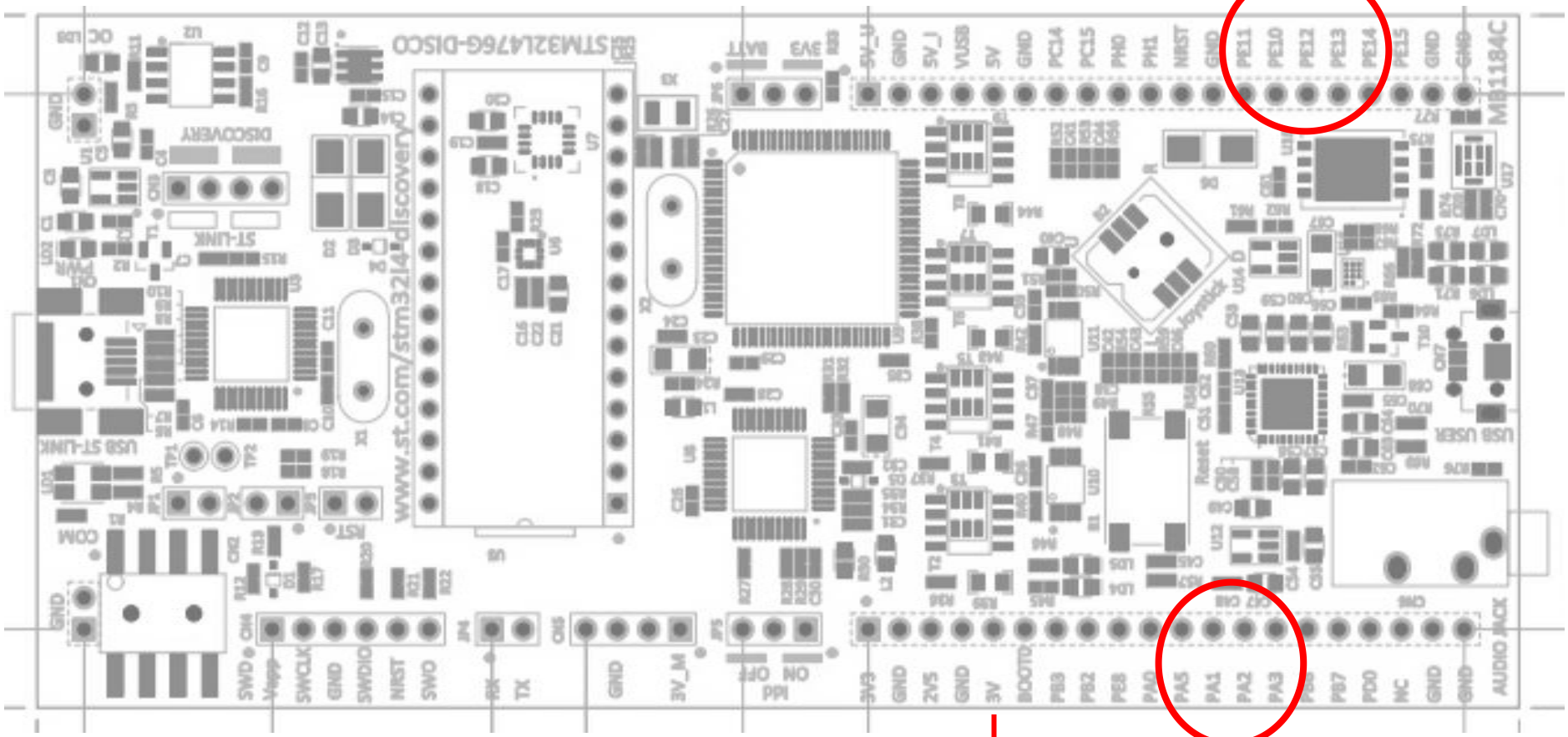
Physical Connection

- Use a breadboard and four 2.2k resistors in order to connect the keypad with the development kit.

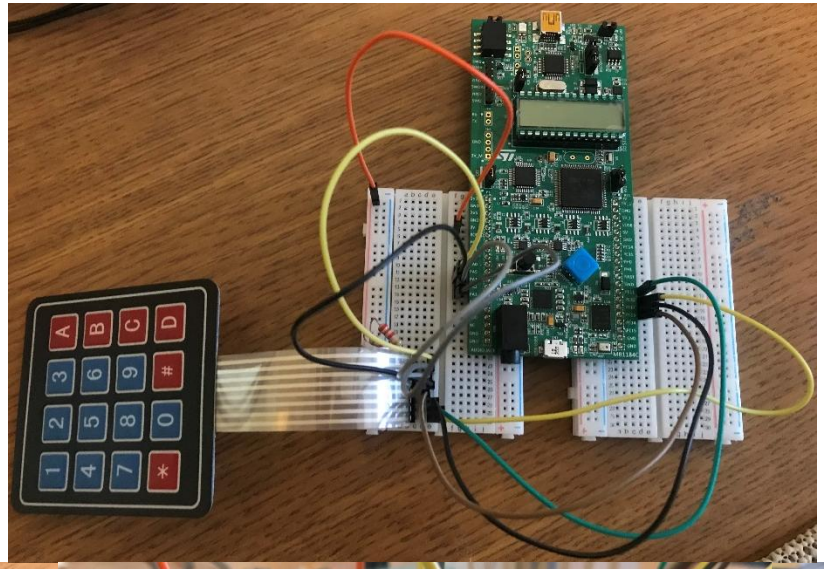
Physical connection

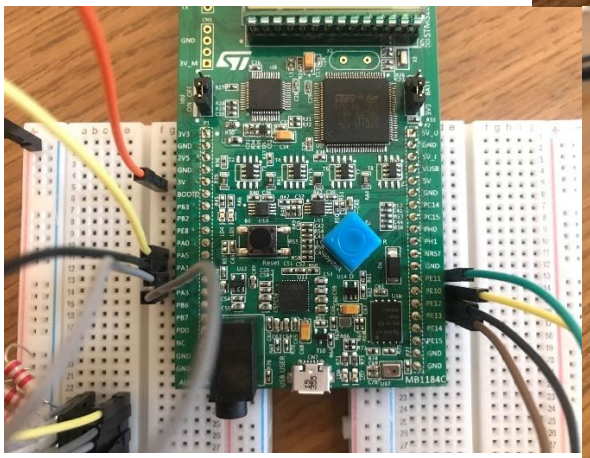


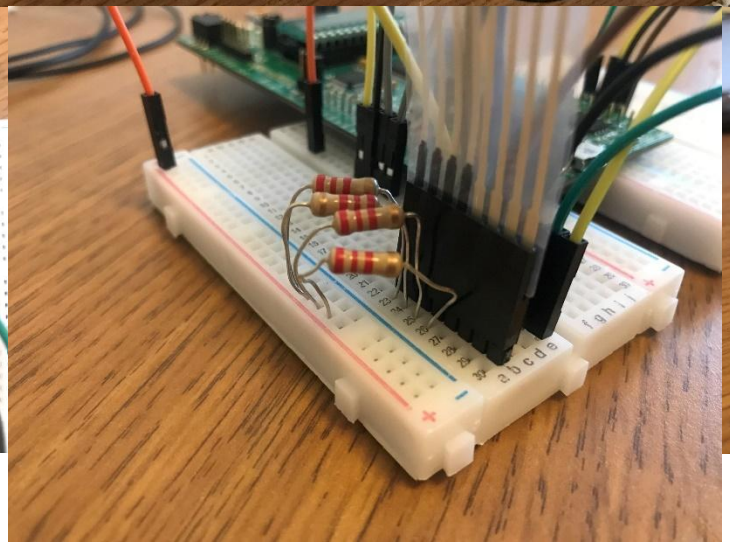
Physical Connection

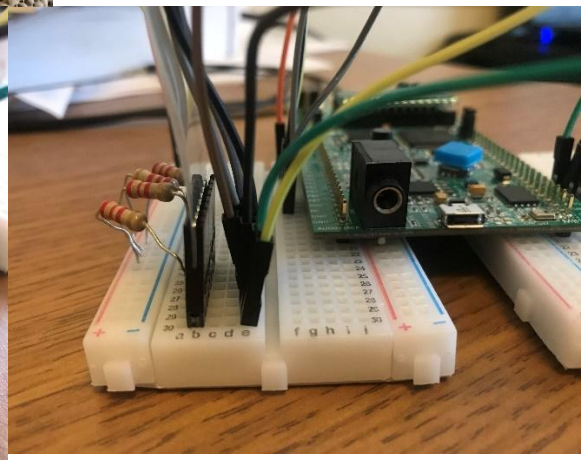


Physical Connection









Keypad Scanning Algorithm

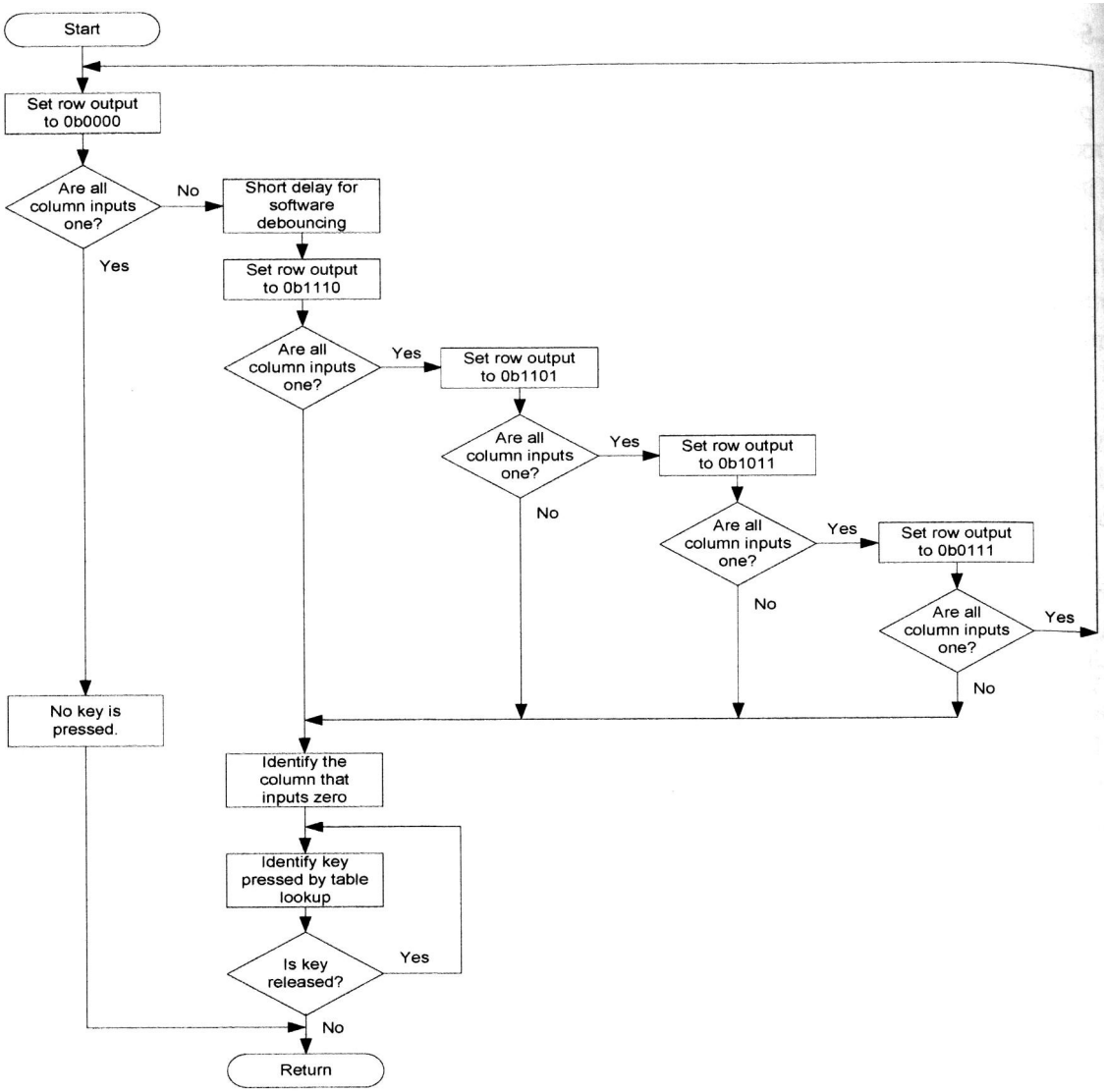


Figure 14-19. Keypad scanning algorithm.
All rows are set as output. All columns are set as inputs.