



Mapúa University

School of Electrical, Electronics and Computer Engineering

Introduction to Embedded Systems COE185P/ E01

Keypad & LCD UART, SPI, I2C Experiment No.6

Submitted By:
Sardina, Kent Johnric M.

Submitted To:
Engr. Jocelyn Villaverde



I. Introduction

A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Matrix keypad is a type of keypad that we commonly see on calculators and even on microwave ovens. A 4x4 matrix keypad has 16 built-in pushbuttons connected to row and column lines in which the myRIO can scan multiple key presses. The main objective of this experiment was to know how to utilize keypad in different situations.

Liquid Crystal Display(LCDs) provide a cost effective way to put a text output unit for a microcontroller. As we have seen in the previous tutorial, LEDs or 7 Segments do not have the flexibility to display informative messages. LCD character display is an electronic display module that can be find in different applications nowadays. It can display text in pixels. In this experiment, LCD will be used together with UART, SPI, and I2C-bus Interface.

II. Objectives

KEYPAD OBJECTIVES

After completing the activities in this chapter, you will be able to:

1. Describe the matrix connection used by the keypad switch array,
2. Use internal pull-up and pull-down resistors to eliminate additional components, and
3. Determine which multi-keypress patterns can be uniquely decoded.



LCD OBJECTIVES

After completing the activities in this chapter, you will be able to:

1. Configure the display for UART, SPI, and I2C-bus serial communications at a desired baud rate,
2. Send characters directly to appear on display, and
3. Send escape sequences to adjust the display modes.

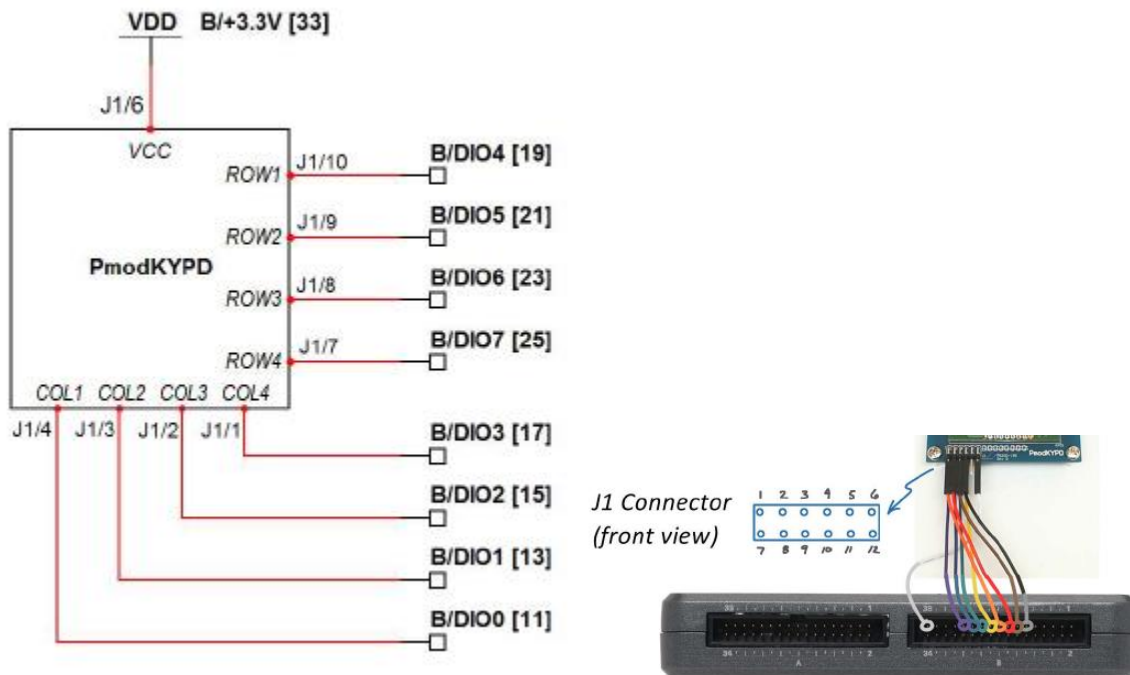
III. Materials and Components

- Breadboard
- Jumper wires
- 4x4 matrix keypad
- NI myRio kit
- MXP(myRio expansion port)
- LCD character display with serial interface (PmodCLS),

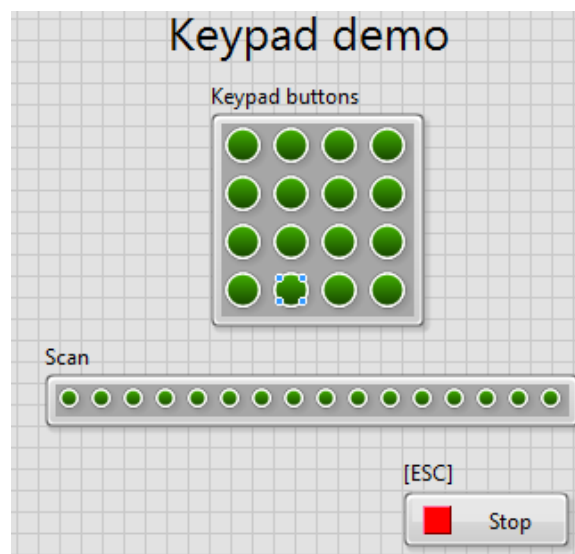
IV. PROCEDURE

KEYPAD

Step 1. Follow the schematic provided.

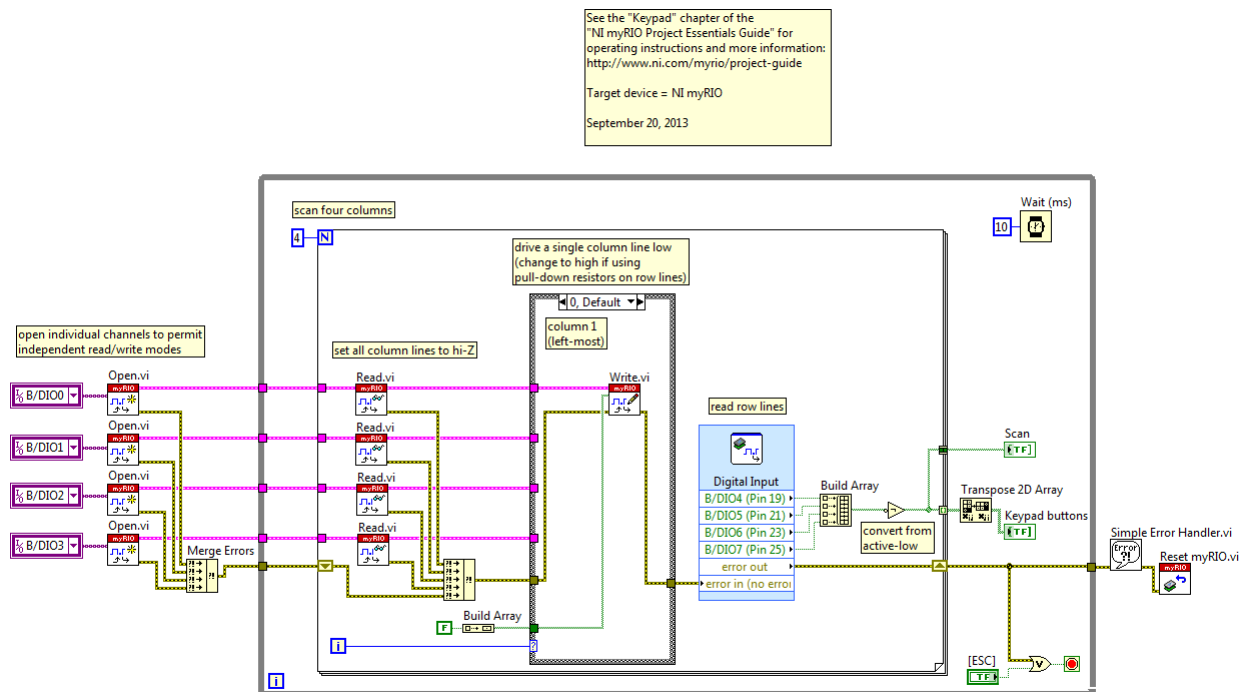


Step 2. Open The Demo file then run





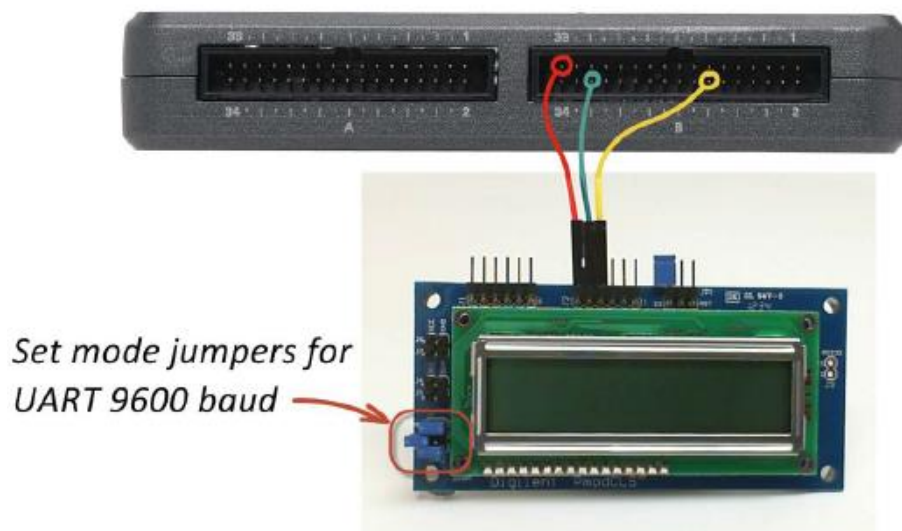
This is the schematic design of the keypad

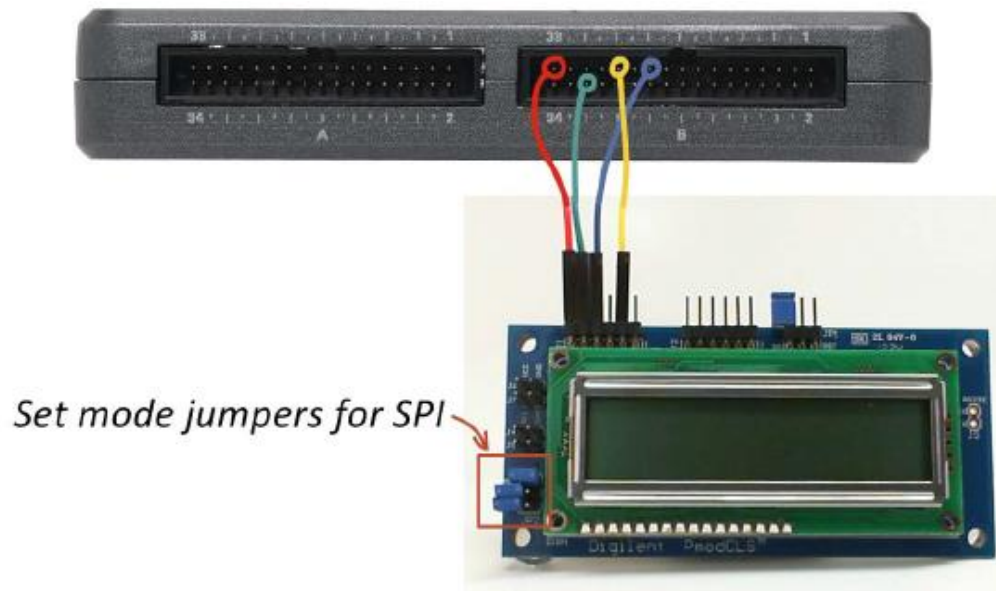


LCD

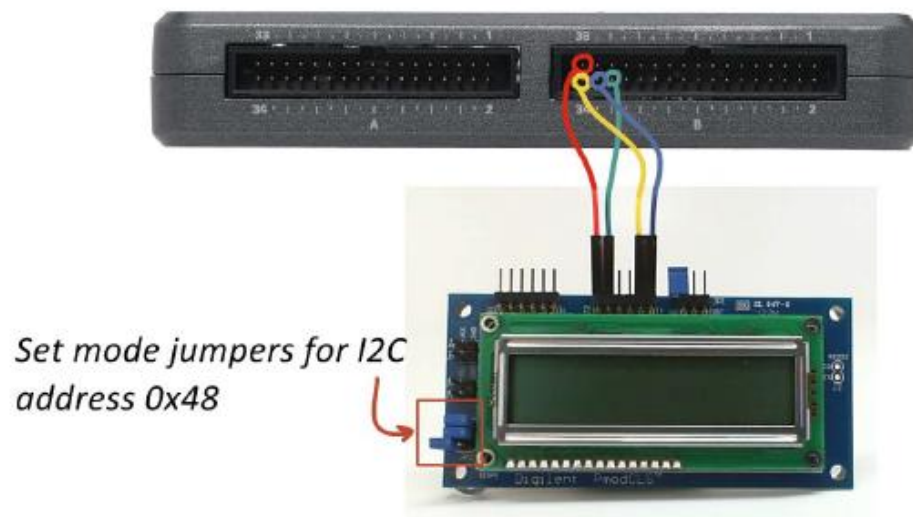
Step 1. Follow the diagram given in the manual.

For UART:





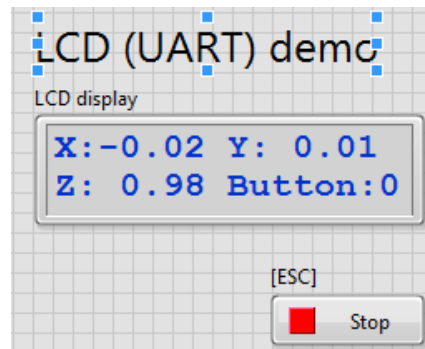
For I2C:



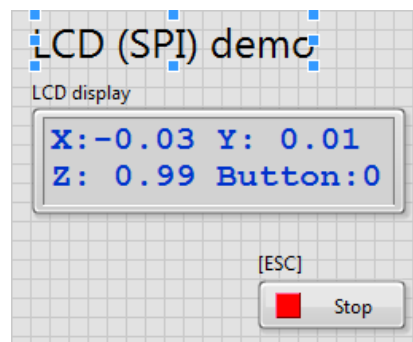


Step 2. Open the Demo file then run.

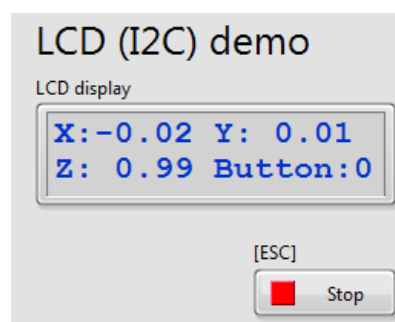
For UART:



For SPI:

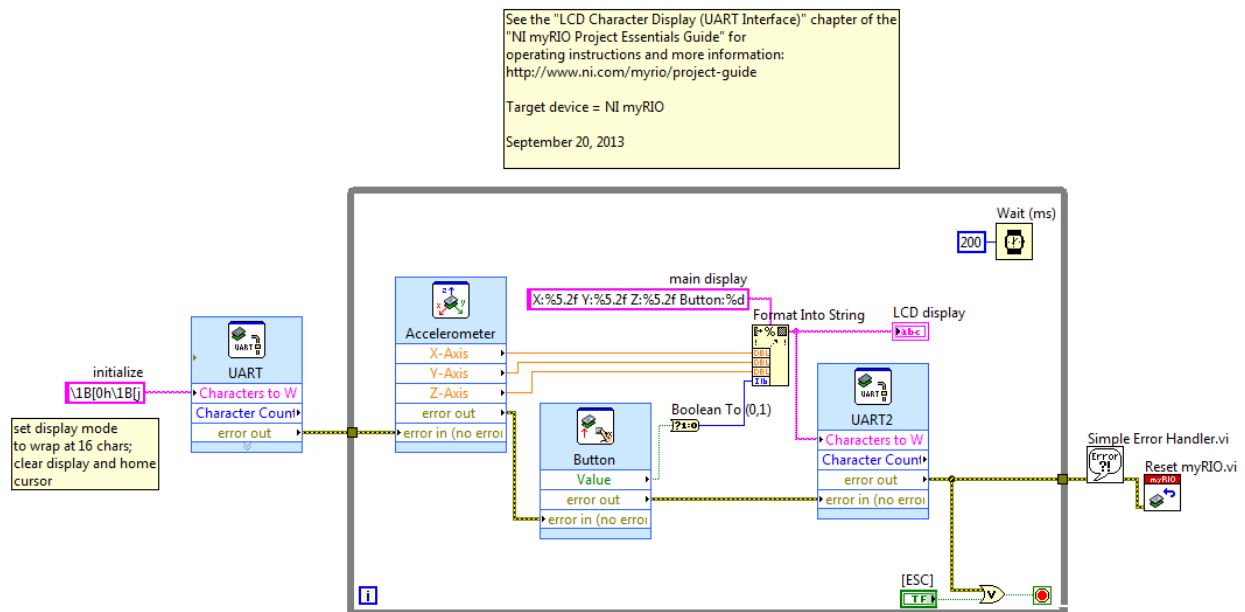


For I2C:

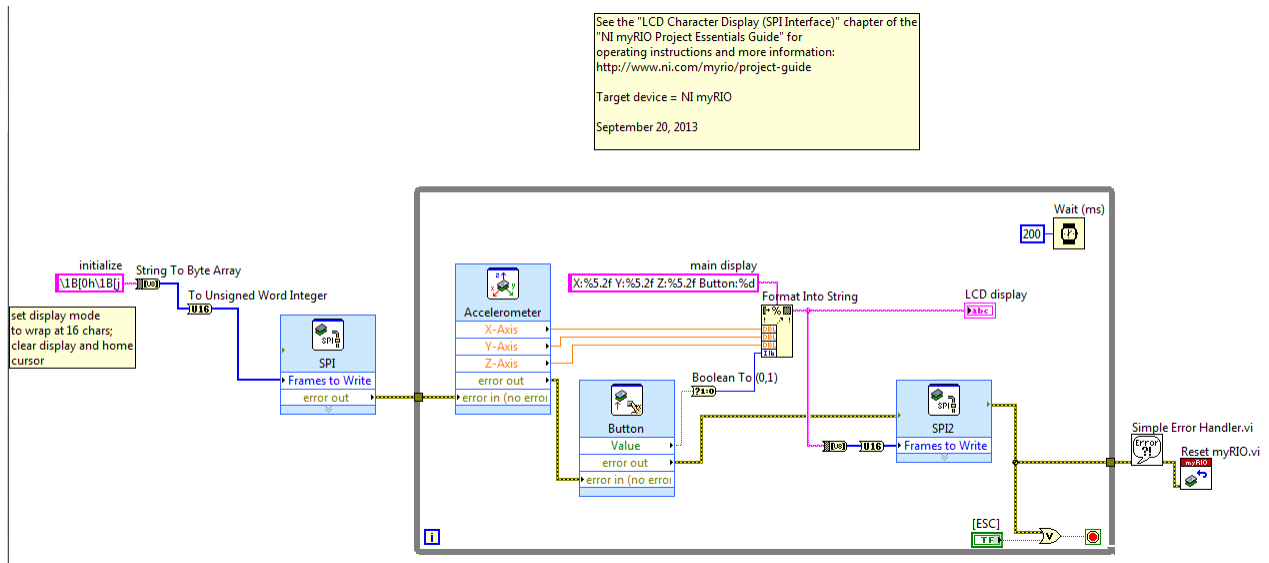


This is the Schematic Diagram for the LCD

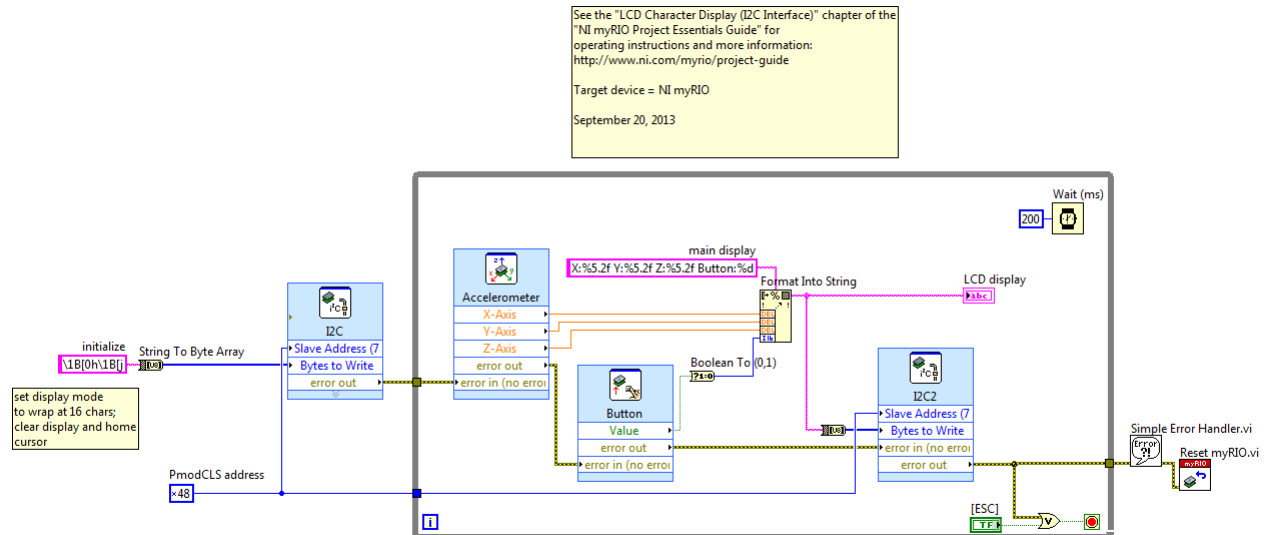
For UART:



For SPI:



For I2C:



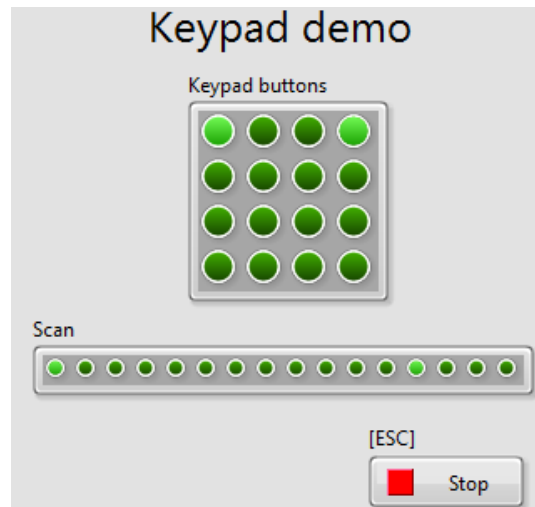
V. Results and Discussion

The first thing I do is connect the keypad to breadboard to myRio using some F-M Jumping wires, As seen below.

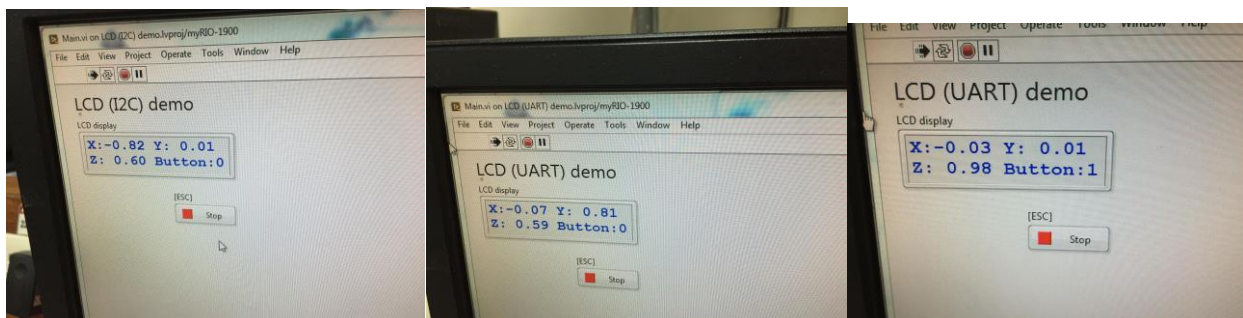


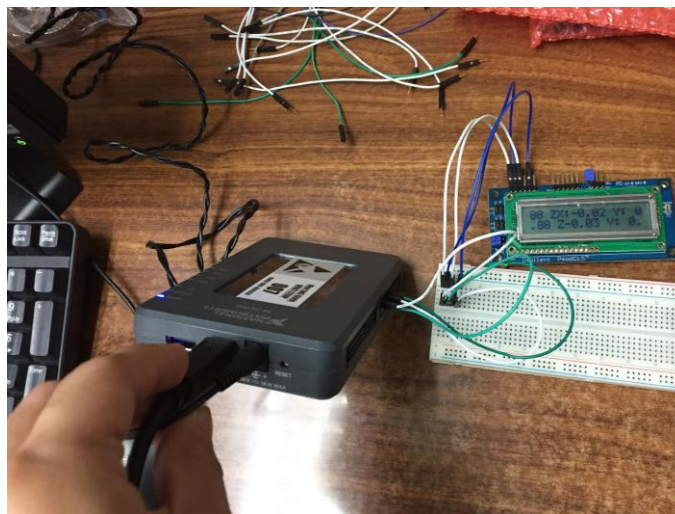
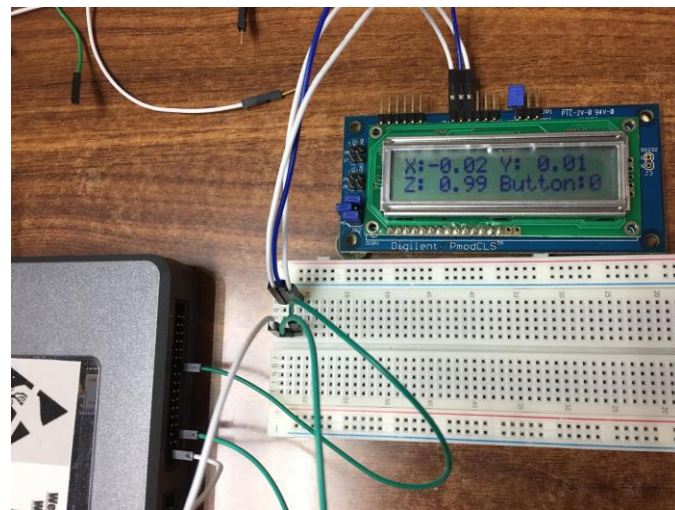
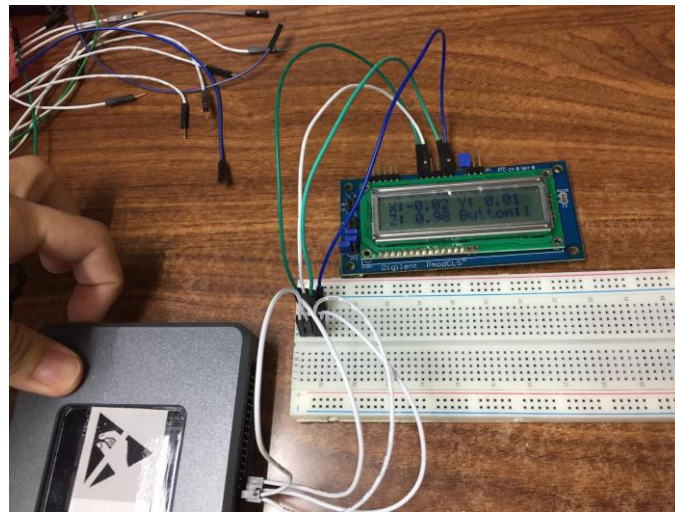


As I press the button in the keypad there is a signal showing in the schematic that it is being pressed down.



For the first part of the experiment, the breadboard layout and the interface circuit were built based from the schematic diagram provided. When the demo was runned, the demo displayed the state of the NI myRIO on-board 3-axis accelerometer as three values, which were, X, Y and Z directions, and the state of the built-in push buttons on the bottom side of myRIO. The button was pressed and the state changed from 0 to 1. And the orientation of the myRIO was changed and the accelerometer values were changed, then the myRIO was shaken and the acceleration values were changed to a larger value.







VI. Conclusion

After the activity, the only objective that been achieved is the first one. A keypad is a miniature keyboard or a set of buttons for operation a portable electronic device, telephone, or other equipment, that utilized matrix. The matrix connection of the keypad can be easily demonstrated by rows and columns. Every key has corresponding binary number and the sequence of the keys is by columns. The key being pressed can be displayed on the front panel through utilizing and adding numerical indicator on the front-panel.

I have successfully finished the laboratory experiment using the 3 types of LCD interface which are UART, SPI and I2C-bus with myRIO application. I successfully display all the characters in the LCD display based on the LABVIEW application provided to me.