Experiment 8: Keypad Handling

Objectives

In this experiment you have to write a program to handle the alphanumeric keypad that is provided in our PIC lab.

Equipment List

- chipKITTM Pro MX7 processor board with USB cable
- PmodKYPD - 16-Button Keypad
- Microchip MPLAB ® X IDE
- MPLAB ® XC32++ Compiler
- PC-based terminal emulations (HyperTerminal®)

Overview

The PmodKYPD is an array of buttons used for input. The PmodKYPD uses a standard 12-pin Pmod header[7] that indicates which row and which column has been pressed in the array of buttons (see Table 8).

Pin	Signal	Description
1	COL4	Column 4
2	COL3	Column 3
3	COL2	Column 2
4	COL1	Column 1
5	GND	Power Supply Ground
6	VCC	Power Supply (3.3v)
7	ROW4	Row 4
8	ROW3	Row 3
9	ROW2	Row 2
10	ROW1	Row 1
11	GND	Power Supply Ground
12	VCC	Power SUpply (3.3v)

Table 8: Connector J1 - Column/Row Indicators.

The PmodKYPD is set up as a matrix (see Figure 22) in which each row of buttons from left to right is tied to a row pin, and each column from top to bottom is tied to a column pin. This gives the user four

row pins and four column pins to address the button push. As shown in Figure 22, ROW1 is the uppermost row of the keypad which consists of buttons 1 to A and COL1 is the leftmost column of the keypad which consists of buttons 1 to 0.

To read a button's state, the column pin in which the button resides must be pulled low. This enables all of the buttons in that column. When a button in that column is pushed, the corresponding row pin will read logic low. All of the buttons can be read by walking a logic 0 through each column pin (keeping the other pins at logic high) and reading the row pins. This will read the state of each button.

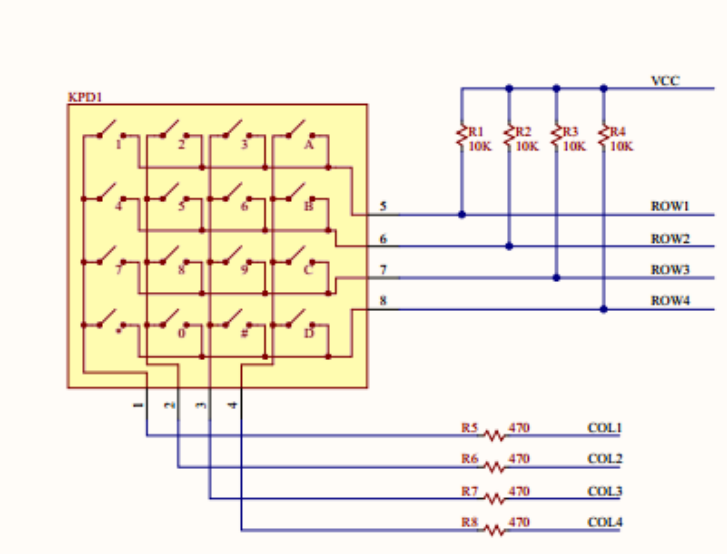

Figure 22: PmodKYPD Schematics.

Experiment

This experiment will require you to implement a code to detect keystrokes from a keypad (keypad interface program).

1. Connect the PmodKYPD to Pmod Connector JA[4].
2. Generate a new Harmony project and apply the basic configurations (Driver options, clock diagram, pin setting, ...)
3. Configure the column pins of MCU as digital output and row pins as digital input (refer to schematics of the Cerebot MX7ck board[5] for pin mapping between Pmod connector and MCU ports).
4. Write a C program to do the following
   - Keep checking the keypad. If any key is pressed, your program should determine the scanning code for this key.
   - Each time a key is pressed on the keypad, the program should display the key to the Hyper Terminal
   - Also, each time a key is pressed, you should display the binary code of the pressed key on the 4 LEDs of the board (consider LED1 is the least significant bit). For example, if pressed key is 9, then turn on LEDs 1 and 4 and turn off LEDs 2 and 3.

[4]Any other Pmod connector can be used for PmodKYPD but you have to make sure of its pin mapping first.
[5]The schematics are uploaded on PIC Lab course page on Moodle.