



Computer Engineering Department
Microcontroller Lab (10636496)
Report Grading Sheet

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Academic Year: 2024/2025	Performed on:		
Semester:	Submitted on:		
Student Names:			
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3-	4-		
5-	6-		
Evaluation Criterion	CLO	Grade	Points
Abstract and Aims Aims and idea of the experiment are clearly stated in simple words		10	
Introduction, Apparatus and Procedures Introduction is complete and well-written, all grammar/spelling correct, Appropriate background information related to the principles of the experiment is provided. The list of apparatus and procedures are also provided		15	
Experimental Results, Calculations and Discussion Results analyzed correctly. Experimental findings adequately and specifically summarized, in graphical, tabular, and/or written form. Comparison of theoretical predictions to experimental results, including discussion of accuracy and error analysis as needed.		50	
Conclusions Conclusions summarize the major findings from the experimental results with adequate specificity. Highlighting the most important results		15	
Appearance Title page is complete, page numbers applied, content is well organized, correct spelling, fonts are consistent, good visual appeal. You have also to use reference for the information you provide		10	
Total		100	



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Abstract

The purpose of this experiment is to write a program to handle the alphanumeric keypad that is provided in our PIC lab.

Introduction

The keypad has four rows and four columns. To determine which button is clicked, we first set one column's value to zero and the other columns' values to one. Next, we check each row individually to see if any of the values are equal to zero; if so, that button is the one that was clicked. We create that for every column to verify which keypad button was pressed.

Materials

- Material: ChipKITTM Pro MX7 processor board with USB cable.
- Microchip MPLAB R X IDE.
- MPLAB R XC32++ Compiler.
- MPLAB Harmony Framework.
- Tera Term.
- PmodKYPD - 16-Button Keypad.



Methods

First, we create a new harmony project with our settings, then we connect PmodKYPD to JA and map port b with keypad ports and write the code to deal with the keypad and send the character to Tera Term and also turn the Leds to indicate the value of the button clicked.

Experimental Results

We first need to calculate the value of Port B to indicate which column we want and then check its value:

PORTB = 0000 0111 1-0- --00

0's: unused Bits, 1's: Row value (we initiate them to 1 and when button clicked it will change to 0) (RB7,8,8,10) , -'s (dash values) :here we manipulate the values depending on the column we want (0 for the column we want and the others are 1's)

Column 1: 0xFB, Column 2: 0xF7, Column 3: 0xEF, Column 4: 0xFFBF.

Column 1

```
LATB = 0xFB;
for (i = 0; i < 1000000; i++);
if (PORTBbits.RB7 == 0) {
    DRV_USART0_WriteByte('D');
    LATG = 0xD000;
} else if (PORTBbits.RB8 == 0) {
    DRV_USART0_WriteByte('C');
    LATG = 0xC000;
} else if (PORTBbits.RB9 == 0) {
    DRV_USART0_WriteByte('B');
    LATG = 0xB000;
} else if (PORTBbits.RB10 == 0) {
    DRV_USART0_WriteByte('A');
    LATG = 0xA000;
}
```



Column 2

```
LATB = 0xF7;
for (i = 0; i < 1000000; i++);
if (PORTBbits.RB7 == 0) {
    DRV_USART0_WriteByte('E');
    LATG = 0xE000;
} else if (PORTBbits.RB8 == 0) {
    DRV_USART0_WriteByte('9');
    LATG = 0x9000;
} else if (PORTBbits.RB9 == 0) {
    DRV_USART0_WriteByte('6');
    LATG = 0x6000;
} else if (PORTBbits.RB10 == 0) {
    DRV_USART0_WriteByte('3');
    LATG = 0x3000;
}
```

Column 3

```
LATB = 0xEF;
for (i = 0; i < 1000000; i++);
if (PORTBbits.RB7 == 0) {
    DRV_USART0_WriteByte('F');
    LATG = 0xF000;
} else if (PORTBbits.RB8 == 0) {
    DRV_USART0_WriteByte('8');
    LATG = 0x8008;
} else if (PORTBbits.RB9 == 0) {
    DRV_USART0_WriteByte('5');
    LATG = 0x5000;
} else if (PORTBbits.RB10 == 0) {
    DRV_USART0_WriteByte('2');
    LATG = 0x2000;
}
```



Column 4

```
LATB = 0xFFBF;
for (i = 0; i < 1000000; i++);
if (PORTBbits.RB7 == 0) {
    DRV_USART0_WriteByte('0');
    LATG = 0x0000;
} else if (PORTBbits.RB8 == 0) {
    DRV_USART0_WriteByte('7');
    LATG = 0x7000;
} else if (PORTBbits.RB9 == 0) {
    DRV_USART0_WriteByte('4');
    LATG = 0x4000;
} else if (PORTBbits.RB10 == 0) {
    DRV_USART0_WriteByte('1');
    LATG = 0x1000;
}

for (i = 0; i < 1000000; i++);
appData.state = APP_STATE_SERVICE_TASKS;
break;
```

Discussion

We needed to understand how the PmodKYPD worked and its logic and then we coded it and it worked as shown in the pictures above

Conclusion

The experiment taught us about keypads and how they worked and demonstrated how rows and columns are defined as inputs and outputs. Utilizing the schematic mapping between the connections and MCU to write the code to show the value of the button pressed both on Tera Term and in the Leds.