Brunel University London

重慶郵電大學
CHONGQING UNIVERSITY OF POSTS AND TELECOMMUNICATIONS

TERM: Spring 2022

Module: EE1616 Electronic Workshop

CLASS: 34092102

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PIC Lab 1: Introduction to PIC

0 Aims (5 Points)

- Preliminary understanding the architecture of PIC16F877A, instruction set and PICmicro assembly programming.
- Learn to use MPLAB X IDE to write assembly language and copy the code into the PIC board.

1 Task 1 (5 Points)

Table 1. Components and their connections

Component	PICmicro	8 Push buttons	LEDs	8-seg.	LCD 1602
Location numbers	1	13	5	12	20

2 Task 2 (35 Points)

2.1 Task 2.1 (5 Points)

(1) What is the size of the program memory of the PIC16F877A?

8K 14 bit words

(2) What is the size of the data memory of the PIC16F877A?

368 bytes.

2.2 Task 2.2 (10 Points)

(1) STATUS

03h, 83h, 103h, 183h

(2) PORTB

06h, 106h,

(3) TRISB

86h, 186h

2.3 Task 2.3 (10 Points)

(1) clear all PORTB pins

CLRF RORTB

(2) change the current memory to BANK1 (hint: STATUS register)

```
BSF STATUS,RP0
```

(3) PORTB is set up as output (hint: TRISB register)

```
CLRF TRISB
```

(4) change the current memory to BANK0 (hint: STATUS register)

```
BCF STATUS,RP0
```

2.4 Task2.4 (10 Points)

(1) 0 (decimal value)

```
BCF PORTB,0
```

(2) 0xFF (hexadecimal value)

```
BSF PORTB,0
BSF PORTB,1
BSF PORTB,2
BSF PORTB,3
BSF PORTB,4
BSF PORTB,5
BSF PORTB,6
BSF PORTB,7
```

(3) 01010101 (binary value)

```
BSF PORTB,0
BCF PORTB,1
BSF PORTB,2
BCF PORTB,3
BSF PORTB,4
BCF PORTB,5
BSF PORTB,6
BCF PORTB,7
```

3 Task 3 (20 Points)

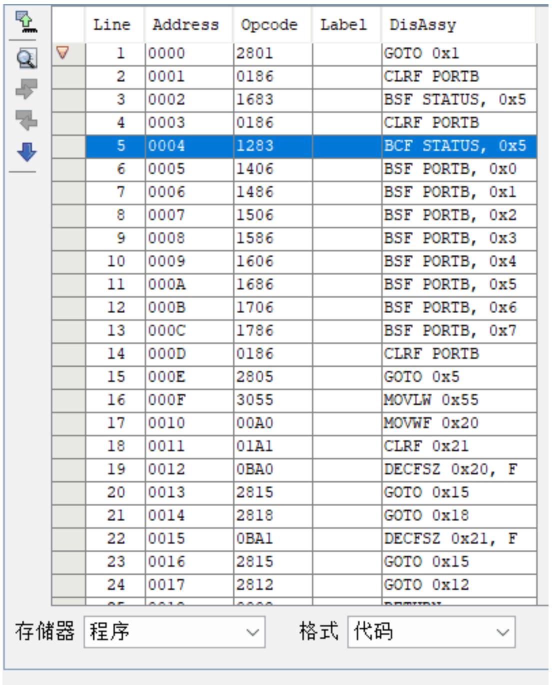
(1) This is my assembly code:

```
#include "p16f877a.inc"
; __config 0xFF32
__CONFIG _FOSC_HS & _WDTE_OFF & _PWRTE_ON & _BOREN_OFF & _LVP_OFF &
_CPD_OFF & _WRT_OFF & _CP_OFF
;******************************************************************************
; Reset Vector
;******************************************************************************
RES_VECT CODE 0x0000 ; processor reset vector
GOTO START ; go to beginning of program
;******************************************************************************
; Task 3 for Assembly programming
START
STATUS
EQU H'03' ; define STATUS register
PORTB
EQU H'06' ; define PORTB register
```

```
TRISB
EQU H'86' ; define TRISB register
COUNT1 EQU H'20' ; define a new variable
COUNT2 EQU H'21' ; define a new variable

CLRF PORTB; clear all PORTB pins
BSF STATUS,RP0; change to BANK1
CLRF TRISB; PORTB is set up as output
BCF STATUS,RP0; change to BANK0

LOOPIT
BSF PORTB,0 ; set Port B pin 0
;CALL DELAY
BSF PORTB,1 ; set Port B pin 1
;CALL DELAY
BSF PORTB,2 ; set Port B pin 2
;CALL DELAY
BSF PORTB,3 ; set Port B pin 3
;CALL DELAY
BSF PORTB,4 ; set Port B pin 4
;CALL DELAY
BSF PORTB,5 ; set Port B pin 5
;CALL DELAY
BSF PORTB,6 ; set Port B pin 6
;CALL DELAY
BSF PORTB,7 ; set Port B pin 7
;CALL DELAY
CLRF PORTB ; clear all PORTB pins
GOTO LOOPIT ; go to address LOOPIT

DELAY MOVLW 255
MOVWF COUNT1
CLRF COUNT2
DELAY1 DECFSZ COUNT1,F
GOTO DELAY2
GOTO COMPLETE
DELAY2 DECFSZ COUNT2,F
GOTO DELAY2
GOTO DELAY1
COMPLETE RETURN
GOTO $ ; loop forever
END
```

The location of the modified code has been highlighted. Then I debug it and find it is correct.

(2) This is the program memory which in my computer.

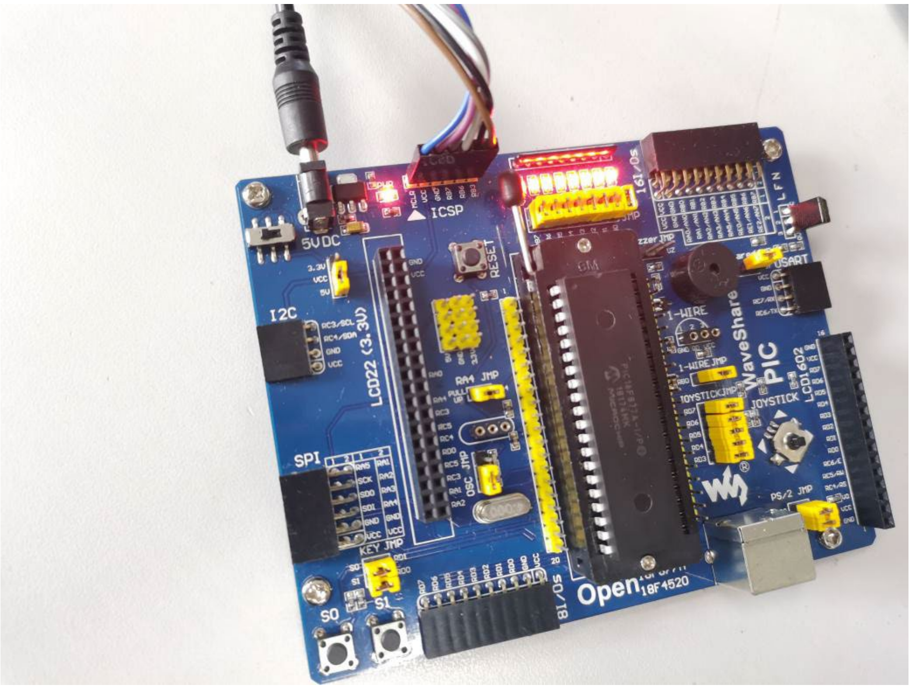


Line	Address	Opcode	Label	DisAssy
1	0000	2801		GOTO 0x1
2	0001	0186		CLRF PORTB
3	0002	1683		BSF STATUS, 0x5
4	0003	0186		CLRF PORTB
5	0004	1283		BCF STATUS, 0x5
6	0005	1406		BSF PORTB, 0x0
7	0006	1486		BSF PORTB, 0x1
8	0007	1506		BSF PORTB, 0x2
9	0008	1586		BSF PORTB, 0x3
10	0009	1606		BSF PORTB, 0x4
11	000A	1686		BSF PORTB, 0x5
12	000B	1706		BSF PORTB, 0x6
13	000C	1786		BSF PORTB, 0x7
14	000D	0186		CLRF PORTB
15	000E	2805		GOTO 0x5
16	000F	3055		MOVLW 0x55
17	0010	00A0		MOVWF 0x20
18	0011	01A1		CLRF 0x21
19	0012	0BA0		DECFSZ 0x20, F
20	0013	2815		GOTO 0x15
21	0014	2818		GOTO 0x18
22	0015	0BA1		DECFSZ 0x21, F
23	0016	2815		GOTO 0x15
24	0017	2812		GOTO 0x12
25	0018	0008		RETURN

存储器 程序 格式 代码

4 Task 4 (30 Points)

(1) Make the modification on the code by removing the “;” in every “CALL DELAY”. then run the program on the PICmicro development board. This is my result.

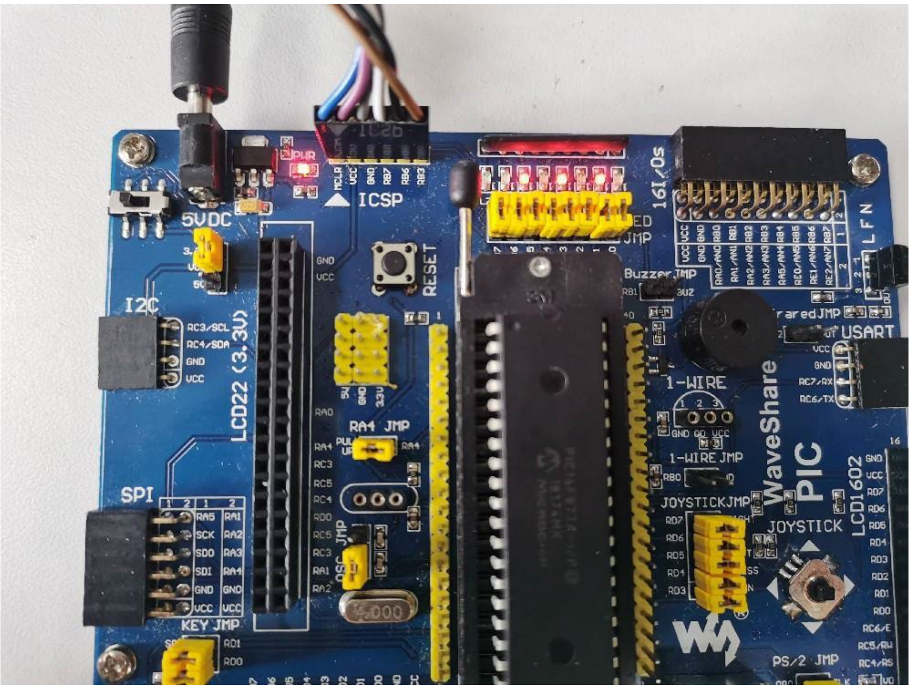


(2) Then I modified the code with the pattern “01010101”.

The assembly code is :

```
        BSF PORTB,0
        CALL DEALY
        BCF PORTB,1
        CALL DEALY
        BSF PORTB,2
        CALL DEALY
        BCF PORTB,3
        CALL DEALY
        BSF PORTB,4
        CALL DEALY
        BCF PORTB,5
        CALL DEALY
        BSF PORTB,6
        CALL DEALY
        BCF PORTB,7
        CALL DEALY
```

The result is:



5 Conclusions (5 Points)

In this seminar, I briefly understand the architecture of PIC16F877A and the assembly language. In assembly language, I know that “CLRF” can clear the data in the register like “CLRF PORTB”. “BSF f,b” can set bit b of the f register to 1 and “BCF F,b” set bit b of the register to 0. Finally, copy the correct code on the PIC board and find the interesting LEDs flash.