EECE416: Microcomputer Fundamentals and Design

PIC Coding Practice - A

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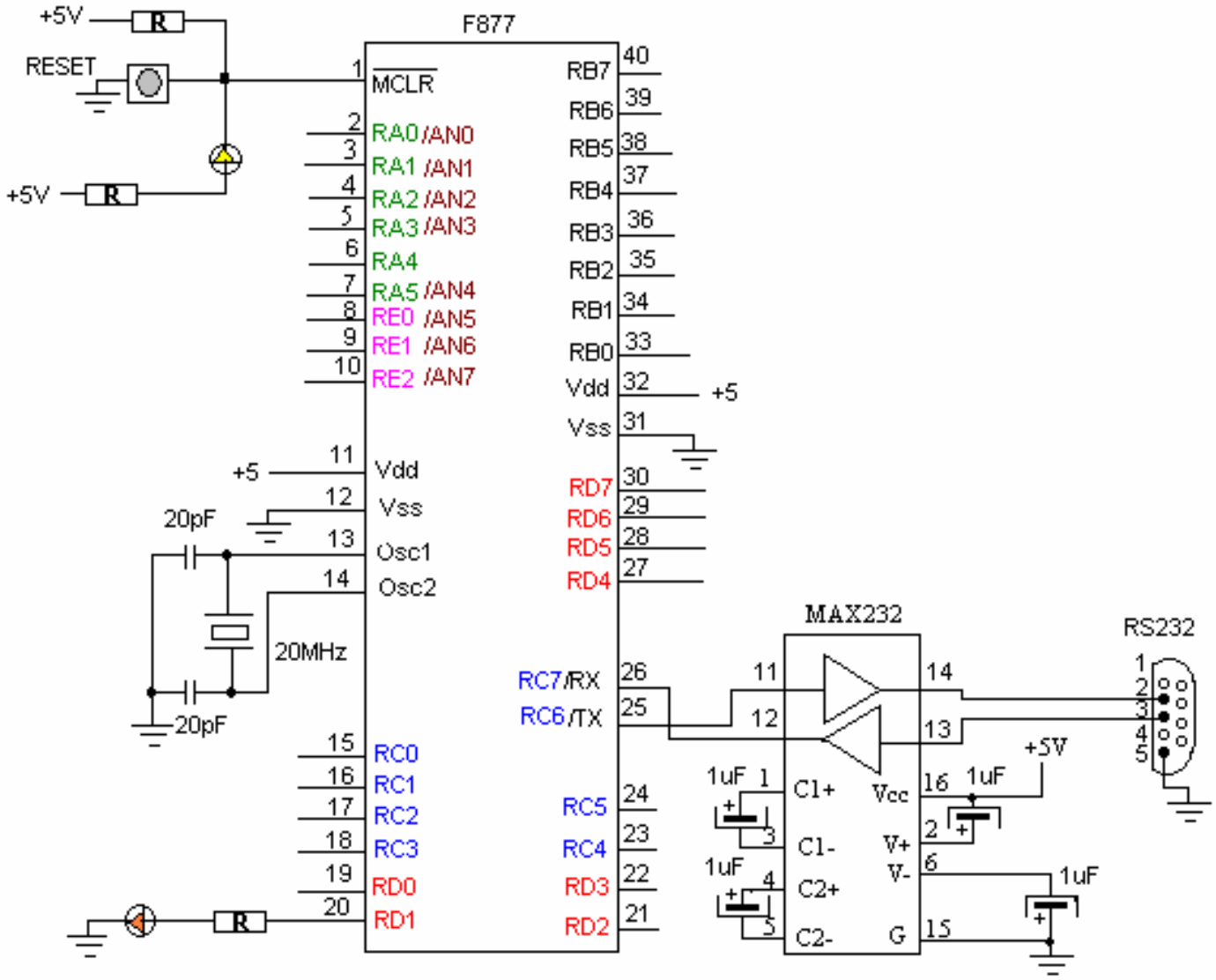
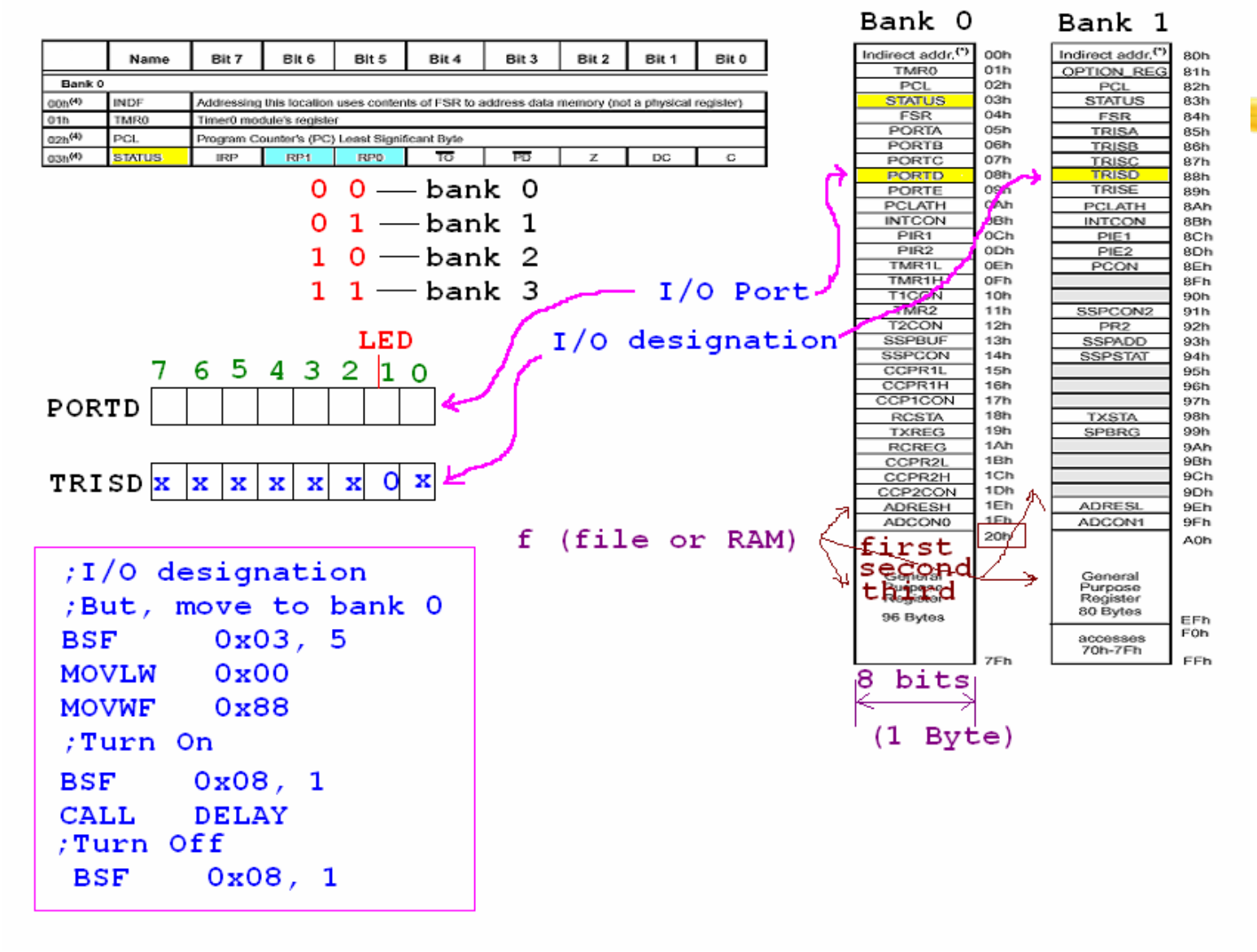
1: LED On/Off


F877
+5V
RESET
+5V
MCLR
RA0 /AN0
RA1 /AN1
RA2 /AN2
RA3 /AN3
RA4
RA5 /AN4
RE0 /AN5
RE1 /AN6
RE2 /AN7
Vdd
Vss
Osc1
Osc2
RB7
RB6
RB5
RB4
RB3
RB2
RB1
RB0
Vdd
Vss
RD7
RD6
RD5
RD4
RC7/RX
RC6/TX
RC0
RC1
RC2
RC3
RD0
RD1
RC5
RC4
RD3
RD2
20pF
20MHz
20pF
MAX232
C1+
C1-
C2+
C2-
Vcc
V+
V-
G
1uF
RS232

Illustration



	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bank 0									
00h(4)	INDF	Addressing this location uses contents of FSR to address data memory (not a physical register)							
01h	TMR0	Timer0 module's register							
02h(4)	PCL	Program Counter's (PC) Least Significant Byte							
03h(4)	STATUS	IRP	RP1	RP0	$\overline{TO}$	$\overline{PD}$	Z	DC	C

```
;I/O designation
;But, move to bank 0
BSF     0x03, 5
MOVLW   0x00
MOVWF   0x88
;Turn On
BSF     0x08, 1
CALL    DELAY
;Turn Off
 BSF    0x08, 1
```

Any Help with Bank selection headache ?

- A MPASM Directive
- MPASM User's Guide (Table 5.1)
- BANKSEL: Generates RAM bank selecting code
- Usage and Example
  - `BANKSEL  f ; f is the register to access`
  - `BANKSEL  TRISD`
  - `MOVLW  0x05`
  - `MOVWF  TRISD`
- Caution:
  - No Label left to `BANKSEL`
  - When Label is needed, use it above the `BANKSEL` line.

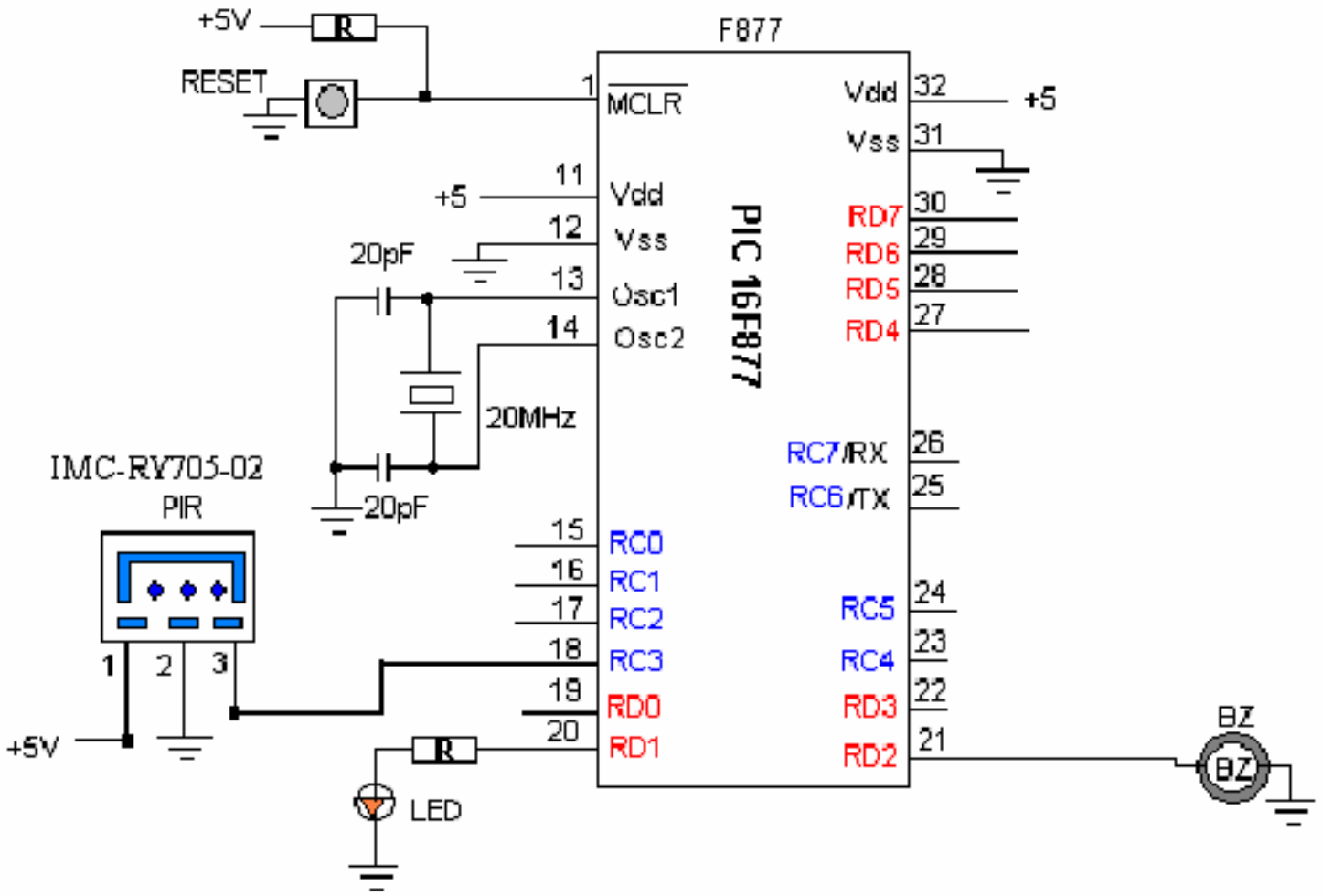
New LED code with BANKSEL

```
;Bootloader accommocation ===
        ORG     0x00
        GOTO    START
        ORG 0x05
;Bootloader accommodation ===

START
        BANKSEL TRISD
; 1 for input, 0 for output
        MOVLW   0x45            ;01000101 RD1 OUTPUT
        MOVWF   TRISD

; LED FLASH LOOP
        BANKSEL PORTD
        CLRF    PORTD
LOOP    BSF     PORTD,LED1              ;led on
        CALL    DELAY
        BCF     PORTD,LED1              ;led off
        CALL    DELAY
        GOTO    LOOP
```

2: Motion Detection and Buzzing



Step 1: Piezo Buzzer

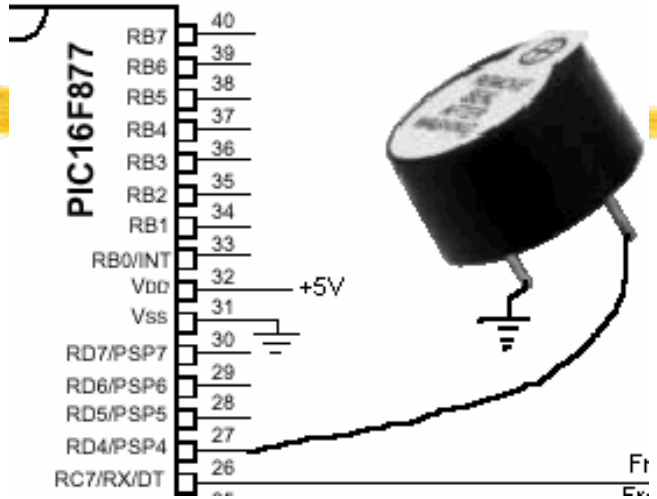
CE-328 Series

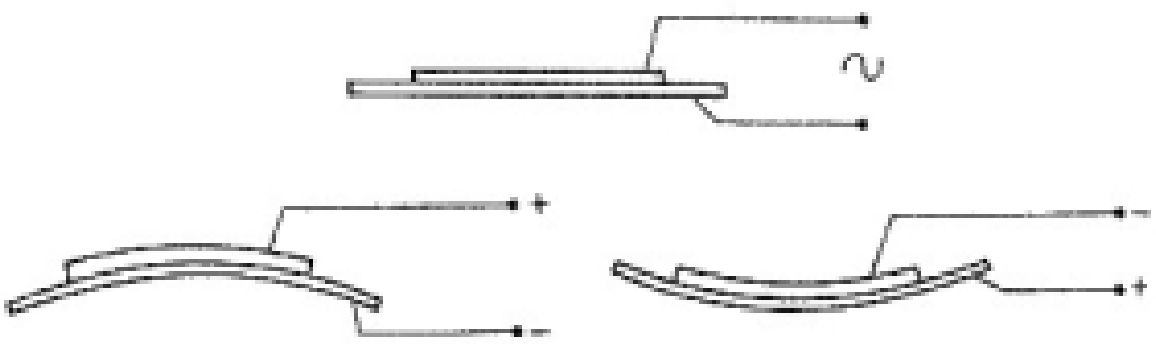
color Black
Noryl
Housing Material
Pin Terminal

ELECTRICAL SPECIFICATIONS

MODEL NO.		32S4120
Operating Voltage	(VDC)	3 - 16
Rated Voltage	(VDC)	12
*Max. Rated Current	(mA.)	7
*Min. Sound Output	(dBA/10cm)	80
*Frequency	(Hz.)	4000±500
Tone Nature		single
Operating Temperature	(°C)	-20 – +60
Weight	(gm.)	1

*Value applying at rated voltage





1 Hz

5 Hz

50 Hz

500 Hz

4000 Hz

100 us Delay and 1 ms Delay

- 100 us delay
  - needs 500 instruction cycles
  - 600 =166*3 +2
    - Number of Loops=166=0xA6
  - or =165*3 +5
    - Number of Loops=165=0xA5
  - or =164*3 +8
    - Number of Loops=164=0xA4

```
;100us delay needs 500 inst
;  500 =166*3 +2 ---->Kount
;  or  =165*3 +5 ---->Kount
;  or  =164*3 +8 ---->Kount
Delay100us
    banksel Kount100us
    movlw   H'A4'
    movwf   Kount100us
R100us  decfsz  Kount100us
    goto    R100us
    return
```

```
;
Delay1ms
    banksel Kount1ms
    movlw   0x0A    ;10
    movwf   Kount1ms
R1ms    call    Delay100us
    decfsz  Kount1ms
    goto    R1ms
    return
```

Piezo buzzing Practice

```
;PBuzz is connected to RD2
;

        list P = 16F877

STATUS  EQU 0x03
PORTD   EQU 0x08
TRISD   EQU 0x88
PBUZZ   EQU 0x02

    CBLOCK  0x20
        TEMP
        TEMP2
        Kount120us
        Kount100us
        Kount1ms
        Kount10ms
        Kount100ms
        Kount500ms
        Kount1s
        Kount10s
        Kount1m
    ENDC
```

```
;====================
    org     0x0000
    GOTO    START

;====================

    org 0x05
START
    BANKSEL TRISD
    movlw   0x00
    movwf   TRISD

    BANKSEL PORTD
    clrf    PORTD
```

```
    movlw   0x08        ;8 pulses of 5Hz
    banksel TEMP
    movwf   TEMP
LOOPb   bsf PORTD, PBUZZ
    call    Delay100ms
    bcf PORTD, PBUZZ
    call    Delay100ms
    decfsz  TEMP
    goto    LOOPb
```

Step2: LED-BUZZ-MOTION Practice

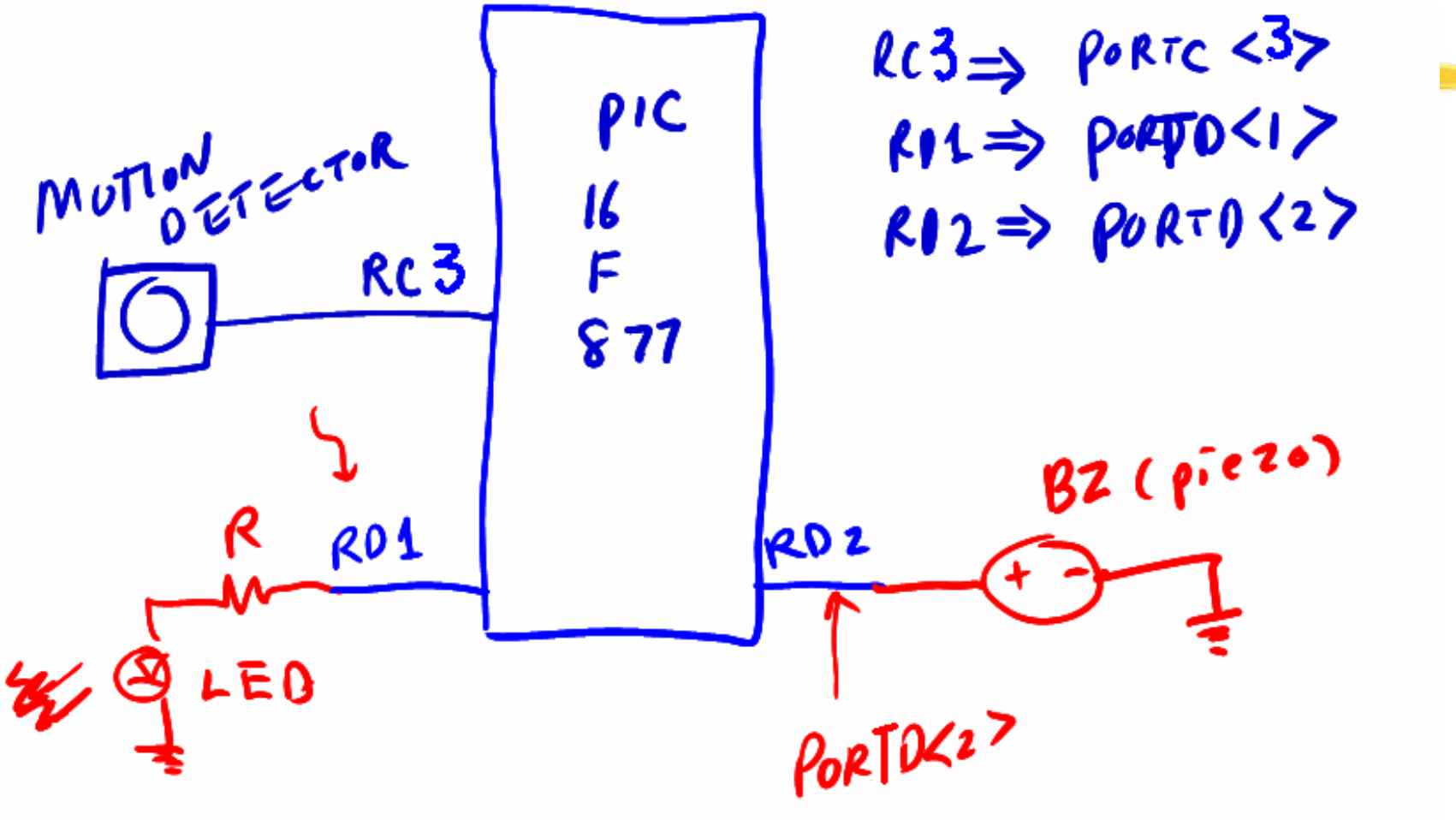
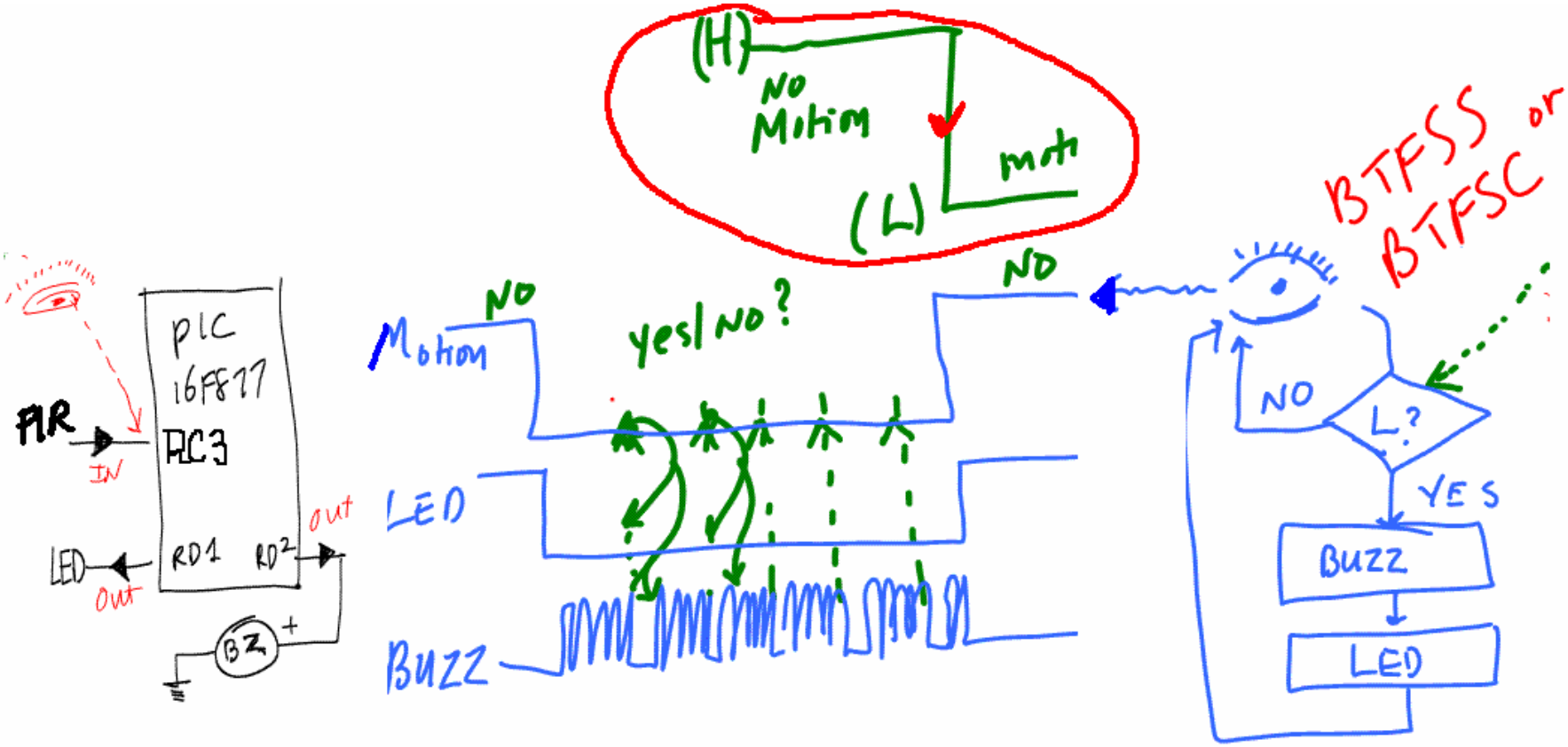


Illustration for Coding



Coding

```
MOTION   btfss    PORTC, PIR
         goto     ACTION
         bsf      PORTD, LED
;        call     DELAY1s
         goto     MOTION
ACTION   bcf      PORTD, LED
         call     BZLED
         call     DELAY1s
         goto     MOTION
```

LED-BUZZ-MOTION (photo)