EECE416: Microcomputer Fundamentals and Design
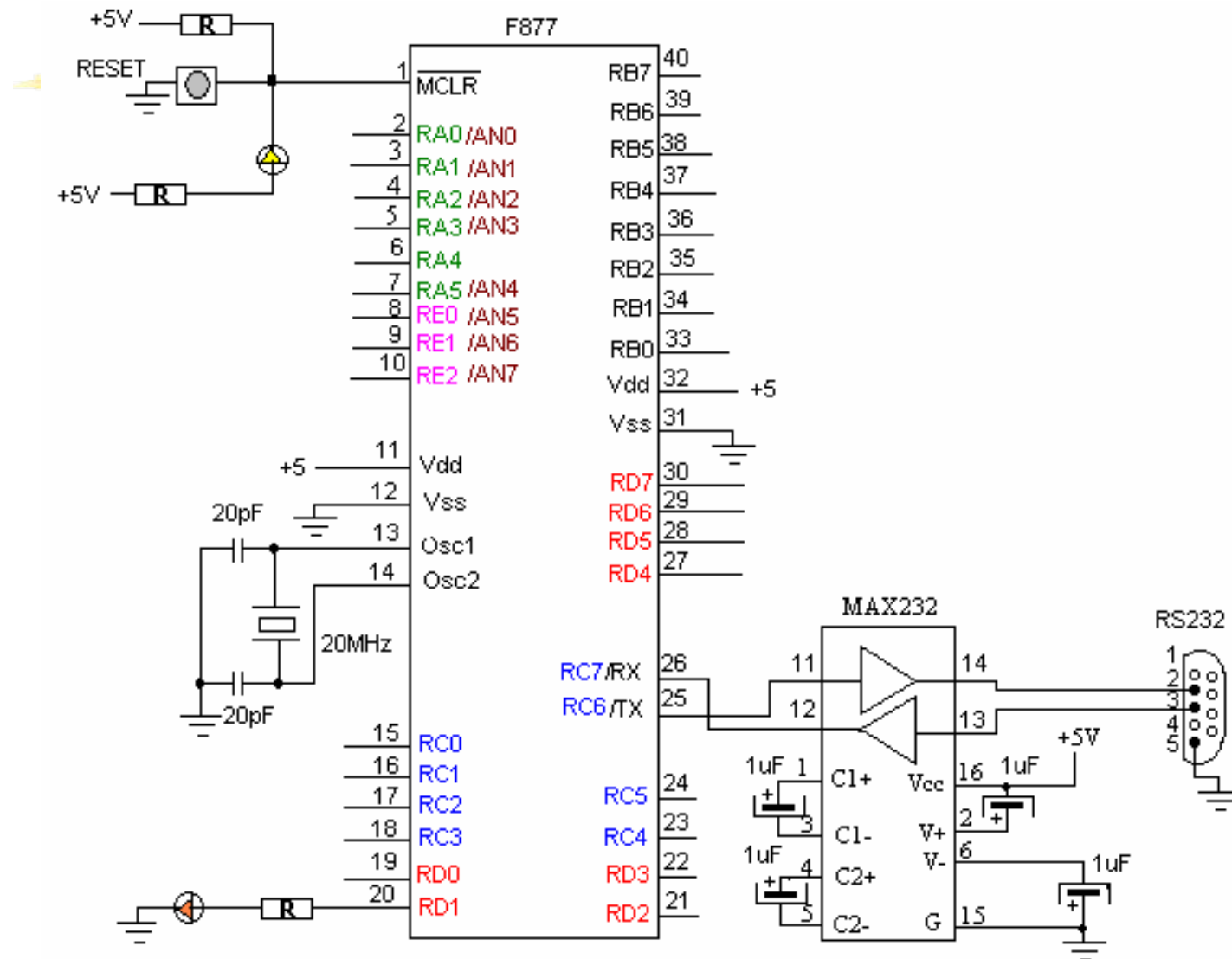
PIC Coding Practice - A

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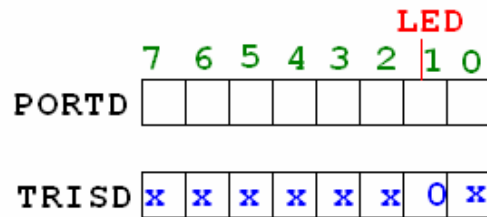**Bank 0**   **Bank 1**

	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	TO	PD	Z	DC	C

```
0 0 — bank 0
0 1 — bank 1
1 0 — bank 2
1 1 — bank 3          I/O Port

                 LED      I/O designation

        7 6 5 4 3 2 1 0

PORTD  [ ][ ][ ][ ][ ][ ][ ][ ]

TRISD  [x][x][x][x][x][x][0][x]
```

f (file or RAM)

```
;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
```

Bank 0		Bank 1	
Indirect addr.(*)	00h	Indirect addr.(*)	80h
TMR0	01h	OPTION_REG	81h
PCL	02h	PCL	82h
STATUS	03h	STATUS	83h
FSR	04h	FSR	84h
PORTA	05h	TRISA	85h
PORTB	06h	TRISB	86h
PORTC	07h	TRISC	87h
PORTD	08h	TRISD	88h
PORTE	09h	TRISE	89h
PCLATH	0Ah	PCLATH	8Ah
INTCON	0Bh	INTCON	8Bh
PIR1	0Ch	PIE1	8Ch
PIR2	0Dh	PIE2	8Dh
TMR1L	0Eh	PCON	8Eh
TMR1H	0Fh		8Fh
T1CON	10h		90h
TMR2	11h	SSPCON2	91h
T2CON	12h	PR2	92h
SSPBUF	13h	SSPADD	93h
SSPCON	14h	SSPSTAT	94h
CCPR1L	15h		95h
CCPR1H	16h		96h
CCP1CON	17h		97h
RCSTA	18h	TXSTA	98h
TXREG	19h	SPBRG	99h
RCREG	1Ah		9Ah
CCPR2L	1Bh		9Bh
CCPR2H	1Ch		9Ch
CCP2CON	1Dh		9Dh
ADRESH	1Eh	ADRESL	9Eh
ADCON0	1Fh	ADCON1	9Fh
	20h		A0h
General Purpose Register 96 Bytes		General Purpose Register 80 Bytes	EFh
		accesses 70h-7Fh	F0h
	7Fh		FFh

first
second
third

8 bits
(1 Byte)

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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

```asm
;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
```
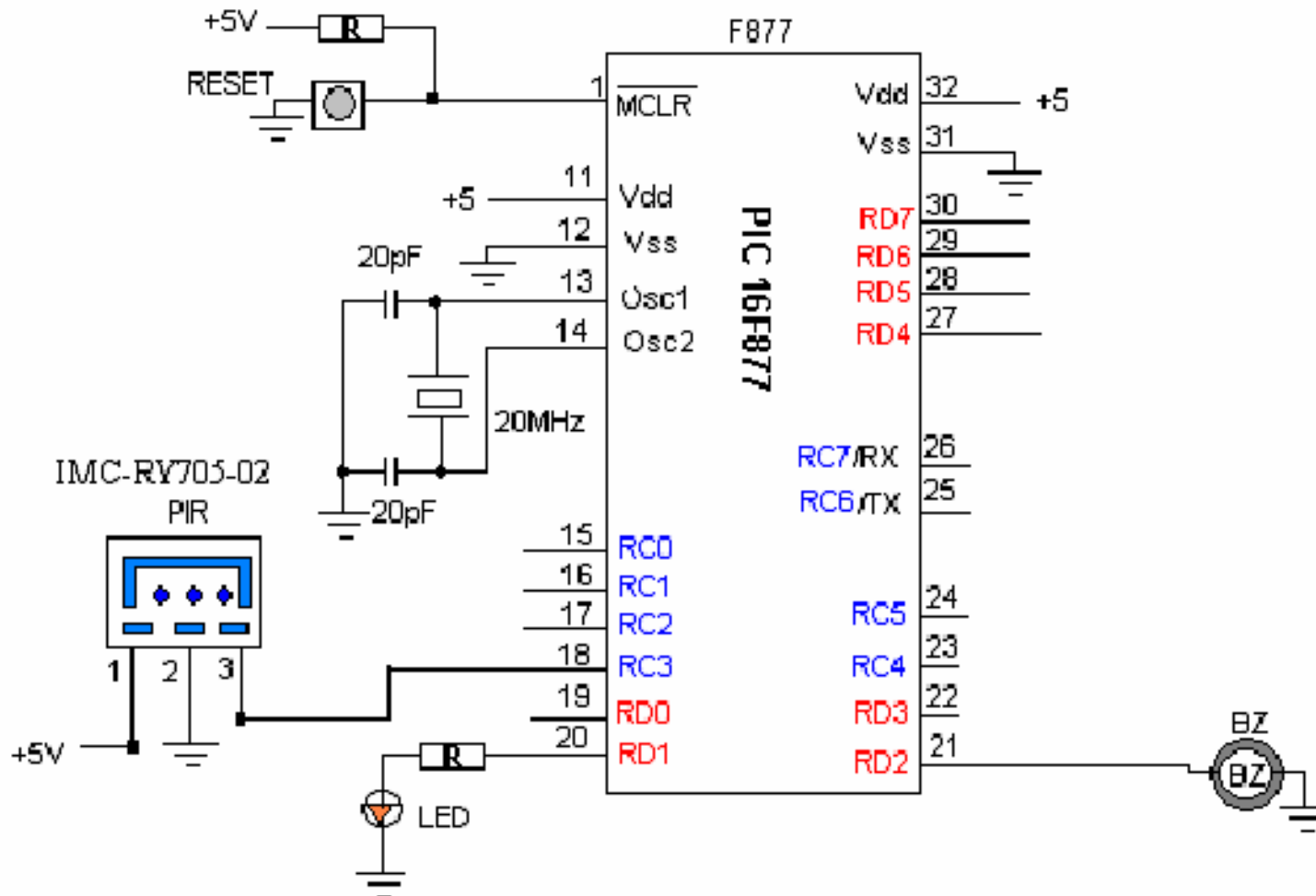
CE-328 Series

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

PIC16F877

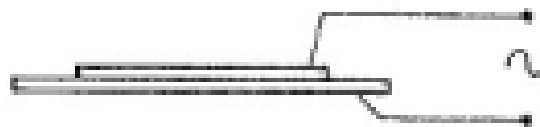|	
RB7	40
RB6	39
RB5	38
RB4	37
RB3	36
RB2	35
RB1	34
RB0/INT	33
VDD	32 +5V
Vss	31
RD7/PSP7	30
RD6/PSP6	29
RD5/PSP5	28
RD4/PSP4	27
RC7/RX/DT	26
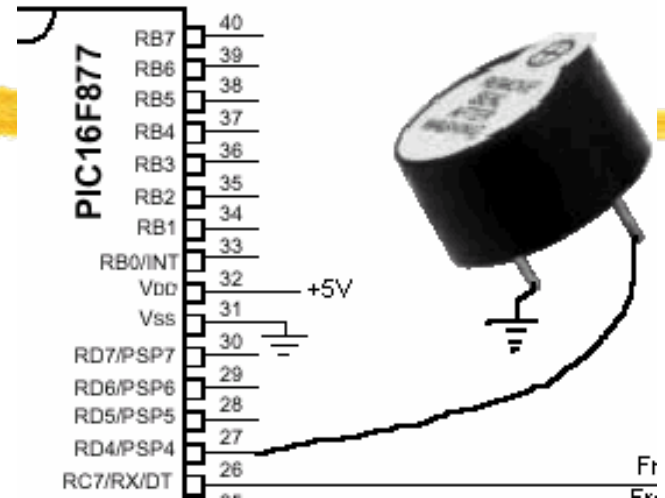
1 Hz

5 Hz

50 Hz

500 Hz

4000 Hz

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⌘ 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
```

MOTION DETECTOR

RC3

PIC 16 F 877

RC3 ⇒ PORTC <3>
RD1 ⇒ PORTD <1>
RD2 ⇒ PORTD <2>

R   RD1

LED

RD2

BZ (piezo)

(+ -)

PORTD<2>

Coding

```
MOTION      btfss       PORTC, PIR
            goto        ACTION
            bsf         PORTD, LED
;           call        DELAY1s
            goto        MOTION
ACTION      bcf         PORTD, LED
            call        BZLED
            call        DELAY1s
            goto        MOTION
```
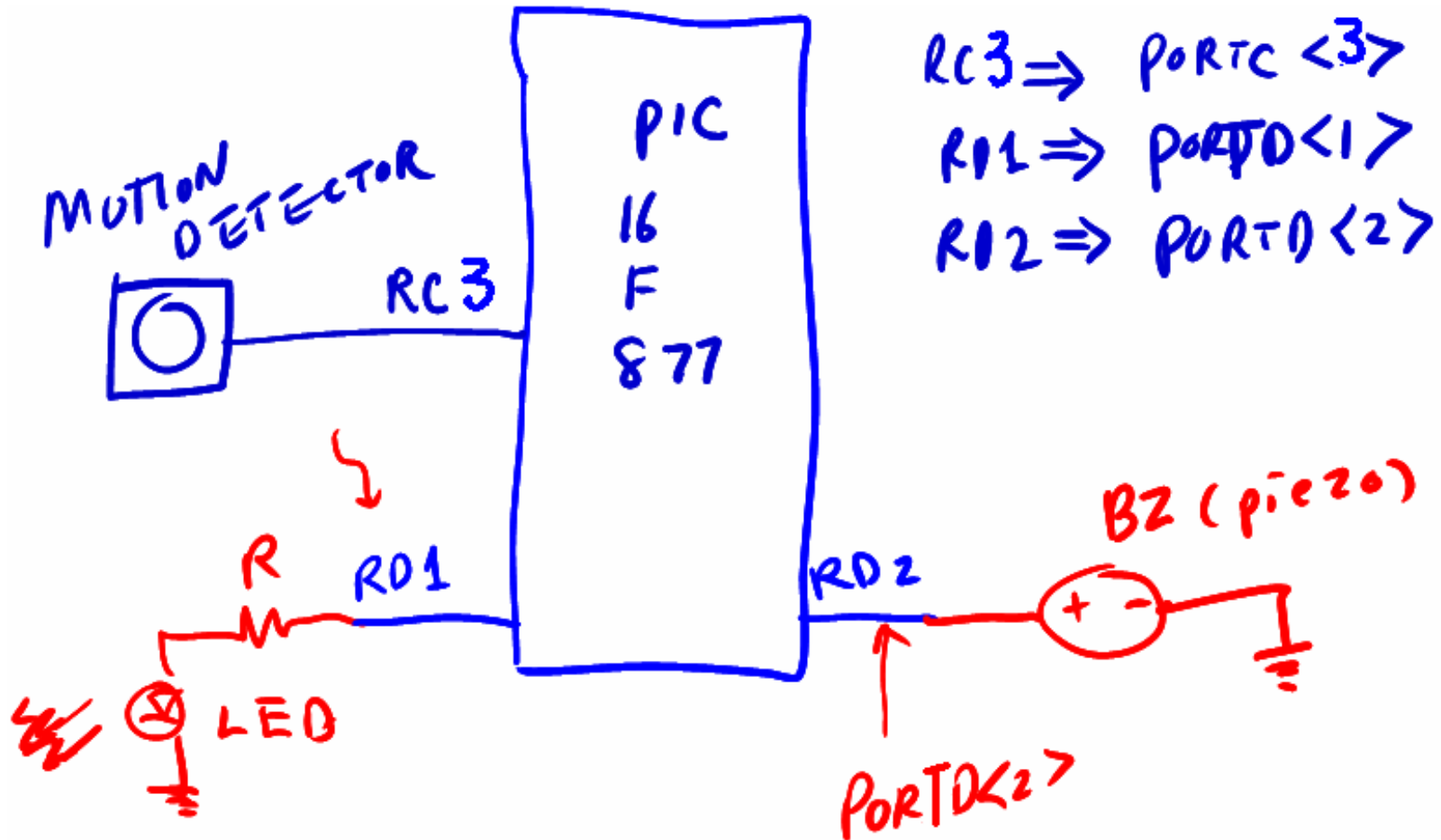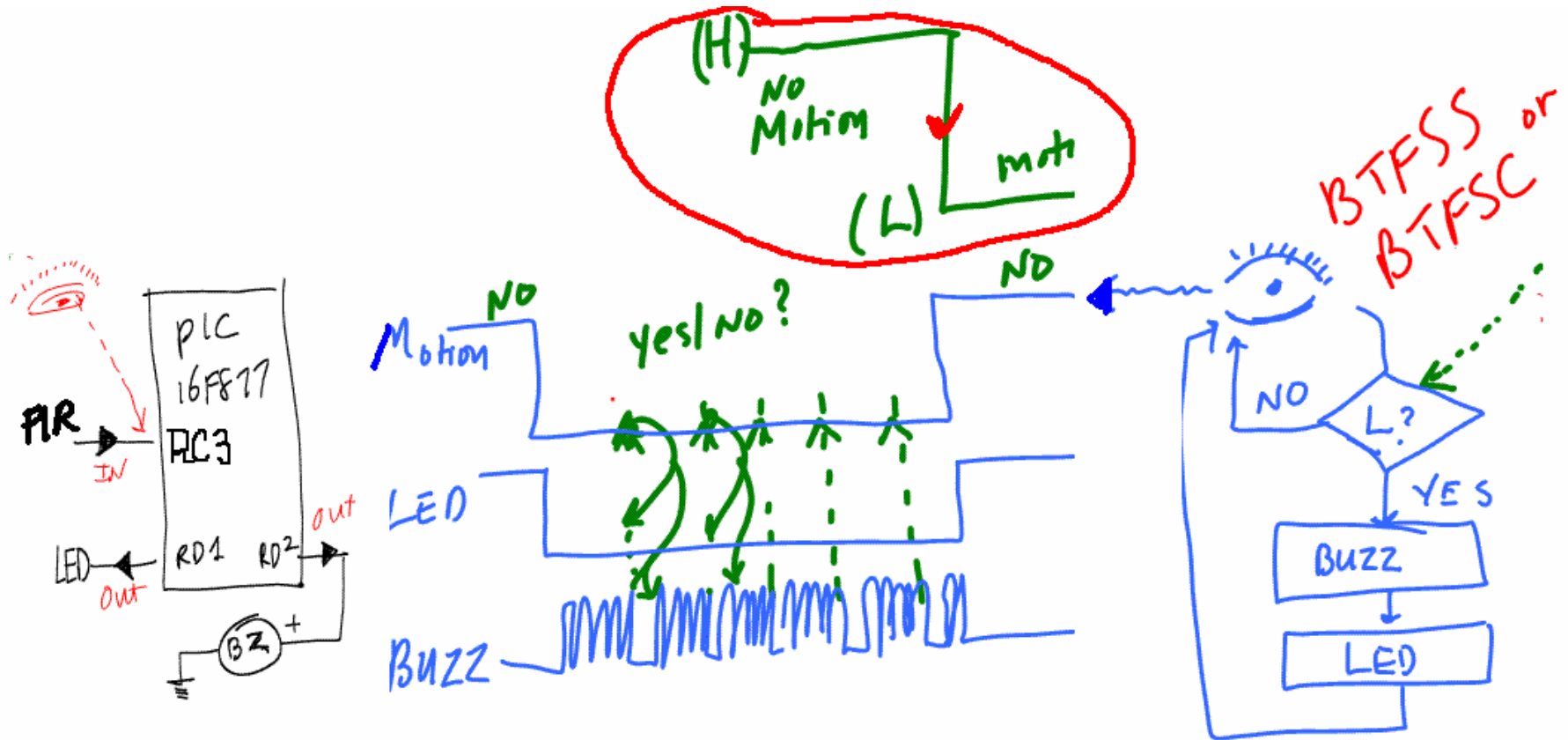
LED-BUZZ-MOTION (photo)

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