Weather Station

- Anemometer (Wind Speed Sensor)
- Temperature Sensor (LM35D)
- LCD Data Display
Anemometer

- An instrument with three or four small hollow metal hemispheres that measures wind velocity.
- An electrical device records the revolutions of the cups and calculates the wind velocity.
Anemometer Components

- IRED
- DC Motor
- Plastic Cups
Infra Red Emitter & Detector

Circuit diagram of an infrared reflectance sensor.
Start

Initialize pin RC4 as low interrupt to count pulses

Initialize timer0 as high interrupt every 1 second

Repeat

Get number of pulses generated during 1 second

Find Wind Speed

\[ V = N \times 2\pi \times r \]

<199

Yes

Display “Calm”

No

>200

Yes

Display “Wind”

No

Display “Calm”
The name or number 1 placed under each bit means that these bits are set to high (high=1), if 0 or nothing is put under the bit it means that this bit is set to low.
Timer0 initialization

<table>
<thead>
<tr>
<th>Register</th>
<th>B7</th>
<th>B6</th>
<th>B5</th>
<th>B4</th>
<th>B3</th>
<th>B2</th>
<th>B1</th>
<th>B0</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0CON</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>TOPS2 (1)</td>
<td>TOPS1(0)</td>
<td>TOPS0(1)</td>
</tr>
</tbody>
</table>

TIMER0 in 16 bits is set to generate a high-priority interrupt every 1 second using 1:64 pre-scale:

The internal clock period $T$ is $T = 1/8$ Mhz = 125ns
The instruction period $= 4T = 125$ns x 4 = 500ns
Number of instruction cycles needed to generate 1 second $N = 1s/500$ns = 2000000
For pre-scale of 1:64 the count is $C = 2000000/64 \times 31250$
Since the timer counts only up from a loaded number until 0xFFFF, and rolls over to 0x0000, therefore the pre-loaded number should be $65535 - 31250 = 34285 \rightarrow$ in Hexadecimal 85ED
We preload TMRH0H by 85 TMRH0L ED
Anemometer Initialization

```assembly
bsf RCON, IPEN ; set to enable FF priority
bsf INTCON, GIEH ; set to enable high priority interrupt
bsf INTCON, GIEL ; set to enable low priority interrupt
bsf INTCON, TMROIE ; enables TMRO overflow interrupt
bcf INTCON, TMROIF ; TMRO overflow interrupt flag bit
bcf INTCON2, INTEDG1 ; interrupt on falling edge
bsf INTCON2, TMROIP ; TMRO overflow interrupt priority bit set to high priority
bcf INTCON3, INT1IP ; INT1 interrupt priority bit / clear means low priority
bsf INTCON3, INT1IE ; external interrupt enable bit
bcf INTCON3, INT1IF ; clear INT1 flag
movlw b'10000101' ; TMRO On / TMRO setting 64 prescale
movwf TOCON
```
LM35D Temperature Sensor

- Linear + 10.0 mV/C
- 0.5 C accuracy
- Less than 60 uA current drain
- Low self heating, 0.08 C in still air
A/D Flowchart

Start

- Initialize PORTS A, B and D
- Initialize ADC
- Initialize LCD

Get ADC from ADRESL register

BCD Convert

Check If TEMP>33

- NO
- YES

DISPLAY “Hot”

DISPLAY “Warm”
## A/D initialization

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<th>B0</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADCON1</td>
<td>VCFG1 (0)</td>
<td>VCFG0 (0)</td>
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<tr>
<td>ANSEL0</td>
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<td>0</td>
<td>ANS4</td>
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<td>0</td>
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<td>0</td>
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<td>GASEL0 1</td>
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<td>0</td>
<td>ACONV</td>
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<td>0</td>
<td>ACQT1</td>
<td>0</td>
<td>ADCS2</td>
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<td>0</td>
</tr>
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A/D Initialization

;**************************************************************************A/D INITIALIZATION**************************************************************************

MOVWF COUNT9
BCF ADCON1, VCFG1 ; Vref- is AVss
BCF ADCON1, VCFG0 ; Vref+ is AVdd
BSF ANSELO, ANS4 ; Analog input
BCF ADCHS, GASEL1 ; Choosing AN4
BSF ADCHS, GASELO
BCF ADCON0, ACONV ; Single-shot mode
BSF ADCON2, ADFM ; Right justification
MOVWF 0X94
MOVWF ADCON2 ; 4TAD & FOSC/4
BSF ADCON0, ADON ; A/D enable
call DELAY_10US
BSF STATUS, C
Thank You