Chapter Four

Simulations and Results

4.1 Simulations

MICROC program is used to program the microcontroller to read the temperature, humidity, light and pressure sensors values (the microcontroller has internally ADC) and transmit it to receiver. The microcontroller displayed these values on LCD screen and Labview was used to simulate the wireless weather station on Proteus 8 Professional. The design wireless weather station consists of a transmitting station and receiving station.

4.1.1 Circuit diagram

Figure 4.1 shows the simulation result for wireless weather station using radio frequency.

![Figure 4.1: Simulation wireless weather station using radio frequency](image-url)
Figure 4. 2: shows the transmitter circuit.

At transmitter circuit microcontroller (PIC16F877A) with an external oscillator connected crystal 4MHz that in parallel with two capacitors(22pf) connected to ground to generate pulse at pin (13,14), 10K ohm connected with a push button and ground to active low the reset pin (1). The LM35 sensor, light sensor, pressure and humidity sensors used to sense the temperature, light, pressure, humidity respectively connected to I/O port A pins (2,4,3,) of the microcontroller humidity sensor connected in pin 15 port C.
And data bit (D0 D1 D2 D3) send through pin(33, 34, 35 ,36) to encoder to transmit through RF transmitter 434 MHZ . Figure 4.3 shows the receiving circuit.

At receiver circuit microcontroller with an external oscillator connected crystal 4MHz that in parallel with two capacitors(22PF) connected to ground to generat pulse at pin (13,14),10K ohm connected with a push button and ground to active low the reset pin(1). And data bit (D0 D1 D2 D3) received through pin(33, 34, 35 ,36) from decoder through RF receiver 434 MHz.
4.1.2 Virtual terminal

The Figure 4.4 and 4.5 show the virtual terminal and virtual terminal data to personal computer.

Figure 4.4: Virtual terminal

![Virtual terminal](image1)

Figure 4.5: Virtual terminal-data to personal computer

Virtual terminal allows to receive and send serial non-simultaneous data type RS232 to and from a PC to and from the system simulates the microprocessor. It is particularly useful in debugging where it can be used to display a trace debug messages which is generated by the program, which is being developed by.

4.1.3 Labview

Laboratory Virtual Instrument Engineering Workbench labview, a product of National Instruments TM, is a powerful software system that accommodates data acquisition, instrument control, data processing and data presentation.
Labview which can run on PC under Windows, Sun SPARstations as well as on Apple Macintosh computers, uses graphical programming language (G language) departing from the traditional high level languages such as the C language, Pascal or Basic. All Labview graphical programs, called Virtual Instruments or simply VIs, contains a front panel and a block diagram. The Figure 4.6 shows the lab view readings and Figure 4.7 shows the weather station block diagrams.

Figure 4.6 : The labview readings
4.2 Result

In this thesis ASK has been used is a form of amplitude modulation that represents digital data as variation in the amplitude of carrier wave. In ASK system the binary symbol 1 is represented by transmitting affixed amplitude carrier wave and fixed frequency for a bit duration of $T$ seconds. If the signal is 1 then the carrier signal will be transmitted otherwise a signal value 0 will be transmitted. The Figure 4.8 shows amplitude shift keying (ASK).

![Figure 4.7: Weather Station block diagrams](image)

![Figure 4.8: Amplitude shift keying](image)
HT12E Encoding 4 parallel input data bit to $2^4$ or 16 output data series and HT12DD Doing the opposite this digital data represent sensor degree. Each sensors have output range of degree this range is divided by the program code (Microc) each rang have specified value will be displayed. The Table 4.1 shows the sensors output range and the value will be displayed and the code of the sensors output during RF module transmitter. Example if the temperature sensor degree less than 35°C the output value will be displayed is 30°C this value represented in microcontroller by the code 0000.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Code</th>
<th>Range</th>
<th>Value Will Be Displayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>temperature sensor</td>
<td>0000</td>
<td>&lt;35</td>
<td>30°C</td>
</tr>
<tr>
<td></td>
<td>0001</td>
<td>35 TO 40</td>
<td>36°C</td>
</tr>
<tr>
<td></td>
<td>0010</td>
<td>40 TO 45</td>
<td>42°C</td>
</tr>
<tr>
<td></td>
<td>0011</td>
<td>45 TO 50</td>
<td>48°C</td>
</tr>
<tr>
<td>Humidity sensor</td>
<td>0100</td>
<td>&lt;80</td>
<td>78%</td>
</tr>
<tr>
<td></td>
<td>0101</td>
<td>80 TO 90</td>
<td>88%</td>
</tr>
<tr>
<td></td>
<td>0110</td>
<td>90 TO 100</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td>0111</td>
<td>100 TO 120</td>
<td>99%</td>
</tr>
<tr>
<td>pressure sensor</td>
<td>1000</td>
<td>&lt;50</td>
<td>50 pa</td>
</tr>
<tr>
<td></td>
<td>1001</td>
<td>50 TO 60</td>
<td>58 pa</td>
</tr>
<tr>
<td></td>
<td>1010</td>
<td>60 TO 70</td>
<td>64 pa</td>
</tr>
<tr>
<td></td>
<td>1011</td>
<td>70 TO 100</td>
<td>76 pa</td>
</tr>
<tr>
<td>light sensors</td>
<td>1100</td>
<td>&lt;10</td>
<td>10 lum</td>
</tr>
<tr>
<td></td>
<td>1101</td>
<td>10 TO 15</td>
<td>14 lum</td>
</tr>
<tr>
<td></td>
<td>1110</td>
<td>15 TO 20</td>
<td>17 lum</td>
</tr>
<tr>
<td></td>
<td>1111</td>
<td>20 TO 25</td>
<td>22 lum</td>
</tr>
</tbody>
</table>

The system that simulates a wireless weather station using radio frequency was run and gave the results as show in the table 4.1. The simulation results proved the efficiency of wireless weather station.