CHAPTER ONE

INTRODUCTION

1.1- BACK GROUND

The continuous increasing of food demands requires the rapid improvement in food production technology. In country like Sudan, where the economy is mainly based on agriculture. In dry areas or in case of inadequate rainfall, irrigation becomes difficult. So, it needs to be automated and handled remotely for farmer safety and high productivity through adaptive control of irrigation using economical method.

Automatic irrigation systems are convenient, especially for those who travel. If installed and programmed properly, automatic irrigation systems can even save you money and help in water conservation. Common methods of water distribution can be enhanced or replaced by using recent technological advances. I hope to use it to improve the deficiency of water distribution, to automate the process of irrigation management, to provide it by using the programming and reporting interface easily, and gives it a scalable, versatile base from which to expand or modify it if needed.

One of the main drawbacks with the old fashioned auto timer system is that they do not care for changing environmental conditions. Temperature, wind,moisture and other elements can dramatically affect the amount of forecasted rain. If these elements were monitored and used to increase water conservation, then the water used should be more effective.

Another aspect of regular irrigation systems that could be improved is its user interface.

The rate of population growth, there arise the needs to intensify the rate of food crop production so as to compensate for the increasing food demands. A method to reduce the problems associated with farming and as well increase the food crop production is the implementation of a controlled technique to meet the soil moisture requirem ent for different food crops grown in respective locations, In this systemyou canenter the requiredplants` values ofsoil moisture, allowing irrigationfor all kinds of plantsin this systemby comparingthedesired valueswiththe valuesmeasuredbysoil moisture sensors.

1.2- problem statement

The system of the microcontroller based on automated irrigation work very well, but its problem during or after Irrigation might rain, in this case the irrigation of plant will be irrigated twice.

1.3-Proposed solution

Automatic irrigation systems highly efficient in controlling irrigation, to increase water conservation add sensor device inthe rain expectation sensor, this part works to sense the expected rain before starting the irrigation process.

1.4- objective

- design microcontroller based on Automatic Irrigation System
- simulation of the proposed system will be run
- Implementation of a pro-type system will be done
- Performance evaluation for the system will be done

The proposed system should satisfy the following points:

- Microcontroller based controlled remote irrigation system is developed for the Agricultural
- Increase conservation water by use online forecast rain.

1.6 Methodology

The Microcontroller based on automated irrigation system consists of moisture sensor, analog to digital Convert, microcontroller, Relay driver, solenoid valve, LCD, rain expectations sensor and a battery. The moisture soil sensor is buried in the field at required depth. If the moisture content in the field is reduced to lower threshold limit, the signal is produced from the microcontroller before the microcontroller turn on relay read the sensor of rain expectations if there was a sign of rain the work is delayed and overdo other turn on relay and the solenoid valve is opened then water from the source is supplied to the field. Moisture level sensed from the sensor will be displayed in the LCD Display. After reaching upper threshold limit, the sensor gives corresponding signal to the microcontroller and the relay is turned OFF and hence the solenoid valve gets closed.

1.5- Research Outline

The research contains six chapters. The chapters are as follows;

Chapter 1: Introduction which present problem statement and the proposed solution along the objectives.

Chapter 2: Literature review covers the sequence of development of Automatic Irrigation System

Chapter 3:System design explain the hardware, Type of sensor like moisture soil sensor) Microcontroller atmega32 and circuit of rain protection.

Chapter 4:software &program

Chapter5:Simulation and results,highlight the obtained simulation result and discuss the result.

Chapter 6: Conclusion and recommendations summarizing the work done in the research and highlight several recommendation for future w

CHPTER TOW

2. LITERATURE REVIEW

2.1-Back Ground

Water is the most important input required for plantgrowth foragriculture production. Irrigation can be defined asreplenishment of soil waterstorage in plant root zone through methodsother than natural precipitation. Irrigation isseen to have found itsroots in the history of mankind since earliest beginning .Ithelpsreduce the uncertainties, particularly the climatic uncertainties inagriculturepractices. Archaeologicalinvestigation has identified evidence ofirrigation where the natural rainfallwas insufficient to supportcrops.

Perennial irrigation was practiced in the Sudanby coaxing water through a matrix ofsmall channels formed in the field.Peoplepracticed Basin irrigation using theloadingof the Niletoinundate land plots which had been surrounded by dykes .The humandeveloped a form of irrigation byusing awaterwheel-like device called aSakia.

2.2-Related Work

The first electronic circuit for automatic irrigation system a simple control circuit used tow input،sensor of humidity (two wires) and sensor of light (LED) when two sensors chive conditions the switch on and irrigation the plant. Then this circuit developed to replace microcontroller control circuit.

In 2011 tem form Amity Institute[1] designs the automatic irrigation system use 80C51 microcontroller. A moisture sensor is associated with each of the plurality of zones. Each such sensor is periodically interrogated by a

[1](Microcontroller-based Automatic Irrigation System with Moisture Sensors(Abhinav Rajpal, Sumit Jain, Nistha Khare and Anil Kumar Shukla) Amity Institute of Telecom Technology & Management,).

pulse signal provided by the micro controller via a driver or buffer circuit. This interrogation signal causes the moisture sensors to output an analog voltage which is proportional to the amount of moisture in the soil in which the sensors are embedded

In the same year (Mahir Dursun* and Semih Ozden)[2]this project use a wireless sensor network for low-cost wireless controlled irrigation solution and real time monitoring of water content of soil. Data acquisition is performed by using solar powered wireless acquisition stations for the purpose of control of valves for irrigation. The designed system has3 units namely: base station unit (BSU), valve unit (VU) and sensor unit (SU). The designed system was applied to an area of 8 decares in a venue located in central Anatolia for controlling drip irrigation of dwarf cherry trees.

S.Mahendra M.Lakshmana Bharathy in January 2013[3]designed automatic irrigation system of Drip Irrigation consists of moisture sensors, temperature sensors, Signal conditioning circuit, Digital to analog converter, LCD Module, Relay driver, solenoid control valves and micro controller ATMEL 89C51 . Once the soil has reached desired moisture level the sensors send a signal to the microcontroller to turn off the relays, which control the valves.

Also tem of Emerging Science and Engineering1[4] design Microcontroller Based Drip Irrigation System, This project. A 16×2 LCD is

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[2] -A wireless application of drip irrigation automation supported by soil moisture sensors (Mahir Dursun* and Semih Ozden)
Department of Electrical Education, Technical Education Faculty, Gazi University, February 2011).

[3]Microcontroller Based Automation of Drip Irrigation System(S.Mahendra M.Lakshmana Bharathy) Electronics and Communication Engineering Department, GKM College of Engineering & Technology, 2*013)*

[4](Microcontroller Based Drip Irrigation System(D.Kotaiah Swami, G.Rajesh, M.Jaya Krishna Poona, A.Rama Krishna International Journal of Emerging Science and Engineering (IJESE) , April 2013)

connected to the microcontroller, which displays the humidity level and ambient temperature. Three pushbuttons are provided to set the limits of humidity for switching the individual solenoid valves controlling the water flow to the field. The humidity and temperature levels are transmitted at regular time interval to the PC through the RS232 serial port for data logging and analysis. The humidity sensors are constructed using aluminum sheets and housed in easily available materials. The aim is to use the readily available material to construct low cost sensors. Five relays are controlled by the microcontroller through the high current driver IC, ULN2003. Four relays are provided for controlling four solenoid valves, which controls the flow of water to four different parts of the field. One relay is used to shut-off the main motor which is used to pump the water to the field.

The same idea continued development of the system with change the sensor and microcontroller, using 8051 micro controller which is programmed as giving the interrupt signal to the sprinkler and Temperature sensor and humidity sensor are connected to internal ports of micro controller via comparator by (Vanuatu Naga Remit Gunturi)in April 2013[5] .

Microcontroller based controlled remote irrigation system is developed for the agricultural plantation by S. R. Kumbhar, Arjun P. Ghatule[6]. The developed system is placed at the remote location and required water provides for plantation whenever the humidity of the soil goes below the set-point value. Humidity sensor provides proportional amount of output with change in humidity, which is compared, to the set-point and the data is taken through the channel. If the set-point data is high, then after motor is turned ON, which provides water to the plant till the humidity goes above set-point value. After reaching the humidity above set-point value motor is turned

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[5]-Micro Controller Based Automatic Plant Irrigation System(Vanuatu Naga Remit Gunturi) Electronics and communication engineering department ،Anna University ،Chennai.

[6]-Microcontroller based Controlled Irrigation System for Plantation (Proceedings of the International Multi Conference of Engineers and Computer Scientists, March 2013, Hong Kong)

OFF and scans the next channel. This provides right amount of water at right time. The required software program is developed in assembly level language.

End project work by tem ofCollege of Technology University of Houston add rain sensor to system when sprinkelr begin watering and raining the rain sensor send interrupt signal to microcontroller to close valve.

Design and implementation of a programmable remote controlled and monitored irrigation system, this paper brings forward new programmable device for remote control and monitoring of irrigation system, the design of a programmable GSM- based remote monitoring and control of Automatic irrigation system is achieved. Any cell phone can send order to the controllers or browse the information from the controllers through the explanation mode using SMS. GSM network and radio provides credible communication for the devices. The system has successfully overcome quite a few shortcomings of the existing systems by reducing the power consumption, maintenance and complexity, at the same time providing a flexible and precise form of maintaining the environment, as well as using the existing wireless communication technology. The system provides the ability to remotely control all irrigation methodologies used in Sudan (drip irrigation, pump irrigation, flood irrigation). Programmed values can be entered via the keypad

CHAPTER THRRE

HARDWAER DISGN

3.1-Components of Circuit

1-Microcontroller (atmega32)

2- Soil moisture sensor

3- Soil Temperature

4- Switching logics

5- Solenoid valve

6- Power

7-Rain expectations

8- Sprinklers

The components of circuit is explained in the following figure 3.1

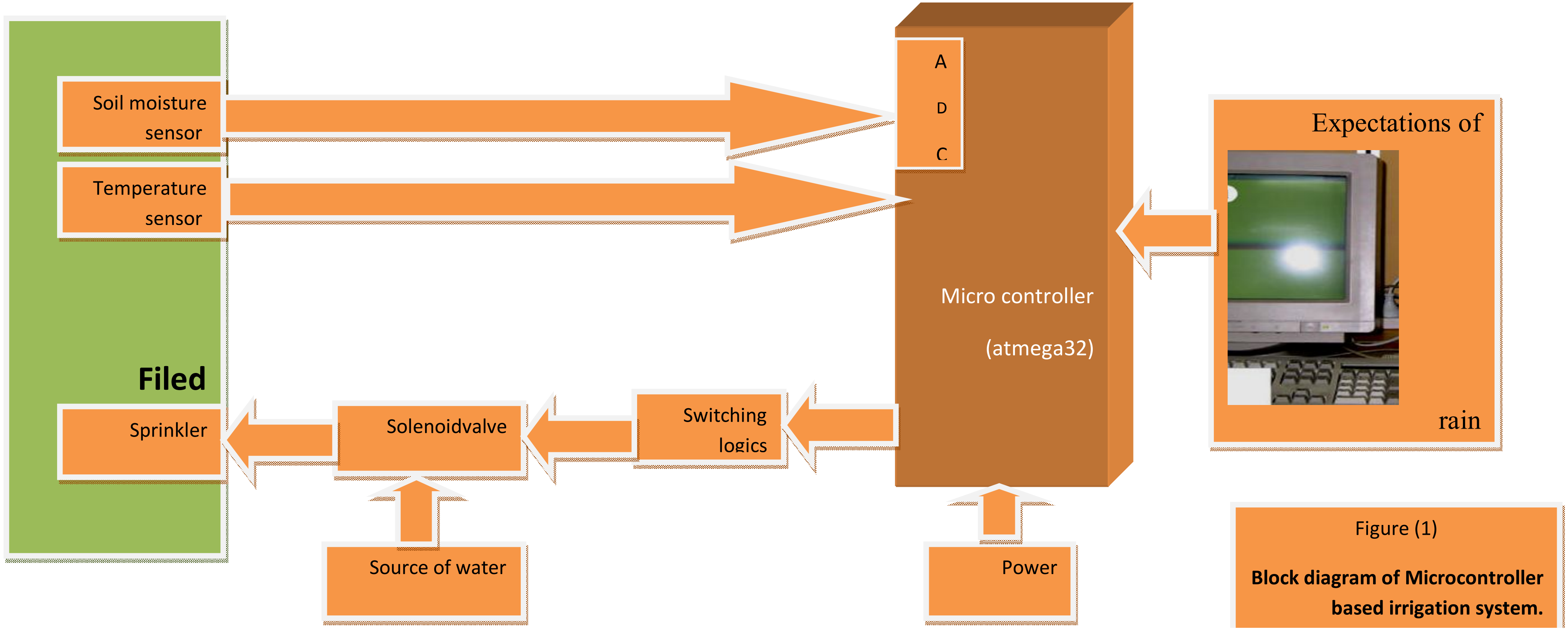


figure3. 1**Block diagram of Microcontroller based irrigation system.**

3.1.1-Micro controller:

ATmega32 is a low-power CMOS 8-bit microcontroller based on the AVRenhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed

The Idle mode stops the CPU while allowing the USART, Two-wire interface, A/D Converter, SRAM; Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next External Interrupt or Hardware Reset. In Power-save mode, the Asynchronous Timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except Asynchronous Timer and ADC, to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low-power consumption. In Extended Standby mode, both the main Oscillator and the Asynchronous Timer continue to run.

3.1.1 Analog to digital converter (ADC)

This peripheral in the micro-controller takes the analog signals from each sensor through the port and saves an eight-bit data representation of the analog signal on the ports register binary output of the corresponding voltage level at the input. This is necessary for the microcontroller to process the signals from the sensor, (analog is continuous signal while digital is discontinuous signal so this calls for the said process of data conversion) the ADC serves as an interface between analog and digital signals.

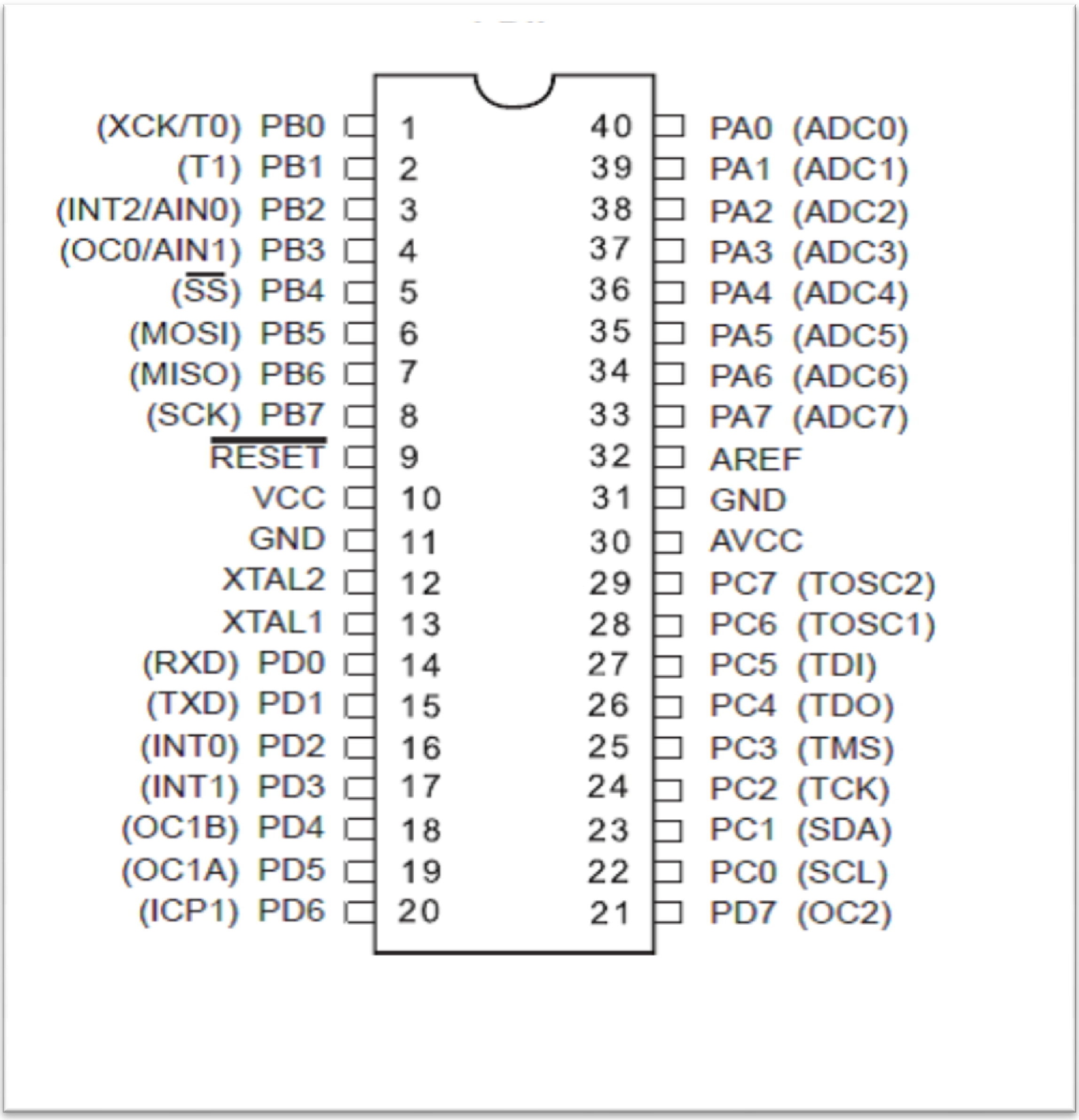


figure3.2 Pin out ATmega32

3.1.2- Soil Moisture Sensor:

The Moisture sensor is the resistive type of sensor which senses the change of resistivity between the probes and accordingly gives the output. Soil moisture probes can be permanently installed at representative points in an agricultural field to provide repeated moisture readings over time that can be used for irrigation management. Special care is needed when using soil moisture devices in coarse soils. The sensor used in this research is the ECH2O (EC-5) Dielectric Aqua meter sensors for measuring soil water content. These innovative sensors enable to measure soil moisture accurately and with suitable calibration equation for all types of soils. :

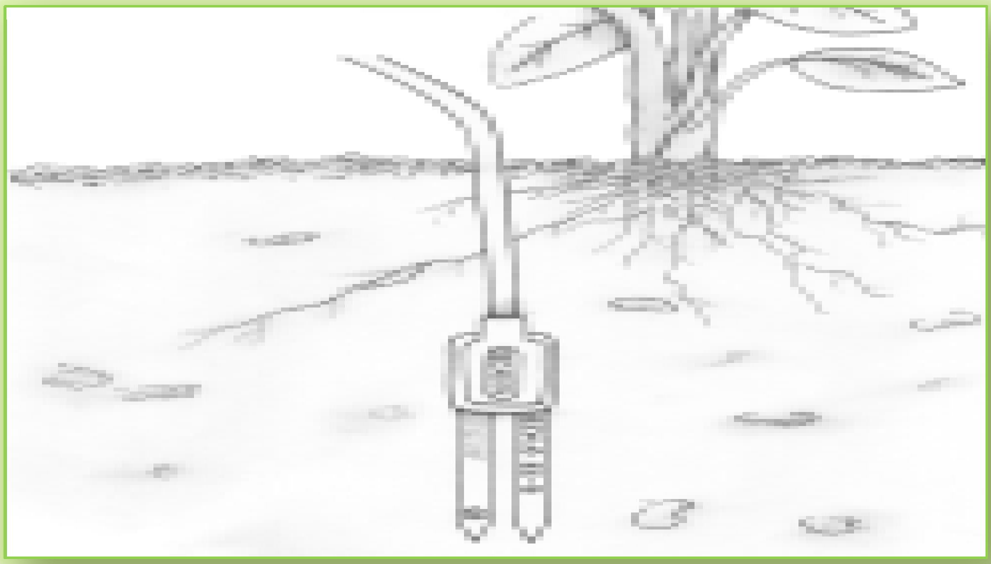


figure3.3Soil moisture sensor

3.1.3-Soil Temperature

It is a measure of temperature at different levels of the Earth's atmosphere. It is governed by many factors, including incoming solar radiation, humidity and altitude. This variable should be defined as a continuous signal (normallyas a sine wave which simulated the day and night temperature changes) .

An analog temperature sensor that is LM35 is a chip that tells us what the ambient temperature is. These sensors use a solid-state technique to determine the temperature. That is to say, they don’t use mercury (like old thermometers), bimetallic strips (like in some home thermometers or stoves), nor do they use thermistors (temperature sensitive resistors). Instead, they use the fact as temperature increases, the voltage across a diode increases at a known rate. Technically, this is actually the voltage drop between the base and emitter of a transistor. By precisely amplifying the voltage change, it is easy to generate an analog signal that is directly proportional to temperature. These sensors have no moving parts, they are precise, never wear out, don't need calibration, work under many environmental conditions, and are consistent between sensors and readings. Moreover they are very inexpensive and quite easy to use. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range.

3.1.4- Switching Logics

Use Relay Board Design:

Relay output to the solenoid valves was selected over other alternatives (e.g. TRIAC)as providing the best isolation from possible transients induced in the solenoid wiring from lightning.

Power is obtained by rectifying the 24 volts AC required for the reticulation Solenoid valves.

A LM317 was used as a regulator to provide the 12 volts for the relays – this was latermodified to 13.8 volts to enable it to charge a standby 12 volt lead acid dry battery for Mains failure power to the micro-controller. The output of this supply, besides powering the relays, is passed on to a 5 volt switch-mode supply used to power the Micro-controller.

As double pole relays were used a saving of components was available by utilizing each pole for a separate valve. Thus only 9 relays replaced the 16 that should have been required to control the reticulation 16 stations.

A led was included in each relay circuit for the prototype to enable ease of program testing during development. All relay coils have diodes across them to prevent backem spikes damaging other components. Capacitors were placed across the contacts tominimize contact wear from sparking.

The components of relay circuit explained in figures 3.4

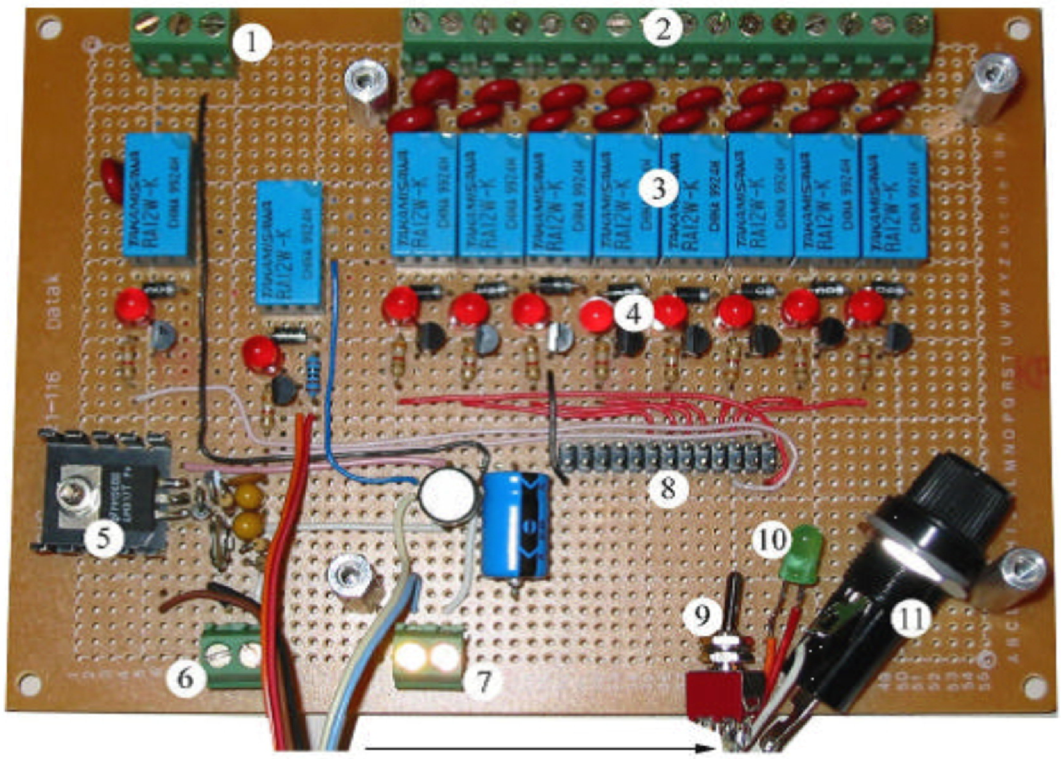


figure3.4photo of Relay Board

1. Common
2. Valve output
3. Relays
4. LED - valve status
5. Voltage regulator
6. 12 V DC input
7. 24 V AC input
8. Microcontroller interface
9. Override switch
10. LED – power status
11. Fuss

3.1.5-Solenoid Valve:

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid. Here, a two-port valve is used in which the flow is switched on or off. It basically works as an actuator for the system.

A solenoid valve has two main parts:

1. the solenoid
2. The valve.

The solenoid converts electrical energy into mechanical energy which, in turn, opens or closes the valve mechanically. The signal to open or close the valve is given by the microcontroller using ULN2803 current driver.

This type of valve relies on a differential of pressure between input and output as the pressure at the input must always be greater than the pressure at the output for it to work. If the pressure at the output, for any reason, rise above that of the input then the valve Would open regardless of the state of the solenoid and pilot valve.

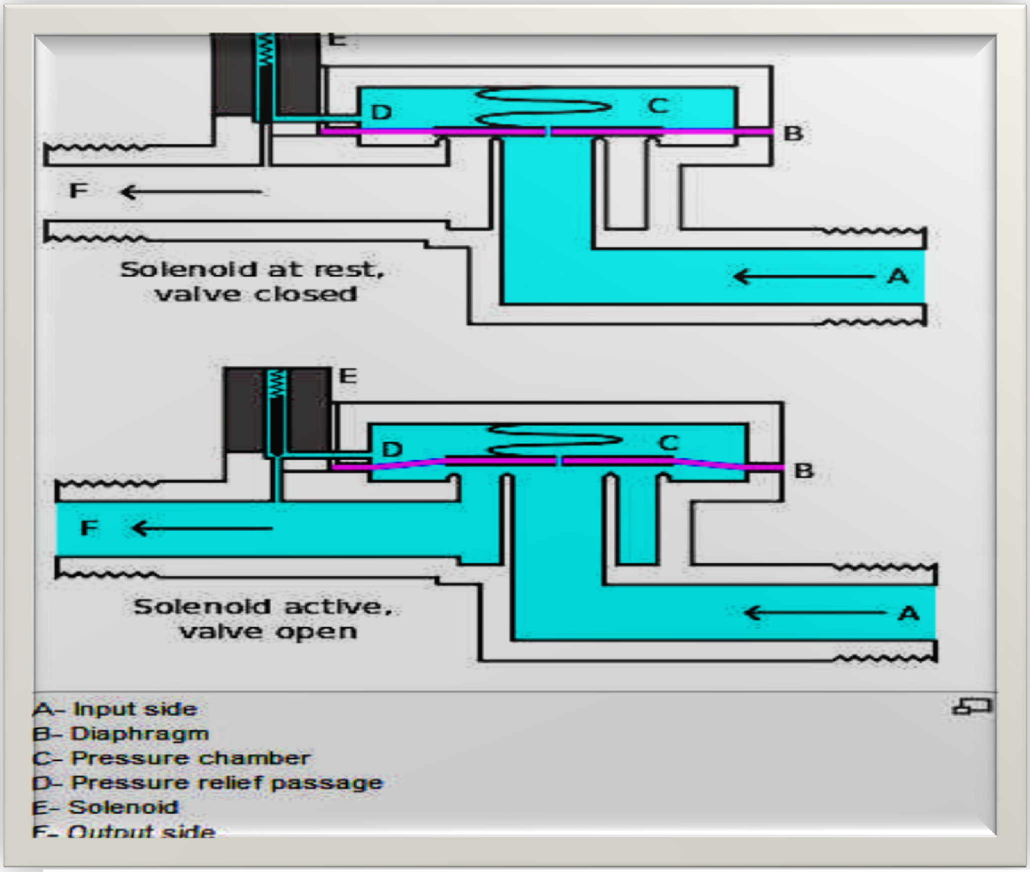


figure3.5**solenoid valve**

3.1.6-Liquid Crystal Display

The LCD will display the alphabets, numbers, characters and symbols. The LCD used here is eight bit parallel type and the display size is 16*2. Liquid Crystal Display is used for displaying the moisture value.LCD consists of three control pins and eight data pins. Based on the commands given to the control pins, data can be read from or write to the LCD. The eight data pins of the LCD are connected to the PORTB pins RB0 -RB7.

Three control pins are connected to PORTC pins. RC0, RC1, RC2 are used for register select (RS), read/write (R/W) and enable (E) respectively.

3.1.7-Power Suply

- Solar Panel

Solar panel isan assembly of solar cells. Solar cell or photovoltaic cell is made up of silicon semiconductor. Electricity is produced when the sunlight strikes the solar cell, causing electrons to move around. In this project solar panel of 12v, 10 watts Capacity is used.

- Ni-Cd Battery

In this project Ni-Cd battery of 12v capacity is used. Ni-Cd batteries use Nickel hydroxide as positive electrode, cadmium as negative electrode, and an alkaline electrolyte.

3.1.8-Rain expectations:

Is used to know the rain expectations. The geographical information system (GIS) captures space photos for rainy clouds. The photos are captured constantly after one hour. There is a camera attach with the microcontroller reflects photos to itself.

3.2-How the System Works

This embedded system works in a simple way, the system basically consists of moisture level sensors, microcontroller, rain expectations and solenoid valve. The microcontroller converts the analog signal from each sensor which is buried inside the soil, to digital values .This is compared with a value representing the minimum allowable moisture content of the soil.

Once any of these sensors read a value below this minimum value ,the microcontroller see rain forecast is not raining a signal is sent to turn on the corresponding solenoid valve to allow water flow into the farm other a raining institute time delay and reset microcontroller. But it's good to work like this, but in this design the signals that are responsible to switch the solenoid valves are queued. This is to make sure that irrigation is carried out once in a day and preferably in the morning, to save energy and as well crops health .this process is termed SCHEDULING. Every procedure in scheduling is controlled by the program inside the microcontroller.

Soil Moisture measurement the most important factor to consider is the value of soil moisture content measured in unit of water fraction by volume (wfv or m3m-3) this means; a percentage of water in the soil displayed in decimal. The three equations below help to determine when to carry out irrigation.

AD = (FC- PWP) x MAD……………….[3.1]

AWC = FC – PWP……………………… [3.2]

FC-AD = LL …………………………….. [3.3]

The following are terms communally used in soil hydrology which refers to the terms used in the formula above:

- Soil saturation refers to the situation where all the soil pores are filled with water. This occurs below the water table and in the unsaturated zone above the water table after a heavy rain or irrigation event. After the rain event, the soil moisture (above the water table) will decrease from saturation to field capacity.
- Field capacity (FC in equations above) refers to the amount of water left behind in soil after gravity drains saturated soil.
- Permanent wilting point (PWP in equations above) refers to the amount of water in soil that is unavailable to the plant.

- The Allowable Depletion (AD in the equations above) is calculated by equation [1]. The allowable depletion represents the amount of soil moisture that can be removed by the crop from the soil before the crop begins to stress to get the water.

- Lower soil moisture limit (LL from [3]) is the soil moisture value below which the crop will become stress because it will have insufficient water. When the lower limit is reached, it is time to irrigate.

- The Maximum allowable depletion (MAD) is the fraction of the available water that is 100% available to the crop.

Maximum allowable depletions for different soil textures the lower soil moisture limit is a very important value because dropping below this value

Will affect the health of the crops. Equations 1, 2, and 3 and the example show how to Calculate the lower soil moisture limit.

CHAPTER FOUR

4. SOFTWAER

4.1-Overview

Those days, electronic circuits consisted of numerous CMOS and TTLchips. I saw the 89C2051 as an ideal replacement for a lot of CMOS/TTLchips. It would make PCB design much simpler. So the 2051 became areplacement chip. Now one was able to design his own chips !

The idea to be able to change the behavior of an electronic circuit ،just by reprogramming it without using a solder iron, intrigued me .Today, it is a common practice, to update firmware, to fix bugs or addfeatures. In 1993, it was not so common, at least not to my knowledge.

Initially wrote a complete tool for DOS. I rewrote the tool, when Iwas reasonably satisfied that Windows 3.1 was stable. The tool was formy own usage. When I discovered that it would be usable to others, Idecided to add Help files and a simulator and to sell it for a smallfee.

In 1995, MCS started to sell BASCOM-LT, a BASIC compiler for Windows .٣.١ It was the first Windows application that offered a complete andaffordable solution, editor, compiler, simulator and programmer . BASCOM-LT was an 8051 BASIC compiler. The reason it became popular wasthat it included a lot of functionality that was easy to use from BASIC . Using an LCD display was simple, just a configuration line to definethe used pins and voila, a working application in minutes. When youneeded a different LCD display, you could simply change the CONFIG line .

When a different processor was needed, you only had to change the name of the definition file. No need for a lot of .h files .Another reason for its success was that we hide much of thecomplexity for the user. No ASM to deal with, simple statements. Ofcourse free updates and support.

Small companies that used the BASIC Stamp also recognized anotheradvantage: There was no need for expensive modules and the code ranmuch quicker.When Windows 95 became an industry standard, users also wanted a 32bit version. A big part of BASCOM-LT was rewritten with the additionalsupport for arrays and floating point (single).

.With the many different 8051 variants, it was impossible to supportall the chips. Having device definition “DAT” files, made it easy forthe user to configure the 8051 variants.When Atmel launched the AVR chip, the 8051 compiler was rewritten ،once again, to support the powerful AVR chips. The result wasBASCOM-AVR.The AVR chip has a lot of internal memory. It uses simple linearmemory addressing. The best part is that you can make the chip programitself. No wonder this chip family became so popular.

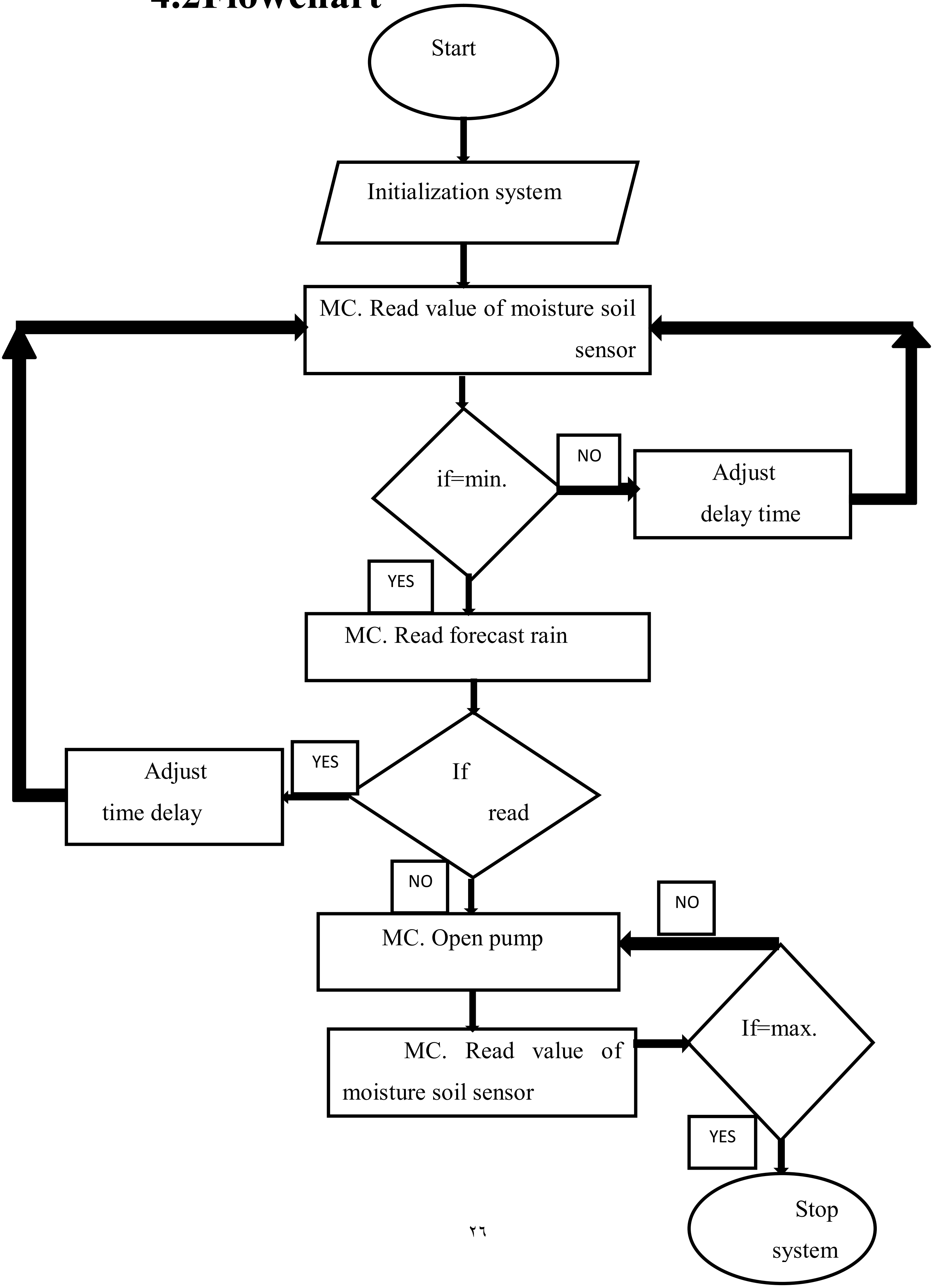
With more and more users, there was no way I could manage everythingin my spare time. So in order to guarantee the future of BASCOM, Idecided to work full time for MCS.Today, MCS is still a small company, with only 3 employees and a few contract workers .

We believe in free updates and support. With the number of (demo)users, it is however not possible to support everybody. You need torealize that reading and answering emails is time consuming .Not to mention to duplicate used hardware. We are unique, in that we even support hardware!For a long time, we are working on a more professional version of the software .We occasionally add new features to the current BASCOM version .

An ARM version is also under development as well .Note, that we do not provide details or time frames, for theseversions, nor do we, for other features. Or main concern is support fornew processors such as the Xmega, and maintenance.In order to migrate to a new version, it is important that you keepyour software up to date. This will make migration simpler.

The coding for the system is done by using Bascom language. Refer to appendix (A) for the coding of the program.

4.2Flowchart



CHAPTERFIVE

RESULT AND DISCUSES

5.1 Overview

This chapter covers the results obtained from the design in all readings of soil moisture sensor and forecast rain.

When the system starts the user enters the lowest and highest values of moisture soil those the plants need. Also enter time delay for all cases.

The result in this chapter divided in threeparts:

1. Resultsof soil moistures Sensor.
2. Resultsof forecast rain.
3. Results of switch logic.

Figure 5.1 system design

5.2Resultsof Soil Moistures Sensor:

This paragraph describes the results of the soil moisture sensor when the system starts the following scenario will be resulted.

- Microcontroller receives value from moisture soil sensors.
- The LCD display the sensor value
- Microcontroller compares the value with lowest value stored.

In this case two results:

1. Not equal the lowest values the microcontroller adjusts delay time from stored in and restart after complete delay time.
2. Equal the lowest value show results of forecast rain

measurement moisture soil inone day

min value=1.5mm

Table5.1

period	Soil Moistures Sensor read(mm)	notice
1	3.5	30 minute delay
2	3	30 minute delay
3	2.5	30 minute delay
4	1.5	show forecast rain

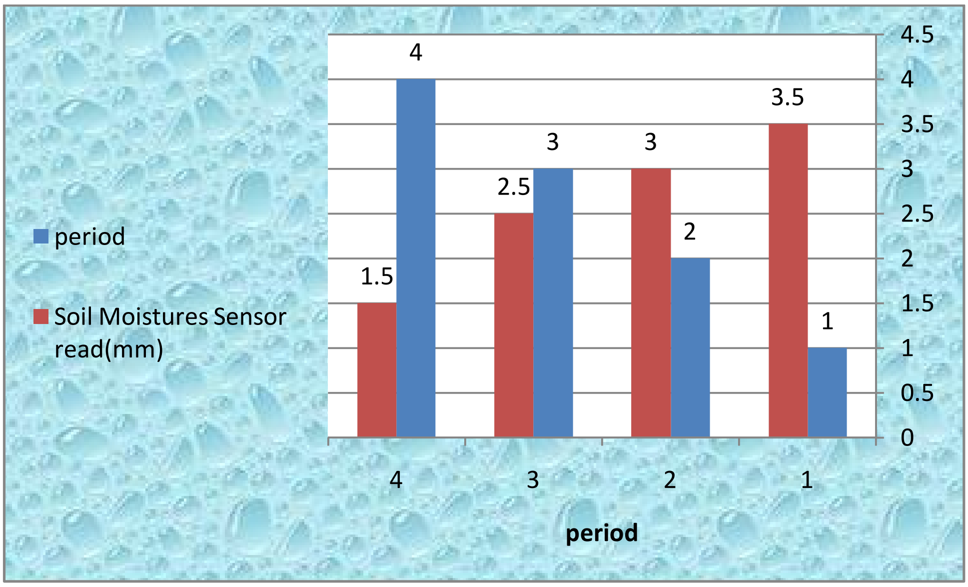


Figure 5.2measurement ofmoisture sensor soil

5.3 Results of forecast rain

The results of forecast rain dependedon receiving signal from microcontroller or not, the following scenario will be resulted:

- The microcontroller receives signal form forecast rain .
- The microcontroller adjust delay time from stored in and restart after complete delay time.

When microcontroller doesn't receive signal, itopens the switch of valve solenoid

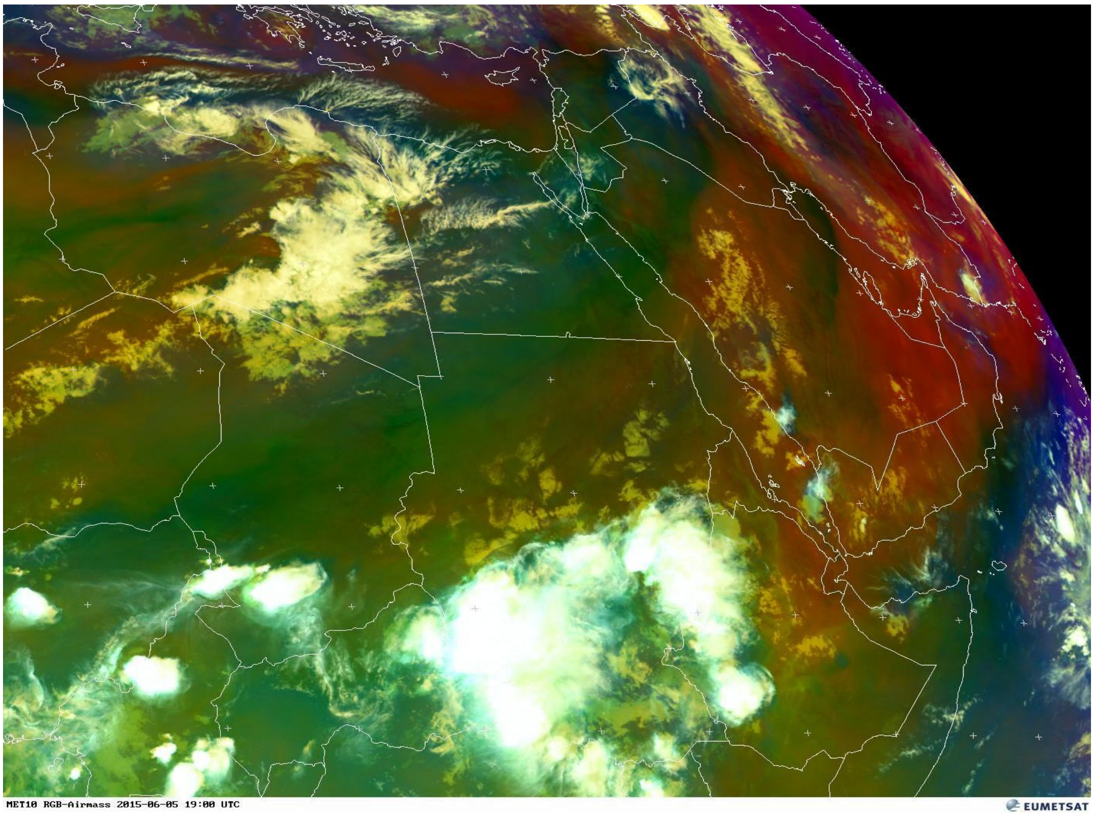


Figure 5.3photo of cloud by satellite

-The color of cloud is white this mean that forecast rain

5.4 -Results of Switch Logic

When opened switch logic begging the irrigation of plant, any plant have highest value for irrigation the microcontroller read the value of moisture soil sensor and compares with it the following scenario will be resulted:

- Microcontroller receives value from moisture soil sensors.
- The LCD display the sensor value
- Microcontrollercompares the value with highest value stored.

In this case two results:

1. Not equal the highest value retained back read and compares.
2. Equal the highest value the microcontroller send signal for close the pump

read of sensor in one day

max value =4.2

Table5.2

time	Soil Moistures Sensor read(mm)	notice
1	1.5	retained back read
2	2.2	retained back read
3	3.5	retained back read
4	4.7	close the pump

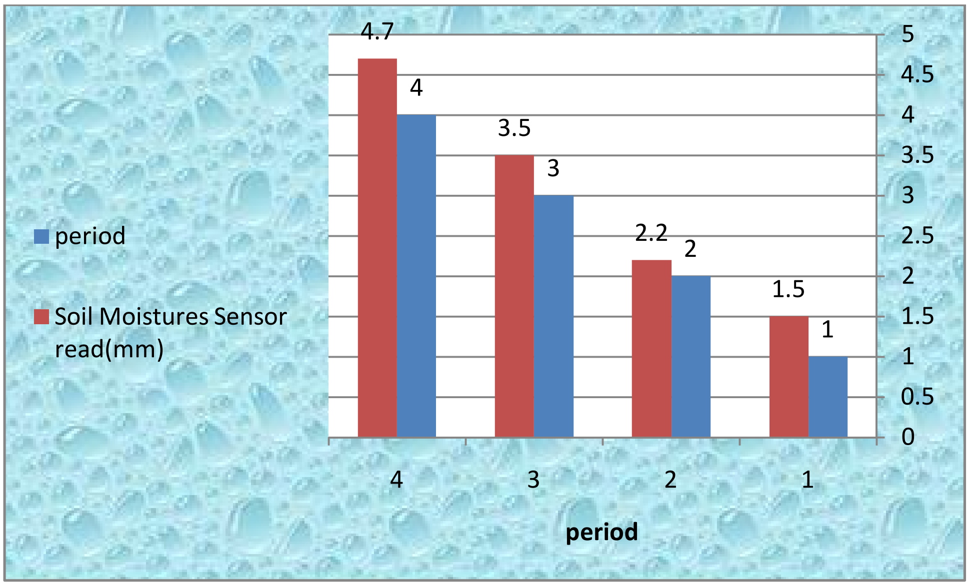


Figure 5.4 measurementmoisture soils

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1Conclusion

Sudanhasvast areasofarable land, butlarge areasof which are notgrownbecause ofthe lack ofrainand the difficulty ofusingtraditionalirrigationbywellsthat requiresworktablesfor the passage ofwater aroundthe plants.

Automatedirrigationsystemusing sprinklers assistant to irrigatefarmlandandalsoprovidesa great deal ofwater for humanand effort.

We used in this project soil moisture sensor and temperature sensor to determine moisture and temperature, output those sensors and input them to microcontroller to control it in locking and opening the valves,this systemcan beusedto irrigateall kinds of plantsonlybyKnowing theminimum and maximumvalueforsoil moisturefor plantsirrigatedborne without beingaffected, the less value ofirrigationbeginsandthenupon reaching themaximum valuedependson theirrigationsystem.

A computerwithmicrocontroller is connected to knowthe expectationsof therain for increasedwater conservationby using theonlineprogram (GIS),givinga signal to themicrocontrollersinthe case of arainyclouds.

This systemis flexibleso thatelementscan be addedto helpin the development ofthe system

6.2Recommendation

Although the designed automated irrigation working very well and it is used in a number of countriessuch asIndia, which contributed to develop agricultureand thereforemoreagricultural products, but the useis very limitedinSudanwhich led tothe deterioration ofAgriculturewiththe lack of rain.

We hope that thispay attentionthat are interestedby orderagricultureand the use ofmodernirrigation systemsandis well known thatground waterlevelis goodfor theflowof the NileRiverinSudan, helping to digwellsforwaterused for irrigation.

This systemcan beusedon protectedfarmsand non-protectedones. The system can replaceonlineprogramradar contactto learnrainforecast, it givesa better and moreaccurate results.

We usedin this projectthesoiltemperaturesensorbecause all theplants need aspecific temperature(seasonalproducts)andcanimprove the systemby adding theheaterandair conditionerto convenientthe temperature, allows growing ofagricultural productsinallseasons.

References:

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[6]. Microchip, copyrght owner of the microchip PIC microcontroller http://www.omega.com

[7]. Introduction to c programming ,by Rob Miles

[8]. http://www.climate-charts.com/Locations/n/NI65082.php

APPENDICS

Appendix (A)

Program

```
$regfile = "m32def.dat"                                   ' we use the M32

$crystal = 1000000

$baud = 9600


'LCD CONFIGURATION

'-----------------------------------------------------------------------------

ConfigLcd = 40 * 2

ConfigLcdpin = Pin , Db4 = Portd.4 , Db5 = Portd.5 , Db6 = Portd.6 , Db7 = Portd.7 , E = Portd.3 , Rs = Portd.2

Cls

Cursor Off


Dim Count As Integer


Config Pinb.0 = Input
```

```
Config Pinb.1 = Input

Config Pinb.2 = Input

Config Pinb.3 = Input

Lcd "WELCOME" ; Count

'Connection to 3 LED's

Config Porta.0 = Output

Config Porta.1 = Output

Config Porta.2 = Output

Waitms 5000


Irrigation:

Do

   If Pinb.1 = 1 Then

Waitms 1000

      Pina.0 = 1

Cls

Lcd "Activate Pump"

Waitms 5000

    Elseif Pinb.1 = 0 Then

    Pina.0 = 0
```

```
Cls

Lcd "Pump  OFF"

Waitms 5000


End If

Loop

End
```

Appendix (B)

Data sheet atmega 32

Features

8-bit Microcontroller

• Advanced RISC Architecture

– 131 Powerful Instructions – MostSingle-clock Cycle Execution

– 32 x 8 General Purpose Working Registers

– Fully Static Operation

– Up to 16 MIPS Throughput at 16 MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments

– 32Kbytes of In-System Self-programmable Flash program memory

– 1024Bytes EEPROM

– 2Kbyte Internal SRAM

– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM

– Data retention: 20 years at 85°C/100 years at 25°C

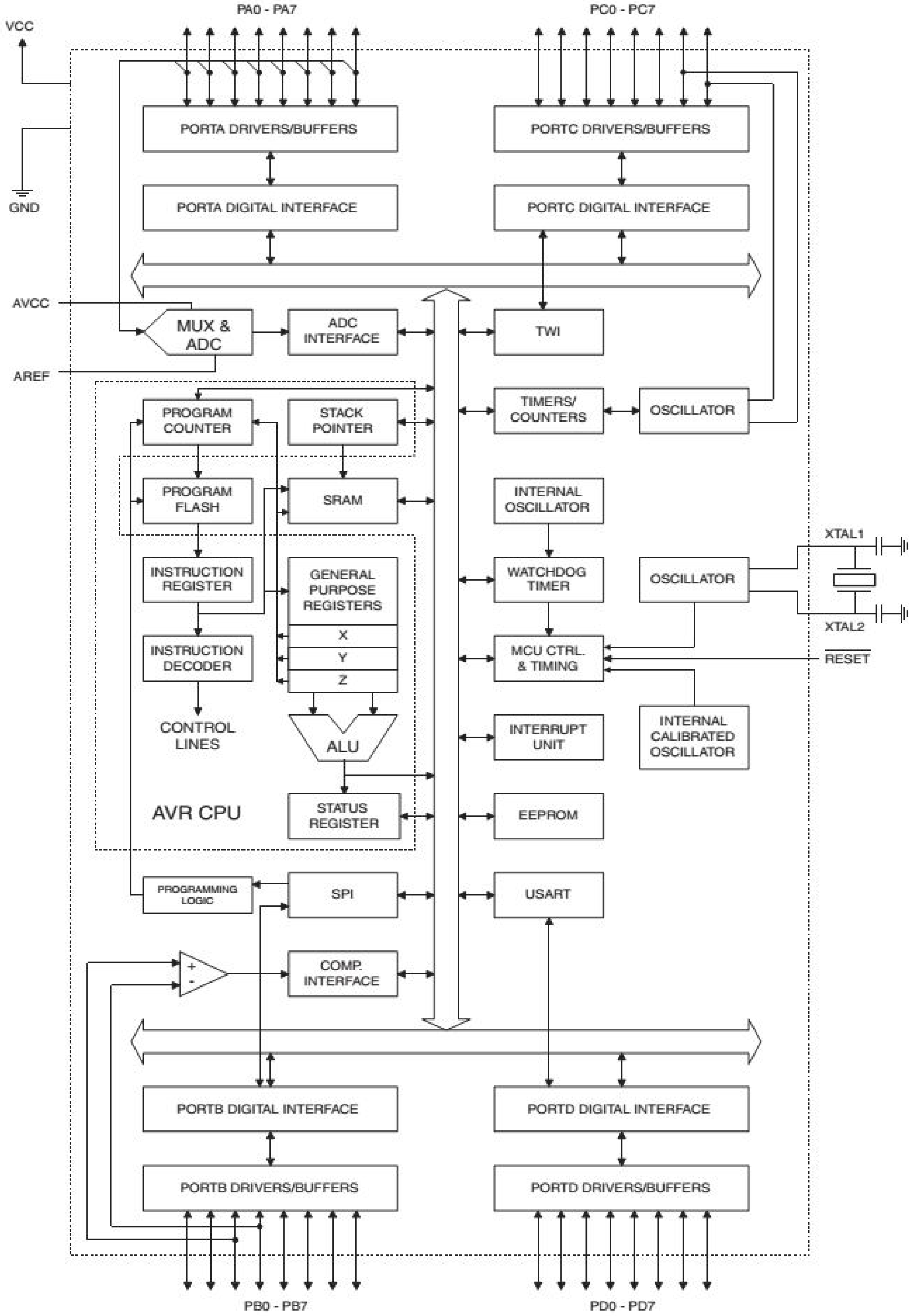
– Optional Boot Code Section with Independent Lock Bits

In-System Programming by On-chip Boot Program

True Read-While-Write Operation

– Programming Lock for Software Security

Figure 2. Block Diagram



Register Summary

Address	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Page
$3F ($5F)	SREG	I	T	H	S	V	N	Z	C	10
$3E ($5E)	SPH	–	–	–	–	SP11	SP10	SP9	SP8	12
$3D ($5D)	SPL	SP7	SP6	SP5	SP4	SP3	SP2	SP1	SP0	12
$3C ($5C)	OCR0	Timer/Counter0 Output Compare Register								82
$3B ($5B)	GICR	INT1	INT0	INT2	–	–	–	IVSEL	IVCE	47, 67
$3A ($5A)	GIFR	INTF1	INTF0	INTF2	–	–	–	–	–	68
$39 ($59)	TIMSK	OCIE2	TOIE2	TICIE1	OCIE1A	OCIE1B	TOIE1	OCIE0	TOIE0	82, 112, 130
$38 ($58)	TIFR	OCF2	TOV2	ICF1	OCF1A	OCF1B	TOV1	OCF0	TOV0	83, 112, 130
$37 ($57)	SPMCR	SPMIE	RWWSB	–	RWWSRE	BLBSET	PGWRT	PGERS	SPMEN	248
$36 ($56)	TWCR	TWINT	TWEA	TWSTA	TWSTO	TWWC	TWEN	–	TWIE	177
$35 ($55)	MCUCR	SE	SM2	SM1	SM0	ISC11	ISC10	ISC01	ISC00	32, 66
$34 ($54)	MCUCSR	JTD	ISC2	–	JTRF	WDRF	BORF	EXTRF	PORF	40, 67, 228
$33 ($53)	TCCR0	FOC0	WGM00	COM01	COM00	WGM01	CS02	CS01	CS00	80
$32 ($52)	TCNT0	Timer/Counter0 (8 Bits)								82
$31[1] ($51)[1]	OSCCAL	Oscillator Calibration Register								30
	OCDR	On-Chip Debug Register								224
$30 ($50)	SFIOR	ADTS2	ADTS1	ADTS0	–	ACME	PUD	PSR2	PSR10	56,85,131,198,218
$2F ($4F)	TCCR1A	COM1A1	COM1A0	COM1B1	COM1B0	FOC1A	FOC1B	WGM11	WGM10	107
$2E ($4E)	TCCR1B	ICNC1	ICES1	–	WGM13	WGM12	CS12	CS11	CS10	110
$2D ($4D)	TCNT1H	Timer/Counter1 – Counter Register High Byte								111
$2C ($4C)	TCNT1L	Timer/Counter1 – Counter Register Low Byte								111
$2B ($4B)	OCR1AH	Timer/Counter1 – Output Compare Register A High Byte								111
$2A ($4A)	OCR1AL	Timer/Counter1 – Output Compare Register A Low Byte								111
$29 ($49)	OCR1BH	Timer/Counter1 – Output Compare Register B High Byte								111
$28 ($48)	OCR1BL	Timer/Counter1 – Output Compare Register B Low Byte								111
$27 ($47)	ICR1H	Timer/Counter1 – Input Capture Register High Byte								111
$26 ($46)	ICR1L	Timer/Counter1 – Input Capture Register Low Byte								111
$25 ($45)	TCCR2	FOC2	WGM20	COM21	COM20	WGM21	CS22	CS21	CS20	125
$24 ($44)	TCNT2	Timer/Counter2 (8 Bits)								127
$23 ($43)	OCR2	Timer/Counter2 Output Compare Register								127
$22 ($42)	ASSR	–	–	–	–	AS2	TCN2UB	OCR2UB	TCR2UB	128
$21 ($41)	WDTCR	–	–	–	WDTOE	WDE	WDP2	WDP1	WDP0	42
$20[2] ($40)[2]	UBRRH	URSEL	–	–	–	UBRR[11:8]				164
	UCSRC	URSEL	UMSEL	UPM1	UPM0	USBS	UCSZ1	UCSZ0	UCPOL	162
$1F ($3F)	EEARH	–	–	–	–	–	–	EEAR9	EEAR8	19
$1E ($3E)	EEARL	EEPROM Address Register Low Byte								19
$1D ($3D)	EEDR	EEPROM Data Register								19
$1C ($3C)	EECR	–	–	–	–	EERIE	EEMWE	EEWE	EERE	19
$1B ($3B)	PORTA	PORTA7	PORTA6	PORTA5	PORTA4	PORTA3	PORTA2	PORTA1	PORTA0	64
$1A ($3A)	DDRA	DDA7	DDA6	DDA5	DDA4	DDA3	DDA2	DDA1	DDA0	64
$19 ($39)	PINA	PINA7	PINA6	PINA5	PINA4	PINA3	PINA2	PINA1	PINA0	64
$18 ($38)	PORTB	PORTB7	PORTB6	PORTB5	PORTB4	PORTB3	PORTB2	PORTB1	PORTB0	64
$17 ($37)	DDRB	DDB7	DDB6	DDB5	DDB4	DDB3	DDB2	DDB1	DDB0	64
$16 ($36)	PINB	PINB7	PINB6	PINB5	PINB4	PINB3	PINB2	PINB1	PINB0	65
$15 ($35)	PORTC	PORTC7	PORTC6	PORTC5	PORTC4	PORTC3	PORTC2	PORTC1	PORTC0	65
$14 ($34)	DDRC	DDC7	DDC6	DDC5	DDC4	DDC3	DDC2	DDC1	DDC0	65
$13 ($33)	PINC	PINC7	PINC6	PINC5	PINC4	PINC3	PINC2	PINC1	PINC0	65
$12 ($32)	PORTD	PORTD7	PORTD6	PORTD5	PORTD4	PORTD3	PORTD2	PORTD1	PORTD0	65
$11 ($31)	DDRD	DDD7	DDD6	DDD5	DDD4	DDD3	DDD2	DDD1	DDD0	65
$10 ($30)	PIND	PIND7	PIND6	PIND5	PIND4	PIND3	PIND2	PIND1	PIND0	65
$0F ($2F)	SPDR	SPI Data Register								138
$0E ($2E)	SPSR	SPIF	WCOL	–	–	–	–	–	SPI2X	138
$0D ($2D)	SPCR	SPIE	SPE	DORD	MSTR	CPOL	CPHA	SPR1	SPR0	136
$0C ($2C)	UDR	USART I/O Data Register								159
$0B ($2B)	UCSRA	RXC	TXC	UDRE	FE	DOR	PE	U2X	MPCM	160
$0A ($2A)	UCSRB	RXCIE	TXCIE	UDRIE	RXEN	TXEN	UCSZ2	RXB8	TXB8	161
$09 ($29)	UBRRL	USART Baud Rate Register Low Byte								164
$08 ($28)	ACSR	ACD	ACBG	ACO	ACI	ACIE	ACIC	ACIS1	ACIS0	199
$07 ($27)	ADMUX	REFS1	REFS0	ADLAR	MUX4	MUX3	MUX2	MUX1	MUX0	214
$06 ($26)	ADCSRA	ADEN	ADSC	ADATE	ADIF	ADIE	ADPS2	ADPS1	ADPS0	216
$05 ($25)	ADCH	ADC Data Register High Byte								217
$04 ($24)	ADCL	ADC Data Register Low Byte								217
$03 ($23)	TWDR	Two-wire Serial Interface Data Register								179
$02 ($22)	TWAR	TWA6	TWA5	TWA4	TWA3	TWA2	TWA1	TWA0	TWGCE	179

Data sheet EC-5:

The EC-5 varies from its EC-10 and EC-20 cousins. Although the principles of measurement are the same, its two-prong design and higher measurement frequency allows the EC-5 to measure VWC from 0 to 100% (VWC of saturated soils is generally 40-60% depending on the soil type) and allows accurate measurement of all soils and soilless medias and a much wider range of salinities.

Sensor Features

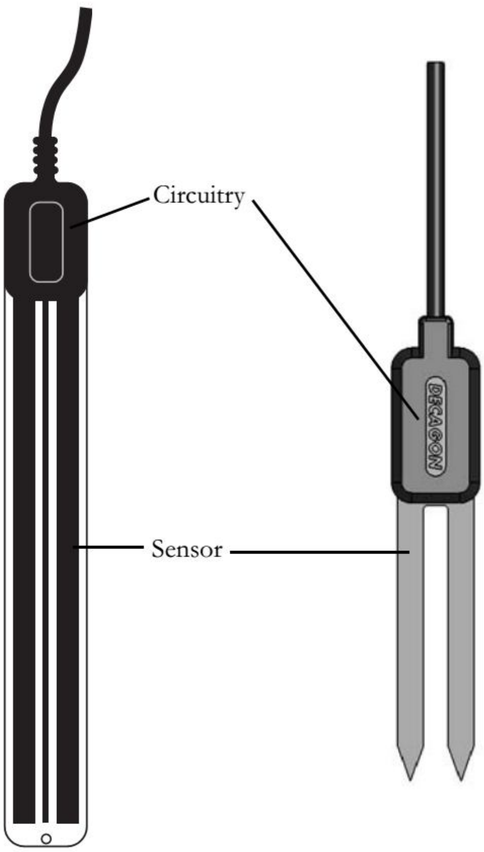


Fig.1: EC-20 diagram   Fig. 2: EC-5 diagram

For the EC-5:

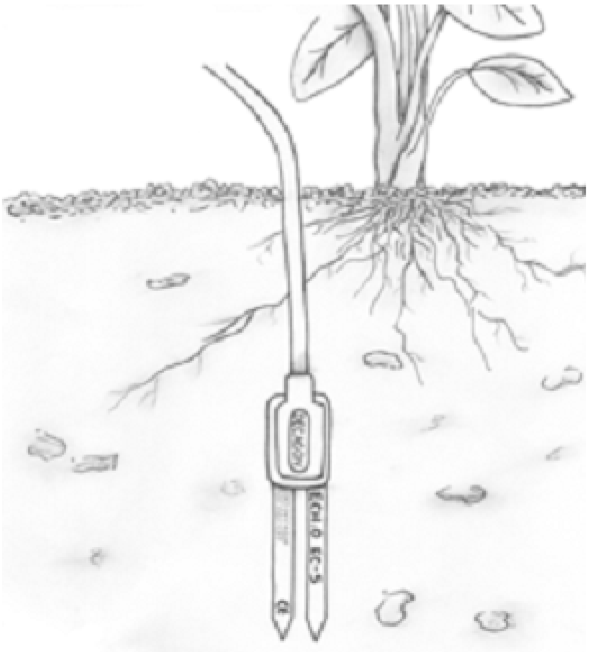
1. The EC-5 sensor was designed for easy installation

into the soil. After digging a hole to the desired

depth, push the prongs on the sensor into undisturbed soil at the bottom ofthe hole or into the sidewall of the hole. Make sure that the prongs are

buried completely up to the black overmolding, as

shown below.



3. Installing the Sensors

The sensor may be difficult to insert into extremely

compact or dry soil. If you have difficulty inserting

the sensor, try loosening the soil somewhat or wetting the soil. Never pound it in!

2. Carefully backfill the hole to match the bulk density

of the surrounding soil. Becareful not to bend the

black overmolding connecting the sensor to the

cable.

Data sheet Lm 35

LM35 - Precision Centigrade Temperature Sensor

Features

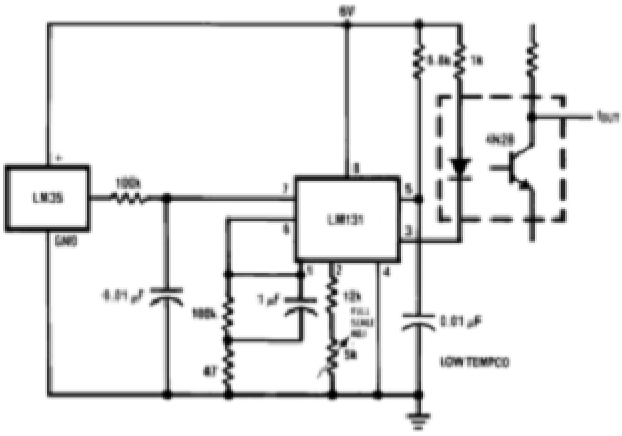
- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor
- 0.5°C accuracy guaranteeable (at +25°C)
- Rated for full -55° to +150°C range
- Suitable for remote applications

Typical Application

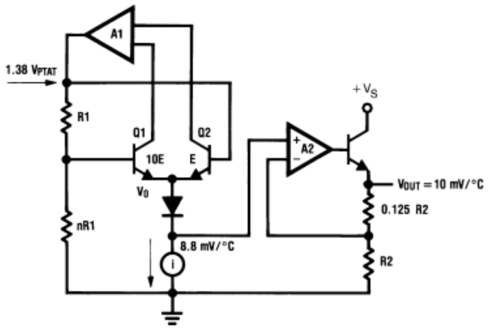
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 µA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±¼°C typical
- Low impedance output, 0.1 Ohm for 1 mA load

General Description

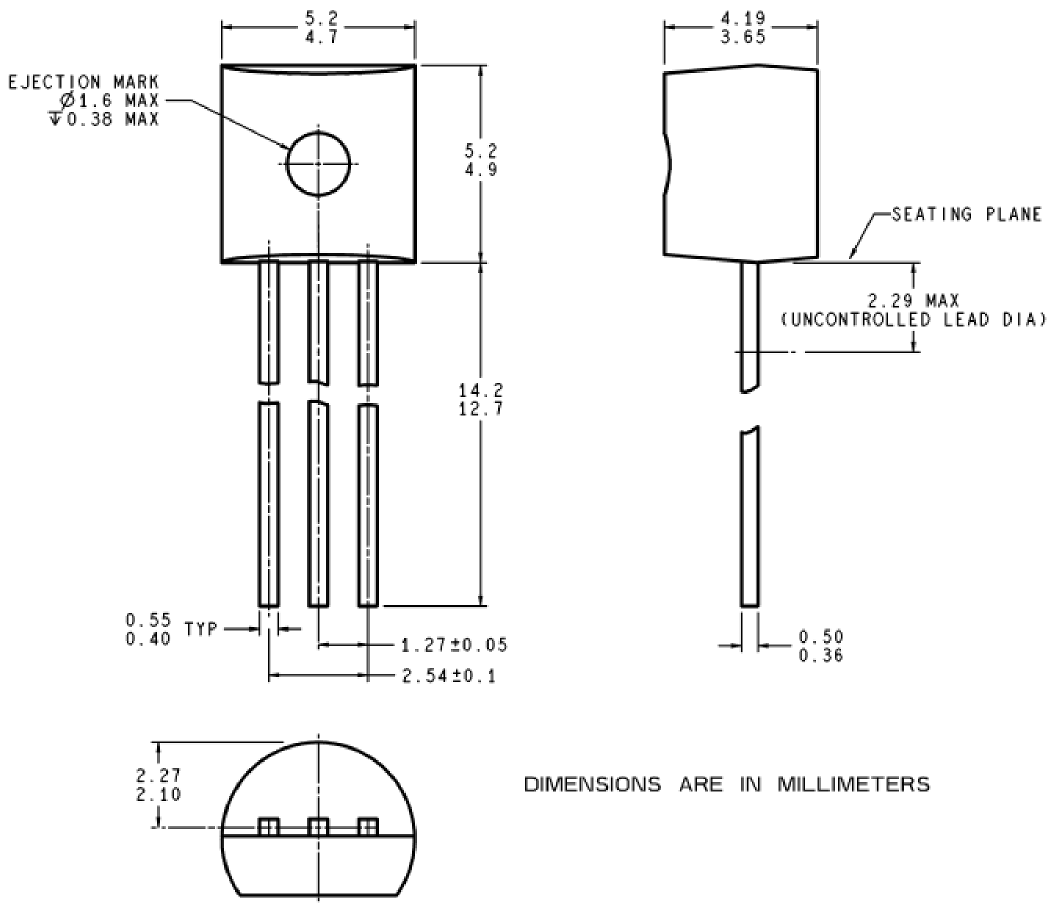
The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.



Block Diagram



Physical Dimensions inches (millimeters) unlessotherwisenoted(Continued)


5.2
4.7
EJECTION MARK
Ø1.6 MAX
0.38 MAX
5.2
4.9
14.2
12.7
0.55
0.40 TYP
1.27±0.05
2.54±0.1
4.19
3.65
SEATING PLANE
2.29 MAX
(UNCONTROLLED LEAD DIA)
0.50
0.36
2.27
2.10
DIMENSIONS ARE IN MILLIMETERS