CHAPTER-01

INTRODUCTION TO SMART AGRICULTURE

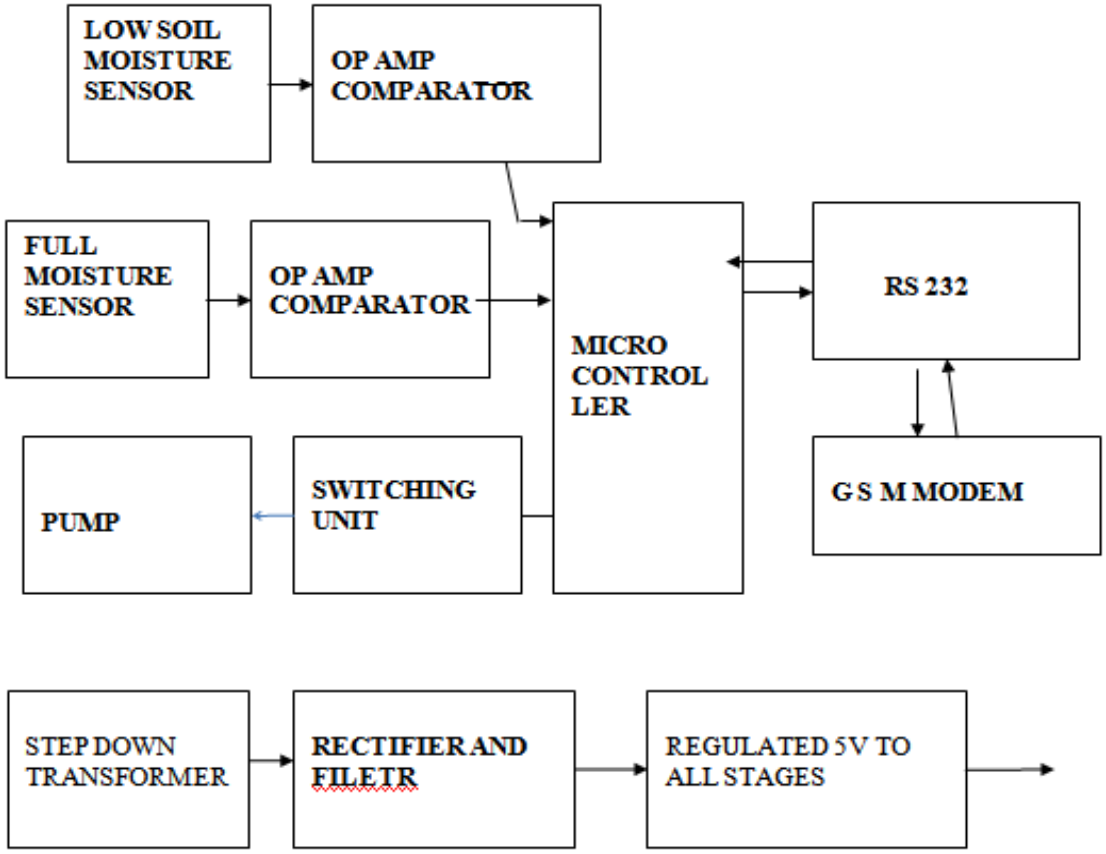
1.1 INTRODUCTION TO SMART AGRICULTURE

As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are done in the field of agriculture. Most projects signify the use of wireless sensor network collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture to overcome these problems. So, in order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the productivity in every stage. But complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level it is not given to the farmers as a product to get benefitted from the resources. Hence this paper deals about developing smart agriculture using GSM and given to the farmers.

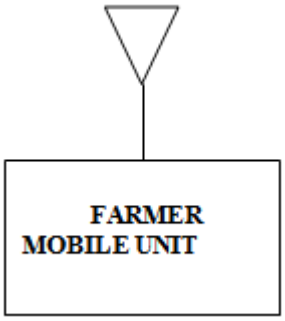
1.2 NEEDS FOR PROJECT

The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings. It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system. It aims at making agriculture smart using automation and GSM technologies. The highlighting features are smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, human detection and keeping vigilance. The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates. This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigator system through wireless communication technology. It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various location of farm and as per the need of crop controller to take the decision whether the irrigation is enabled or not. It proposes an idea about how automated irrigation System was developed to optimize water use for agricultural crops

1.3 BLOCK DIAGRAM PCB PREPARATION AND SOLDERING



User Side



1.4 Working Principle

In a modern agriculture activity there is a need of so many automation technique from which the former perform his work without much of interaction. For this some of the works in a field can be possible to atomized with the help of microcontroller and use of GSM modem so that the farmer can get a message regarding the parameter and possible to control the actions also. The basic requirement of agriculture activity is an irrigation system, in which the old method is just by observing the upper surface of soil and irrigate the plants up till whenever the soil upper surface goes to wet but in this method there is an wastage of water

about 40% because some of plants does not required that much of moisture for their routes as for some plants this may require still more.

This problem can be solved by using a technique of sensing actual moisture level of the soil and action of pump can be controlled. The sensors which are inserted in to the soil absorb the level of moisture and in a driving stage this is further improved and fed to a microcontroller.

According to the moisture level of the soil there is a change in conductivity between two probes. So the microcontroller is designed in a such way that as the moisture level develops between probes reach a normal or abnormal values the output of microcontroller triggers the pump to irrigate the fields.

According to these three parameters and the condition of soil the pump goes to 'ON' or 'OFF'. The output of pump can be further connected to a solenoid where these supplies water to the required area of the field. If in a big field different crops are present, by using a required number of solenoid by keeping a single pump the irrigation can be effectively controlled. To control the action of the pump this possible with GSM modem as the user or farmer gets the information from parameter sensing unit now passes from RS232 a serial interface circuit with GSM modem starts sending the message.

The farmer can interact with this message and send a request now the signal interact in two way and modem controls the action of pumping.

Advantages

- Increased production.
- Water Conservation.
- Real time data and product insight.
- Lowered operation costs.
- Increased quality of production.
- Improved livestock forming.
- Reduced environmental footprint.
- Remote monitoring.

1.5 PCB preparation

The steps involved in the manufacturing of PCB are as follows:

1) Design and preparation
2) Pattern Design
3) Resist Application
4) Etching
5) Clearing and resist remover
6) Finishing

1) Design and preparation: Artwork should be prepared on transparent polystyrene film using block ink or adhesive tapes and pads. In modern technique screen printing method is used for art working of PCB. This is the primary step in fabricating the PCB.

2) Pattern Design: In industrial work, pattern is usually transformed to the surface of the laminate by means of screen printing or by photographic method.

3) Resist application: Adhesive tapes and pads which have high chemical resistance and excellent adhesion can be attached to copper clad laminate.

4) Etching: Etching sol can be prepared using available etchers like ferric Chloride, Cupric chloride etc. Ferric chloride is popularly used. Etching can be carried out in a Spray etching chambers. Few drops of HCL can be added to FECL3 to spread a etching action. The Etching process may take 30-40 min depending upon the PCB'

5) Clearing and Resist Removal: Alter etching, board should be washed under running water and then dried by applying turpentine pads or spirit, the tapes can be cleaned off from PCB, Now printed pattern will be clearly visible.

6) Finishing: After PCB is cleaned, center of terminals can be center punched and holes can drill over board. The drilling machine can be used to drill the holes. Then terminal points can be lightly tinned. After wards suitable component can be mounted on PCB.

CHAPTER – 02

POWER SUPPLY CIRCUIT

2.1 Circuit Diagram of power supply

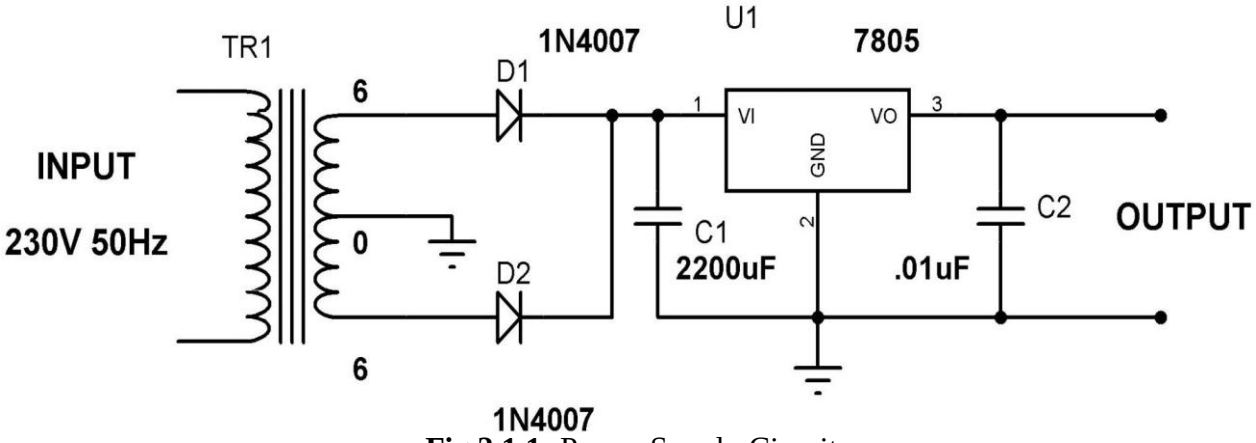


Fig 2.1.1: Power Supply Circuit

2.2 Transformers

A transformer is a static electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Transformers are used to increase or decrease the alternating voltages in eclectic power applications.

The two basic types of transformers classified on the basis of the application they are used with are-

- Step up transformer
- Step down transformer

Step up transformer: step up transformers are those that raise the input voltages to higher voltage level. This means that the input voltage of step up transformers is low with the secondary winding being the high voltage-low current winding and primary winding being made up of thick insulated copper wire. Step up transformers are used in power plants, microwaves and X-ray machines.

Step down transformer: step down transformers are those that reduce the input voltages to lower voltage level. Step down transformers are used in doorbells and converters.

Here, in this project we use the 9-0-9V step down transformer, because to reduce the input voltage.

2.3 Rectifier and Filter

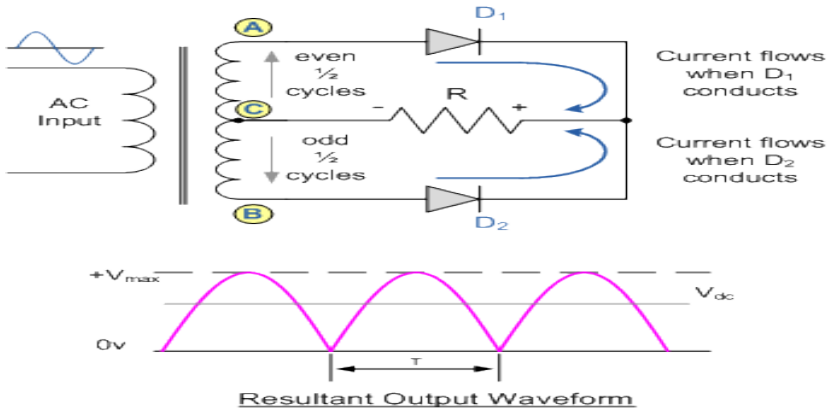
Rectifier: A rectifier is a electronic circuit that is used for converting AC supply into unidirectional DC supply. This process of converting alternating current into direct current is also called as Rectification.

There are three different types of rectifiers are as follows:

- Half wave rectifier
- Full wave rectifier
- Bridge wave rectifier

Here, in this project we use the full wave rectifier.

Full wave rectifier:



Construction: the circuit diagram consists of 230V, 50Hz, single phase AC input apllied across primary of the step down transformer across secondary the reduced voltage id equal to Vm (maximum voltage). The center tapped full wave rectifier having a two diode D1 and D2 and one load resistor RL. The name so because the secondary of the transformer is center tapped.

Working or operation:

During positive half cycle of the input AC voltage the point A is positive with respect to point B. B is negative. Hence the diode D1 is foreword biased and D2 is reverse biased. Hence current flowing through the RL as shown in figure.

During negative half cycle of the input AC voltage the point B is positive with respect to point A. A is negative. Hence the diode D2 is foreword biased and D1 is reverse biased. Hence current flowing through the RL as shown in figure.

In both the half cycle the current flows through the load resistor is same direction. Hence the complete one cycle AC is converted into DC voltage. Hence it I called Full wave rectifier.

Advantages of rectifier

- Low ripple factor (0.48) as compare to the half wave rectifier.
- High efficiency.

Disadvantages of rectifier

- The location of the center tapped secondary of the transformer is difficult.

Applications of rectifier

- Regulated power supply.
- Battery chargers.
- Uninterruptible power supply.

Filter: Filter is an electronic device. It is used to remove the AC ripple from the rectified outputs. The ripple in the output of the both half wave and full wave rectifier is more. Hence this unwanted AC component is to eliminate by the filter circuit and thus provide the desired pure output for the load.

There are different types of filters are ads fallows:

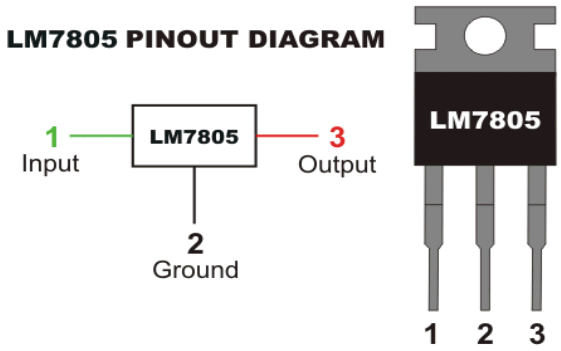
- Capacitor input filter
- LC filter
- RC filter
- Butterworth filter
- RLC filter
- RL filter

2.4 Regulation section

Need: The rectified output is not stable output. It is fluctuation with load or input voltage. Hence it is necessary to construct a power supply whose output voltage remains constant even if the load resistance changes or if the supply line voltage varies. So that regulator circuits are very important in power supplies.

Regulator is a electronic circuit in which the output voltage remains constant with irrespective change in the load or line variations. The performance of the regulator can be measured by two parameters: **1.** Line regulation, **2.** Load regulation.

Here, we use the 7805 IC as regulator. In this IC pin number 1 as input, pin number 2 as ground and pin number 3 as output.



A DC power supply system, which maintains constant voltage irrespective of fluctuations in the main supply or variation in the load, is known as Regulated Power supply. The 7805 IC referred to fixed positive voltage regulator, which provides fixed voltage 5 volts. The 7805 regulator is known as fixed voltage regulator.

Fixed –Voltage regulator design has been greatly simplified by the introduction of 3-terminal regulator ICs such as the 78xx series of positive regulators and the 79xxx series of negative regulators, which incorporate features such as built-in fold back current limiting and thermal protection, etc.

A rectified filter and unregulated DC voltage is given to pin of IC regulator. A bypass capacitor is connected between input and ground to bypass the ripples and oscillations. The output capacitor is connected between output and ground to improve transient response. The unregulated input is applied to the IC must be always more than the regulated output.

The regulated 5v power supply is connected to microcontroller, timer, op-amps or any other circuits of our projects.

Features of regulator

- These are provides high regulated power.
- Thermal and short circuit protection.
- High ripple rejection.
- It provides the output current for 78xx is 1amps and79xx is 1.5amps.

Advantages of regulator

- Simplicity of design.
- Lower part count.
- Space savings (unless a heat sink is used).
- Low noise.
- Fast transient response.
- Low cost.

2.4.4 Disadvantages of regulator

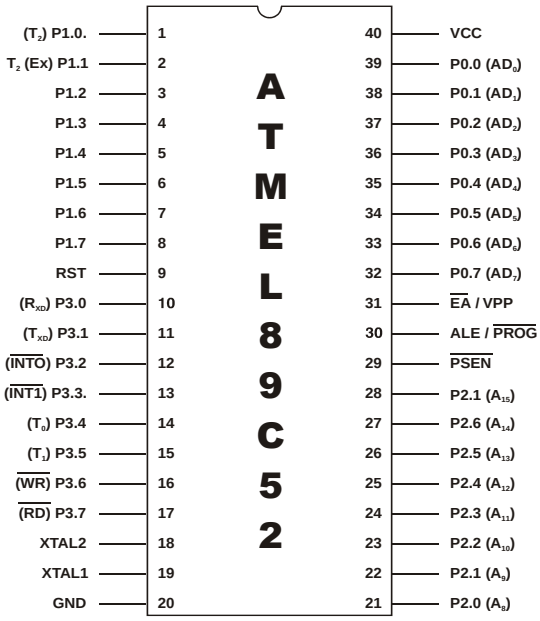
- Low efficiency if input and output difference is large.
- May require a heat sink.
- Capable exclusively of step-down operation.

CHAPTER - 03

8951 MICROCONTROLLER UNIT

3.1 Working: The sensors which are inserted in to the soil absorb the level of moisture and in a driving stage this is further improved and fed to a microcontroller. In this microcontroller we also dumped destination number.

3.2 Pin configuration of 89c51



- **Port1 (Pin1 to Pin8):** Port1 includes pin1.0 to pin1.7 and these pins can be configured as input or output pins.
- **Pin 9 (RST):** Reset pin is used to Reset 8051 Microcontroller by giving a positive pulse to this Pin.
- **Port3 (Pin 10 to 17):** The Port3 Pins are similar to port1 pins and can be used as universal Input or output pins. These pins dual-function Pins and the function of each Pin is given as:
- **Pin 10 (RXD):** RXD pin is a Serial Asynchronous Communication Input or Serial synchronous Communication Output.
- **Pin 11 (TXD):** Serial Asynchronous Communication Output or Serial Synchronous Communication clock Output.
- **Pin 12 (INT0):** Input of Interrupt 0. **Pin 13 (INT1):** Input of Interrupt 1
- **Pin 14 (T0):** Input of Counter 0 clock. **Pin 15 (T1):** Input of Counter 1 clock
- **Pin 16 (WR):** Writing Signal to write content on external RAM. **Pin 17 (RD):** Reading Signal to read contents of external RAM.
- **Pin 18 and 19 (XTAL2, XTAL1):** X2 and X1 pins are input output pins for the oscillator. These pins are used to connect an internal oscillator to the microcontroller.
- **Pin 20 (GND):** Pin 20 is a ground pin.

- **Port2 (Pin 21 to Pin28):** Port2 includes pin21 to pin28 which can be configured as Input Output Pins. But, this is only possible when we don't use any external memory. If we use external memory, then these pins will work as high order address bus (A8 to A15).
- **Pin 29 (PSEN):** This pin is used to enable external program memory. If we use an external ROM for storing the program, then logic 0 appears on it, which indicates Micro controller to read data from the memory.
- **Pin 30 (ALE):** Address Latch Enable pin is an active high-output signal. If we use multiple memory chips, then this pin is used to distinguish between them. This Pin also gives program pulse input during programming of EPROM.
- **Pin 31 (EA):** If we have to use multiple memories then the application of logic 1 to this pin instructs the Microcontroller to read data from both memories: first internal and then external.
- **Port 0 (Pin 32 to 39):** Similar to the port 2 and 3 pins, these pins can be used as input output pins when we don't use any external memory. When ALE or Pin 30 is at 1, then this port is used as data bus: when the ALE pin is at 0, then this port is used as a lower order address bus (A0 to A7)
- **Pin40 (VCC):** This VCC pin is used for power supply.

3.3 POWER AND MEMORY OF 8951 MICROCONTROLLER

Power Modes:

IDLE MODE: In idle mode, the CPU puts itself to sleep while all of the on-chip peripherals stay active. The instruction to invoke the idle mode is the last instruction executed in the normal operating mode before the idle mode is activated. The CPU contents, the on-chip RAM, and all of the special function registers remain intact during this mode. The idle mode can be terminated either by any enabled interrupt (at which time the process is picked up at the interrupt service routine and continued), or by a hardware reset which starts the processor in the same manner as a power-on reset.

POWER-DOWN MODE: In the power-down mode, the oscillator is stopped and the instruction to invoke power-down is the last instruction executed. Only the contents of the on-chip RAM are preserved. A hardware reset is the only way to terminate the power-down

mode. The control bits for the reduced power modes are in the special function register PCON.

Memory:

MC 8051 has 128 byte **Random Access memory (RAM)** for data storage. Random access memory is non volatile memory. During execution for storing the data the RAM is used. RAM consists of the register banks, stack for temporary data storage. It also consists of some special function register (SFR) which are used for some specific purpose like timer, input output ports etc. Normally microcontroller has 256 byte RAM in which 128 byte is used for user space which is normally Register banks and stack. But other 128 byte RAM which consists of SFRs. Address range of RAM can be calculated as,. Since 2^7 bytes so total locations are from 00H to 7F H

In 8051, 4KB **Read Only Memory (ROM)** is available for program storage. This is used for permanent data storage. Or the data which is not changed during the processing like the program or algorithm for specific applications. This is volatile memory; the data saved in this memory does not disappear after power failure. We can interface up to 64KB ROM memory externally if the application is large. These sizes are specified different by their companies. Address Range of PC: Address range of PC means program counter (which points the next instruction to be executing) can be moved between these locations or we can save the program from this location to this location. Address range of PC is 0000H to 0FFFH means total 4KB locations are available from 0000H to 0FFFH. At which we can save the program

Oscillator

It is used for providing the clock to MC8951 which decides the speed or baud rate of MC. We use crystal which frequency varies from 4MHz to 30 MHz, normally we use 11.0592 MHz frequency.

3.4 FEATURES

- 80C51 Central Processing Unit
- On-chip FLASH Program Memory with In-System Programming (ISP) capability
- Boot ROM contains low level FLASH programming routines and a Default serial loader

- Speed up to 33 MHz
- Full static operation
- RAM expandable externally to 64 k bytes
- 4 level priority interrupt
- 7 interrupt sources, depending on device
- Four 8-bit I/O ports
- Full-duplex enhanced UART
    - Framing error detection
    - Automatic address recognition
- Power control modes
    - Clock can be stopped and resumed
    - Idle mode
    - Power down mode
- Programmable clock out
- Second DPTR register
- Asynchronous port reset

3.5 Advantages

- Relatively simple to design and install.
- This is very useful to all climate conditions any it is economic friendly.
- This makes increases productivity and reduces water consumption.
- This is safest and no man power is required.
- Here we are microcontrollers, so there is error free.
- Reduce soil erosion and nutrient leaching.

Disadvantages

- This is only applicable for large size farms
- Equipment is costlier
- Require frequent maintenance for efficient operation.
- Any temporary installations and must be expanded or adjusted to the drip line as plants grow.

Program code:

```
#include"Variable.h"
unsigned char code ucMGMT1[] = "+91 put your no here ";
unsigned char code ucMGMT2[] = "+91 put your no here";
unsigned char code ucMSG1[] = "PLEASE ALERT LOW MOISTURE DETECTED";
unsigned char code ucMSG2[] = "PLEASE ALERT PUMP OVER HEATING
DETECTED                ";
unsigned char code ucMSG3[] = "PLEASE ALERT NO WATER ";
void main(void)
{
  while(1)
  {
   switch(ucsthreadState)
   {
                        ucsthreadState = SR_MDM_INIT;
                                break;
          case SR_MDM_INIT:
                                serial_Init();  // Seriel Initiliasation for the 8051
                                MSDelay(300);
TxdCommandToModem("AT+CMGF=1\r\n");  // Text Mode Enable for the Modem
                                MSDelay(200);
TxdCommandToModem("AT+CNMI=0,0,0,0,0\r\n")//New SMS message indications
Dissable
          MSDelay(200);
          TxdCommandToModem("AT+CMGD=1,4\r\n");                    //Delete INBOX
                                MSDelay(1000);
Prep_lcd_Write_Data("  SMS Sending   ",LINE1_ADDR, "   Controller   ",
LINE2_ADDR);
                        MSDelay(200);
ucsthreadState = HANDLE_RING; // switching ucsthreadState to HANDLE_RING;
                    break;
       case  HANDLE_RING:
                    process_control(); //  calling process control function
              break;
               case NO_ACTION:
              break;
               default:
                     break;
    }
   }
   while(1);
}
void serial_Init(void)
{
          IE              =       0;              ///Dissable ALL Interrupt
          TR0     =       0;              // Disable Timer 0
          TR1     =       0;              // Disable Timer 1
          TF0     =       0;              // Timer Over Flag OFF
    TMOD        |=      0x20;    //Timer 1 is Configured with 8-bit Auto Reload
```

```
        TH1     =   0xFD;   // 9600 Bps
        SCON =  0x50;   // Enable UART
        TR1     =   1;      // Start Timer1
        TI      =   1;      // Enable Transmit   Flag
        RI      =   0;    // Recieve Flag Make OFF at initial
        ES      =   1;      //Enable seriel interrupt
        PS      =   1;    //Higher pririty to seriel interupt
        EA      =   1;    //Enable ALL Interrupt
}
void serial(void) interrupt 4
{
 unsigned char  temp_char;
  if(TI)
  {
    TI = 0;   // disabling Transmit interrupt flag
  }
  else
  if(RI)
  {
   void MSDelay(unsigned int delay)
{
        unsigned int i,j;
        for(i=0;i<delay;i++)
        for(j=0;j<2000;j++);
}
void TxdCommandToModem(unsigned char *s)
{
   while(*s!=NULL_00)   // if pointer s is not equal to null then loop
        {
          SBUF = *s;                  // the *s is moved to sbuf
     MSDelay(1);
          s++;                      // increment of*s
        }
   SBUF = CARRIAGE_RETURN;         // sbuf is equal to 0x0d
   SBUF = END_OF_LINE;                          // END_OF_LINE
        '\n'
        MSDelay(10);
}
void ClearRecdCharArray(void)       // to clear the previously recd char
{
        unsigned char  gucloop;
        for(gucloop=0; gucloop<=MAX_RECD_CHAR; gucloop++)
        recd_char[gucloop] = NULL_00;
                // if gucloop is less or equal to 0x80 then gucloop= null
}
void process_control(void)
{
   if(DTMF_SELECT == 1)
        {
```

```
            DATA  = (DTMF_PORT & 0x0F);   //getting original data(lsb 4 bits).
            switch(DATA)
            {
                 case 0x01:
  Sms_CommandToModem(&ucMSG1[0],1); // send sms to the address of ucMSG1[0] ,1
                                    break;
                case 0x02:
  Sms_CommandToModem(&ucMSG2[0],2); // send sms to the address of ucMSG1[0] ,2
                                    break;
                    case 0x03:
  Sms_CommandToModem(&ucMSG3[0],3); // send sms to the address of ucMSG1[0] ,3
                                    break;
              case 0x04:
  Sms_CommandToModem(&ucMSG3[0],3); // send sms to the address of ucMSG1[0] ,3
                                    break;
                    case 0x08:
  Sms_CommandToModem(&ucMSG3[0],3); // send sms to the address of ucMSG1[0] ,3
                                    break;

}
   }
}
void Sms_CommandToModem(unsigned char *s, unsigned char ucMGMTIndex)
{
 if(ucMGMTIndex == 1) // if ucMGMTIndex =1 sends sms to &ucMGMT11[0] and
displays on lcd
            {
                                TxdCommandToModem(&ucMGMT1[0]);
             }
            if(ucMGMTIndex == 2)                        // if ucMGMTIndex =2 sends sms to
&ucMGMT22[0] and displays on lcd
            {
            gbdevON_1Flag   =   mystr_recdchar_ncmp("ON1",3);
            gbdevOFF_1Flag  =   mystr_recdchar_ncmp("OFF1",4);
```

CAHPTER – 04

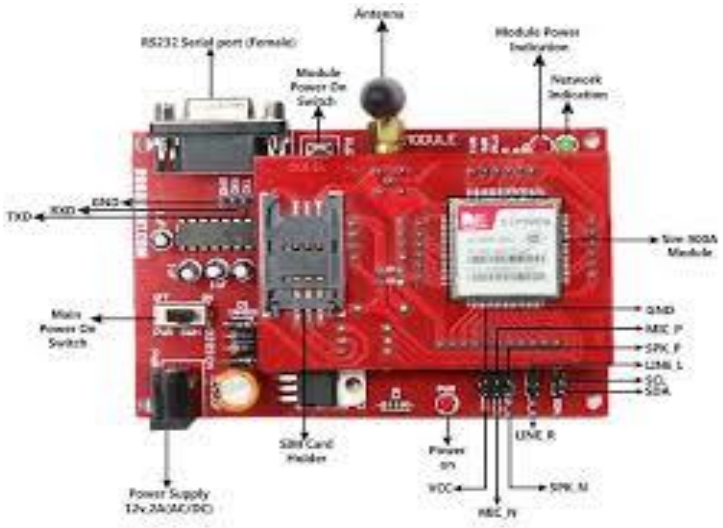
GSM MODULE

4.1 Introduction to GSM

GSM Modem can accept any GSM network operator SIM and it can act just like a mobile phone with its own unique phone number. The necessity to use this is it can use RS-232 protocol which can be easily connected to the controller. It can be used like a phone where it can send and receive SMS and make a call. The GSM modem is connected to the controller through RS- 232. The SMS is sent through the terminal to the number using AT Commands. "AT-Attention" commands which is used by the controller to control the GSM to perform the desired function. It also has reverse voltage protection and the LED notifications. It is operated in 900/1800 MHz

4.2 Working: 900MHZ GSM modem which communicates with microcontroller 8051 with UART protocol. The GSM Smart Modem is a multi-functional, ready to use, rugged unit that can be embedded or plugged into any application. The Smart Modem can be controlled and customized to various levels by using the standard AT (attention) commands. The modem is fully type-approved, it can speed up the operational time with full range of Voice, Data, Fax and Short Messages (Point to Point and Cell Broadcast). The modem interface to microcontroller through MAX 232 IC which is a level converter from TTL to the standards of GSM modem. The roles of GSM here is build up a communication between user electricity board and microcontroller like receiving requests and pass it to microcontroller and pick the data from controller and send it back. And also perform certain functions like disabling meter etc.

The below figure shows the GSM Modem.



According to these three parameters and the condition of soil the pump goes to 'ON' or 'OFF'. The output of pump can be further connected to a solenoid where these supplies water to the required area of the field. If in a big field different crops are present, by using a required number of solenoid by keeping a single pump the irrigation can be effectively controlled. To control the action of the pump this possible with GSM modem as the user or farmer gets the information from parameter sensing unit now passes from RS232 a serial interface circuit with GSM modem starts sending the message.

FEATURES AND APPLICATIONS:

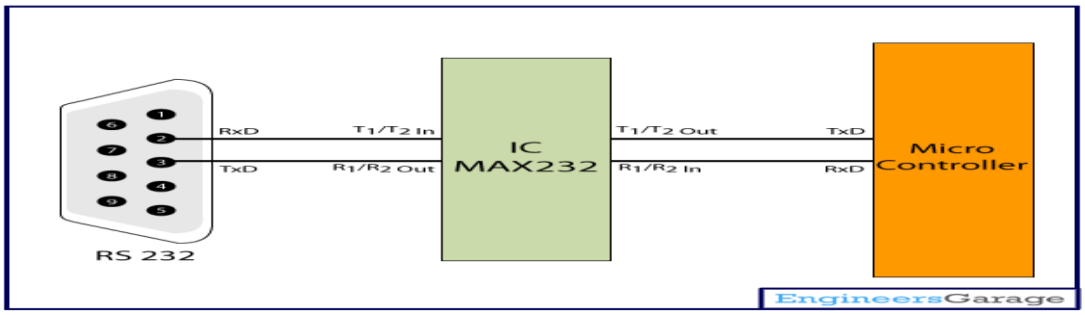
- Controlling irrigation against moisture levels
- Controlling and monitoring through GSM
- Wireless indication of parameters in farmer house
- Pump operation through GSM.
- The fertilizer can be sprayed and controlled through pump

4.3 Introduction to MAX 232

It version of serial I/O standard, which is most widely used in PCs, GSM/GPS and several devices. In MAX232, high and low bits are represented by flowing voltage ranges.

Bit	Voltage Range (in V)	
0	+3	+25
1	-25	-3

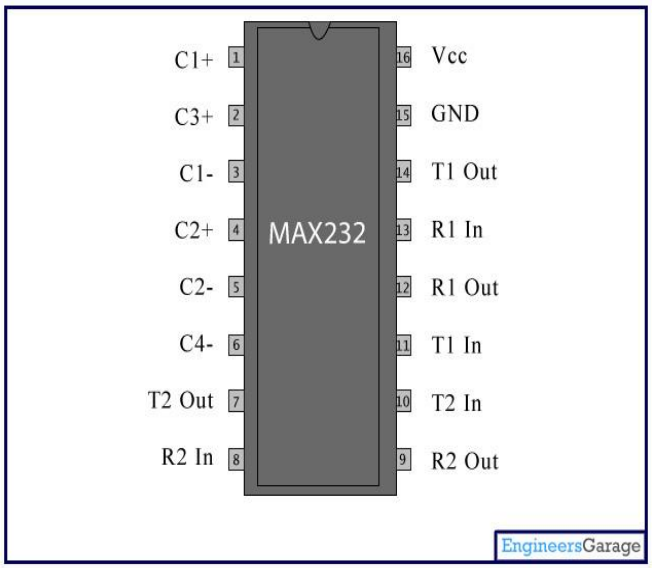
Therefore, while connecting a GSM/GPS to microcontroller system, a voltage converter is required. This converter converts the microcontroller output level to the GSM/GPS voltage levels, and vice versa. IC MAX232 also known as line driver is very commonly used for this purpose. The simplest connection between a GSM/GPS and microcontroller requires a minimum of three pins, RxD (receiver, pin2), TxD (transmitter, pin3) and ground (pin5) of the serial port of GSM/GPS. MAX232 has two sets of line drivers for transferring and receiving data. The line drivers used for transmission are called T1 and T2, where as the line drivers for receiver are designated as R1 and R2. The connection of MAX232 with computer and the controller is shown in the circuit diagram.



The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with GSM/GPS. The controller operates at TTL logic level (0-5V) whereas the serial communication with GSM/GPS works at 12v. This makes it difficult to establish a direct link between them to communicate with each other. Hence max232 IC works as voltage level converter for both the GSM/GPS and microcontroller.

The intermediate link is provided through MAX232. It is a dual driver/receiver that includes a capacitive voltage generator to supply RS232 voltage levels from a single 5V supply. Each receiver converts GSM/GPS inputs to 5V TTL/CMOS levels. The drivers (T_1& T_2), also called transmitters, convert the TTL/CMOS input level into RS232 level. The transmitters take input from controllers serial Transmission pins and sends the output to GSM/GPS receiver. The receivers, on the other hand, take input from transmission pin of serial port and give serial output to microcontroller's receiver pin. MAX232 needs four external capacitors whose value ranges from 1µF to 22µF.

4.4 Pin Diagram:



Pin Description: The microcontroller works at 5v, the output of the microcontroller should be made compatible for GSM/GPS i.e. 12v that is done by the max232 IC. The IC max232 converts microcontroller output compatible to GSM/GPS modem and also the GSM/GPS output to the microcontroller 5v as input. The controller is programmed using AT commands to interact with GSM/GPS. The GSM/GPS Smart Modem is a multi-functional, ready to use, rugged unit that can be embedded or plugged into any application. In many cases, RS-232 ports will operate with voltages as low as _5V to +5V. This wide range of voltages allows for better compatibility between different types of equipment and allows greater noise margin to avoid interference. "Because the voltage swing on RS-232 lines is so large, the RS-232 signal lines generate a significant amount of electrical noise".

The main role of the RS232 chip is to convert the data coming for the 12-volt logic to 5 volt logic and from 5 volt logic to 12 volt logic .RS 232 CONVERTER is a chip to convert the TTL voltage levels into RS 232 level and vice versa, this chip is developed by Maxim Corporation.

4.5 Interface GSM RS 232 Microcontroller

Several devices collect data from sensors and need to send it to another unit, like a computer or microcontroller for further processing. So the data has to be sent from one unit to the other. Like here the data that GSM/GPS receives has to be sent to the microcontroller and also the data has to be sent from the microcontroller to the GSM/GPS for the controlling purpose. The communication between GSM/GPS to microcontroller and vice versa has to be done serially. The logic levels of the GSM/GPS (12v) and microcontroller (5v) are different hence to make the GSM/GPS and microcontroller compatible we require MAX232 compatible device.

Data transfer/communication is generally done in two ways: parallel and serial. In the parallel mode, data transfer is fast and uses more number of lines. This mode is good for short range data transfer. Serial communication on the other hand, uses only one or two data lines to transfer data and is generally used for long distance communication. In serial communication the data is sent as one bit at a time. This article describes the interfacing of 89c51 microcontroller with a GSM/GPS via serial port, RS232. Serial communication is commonly used in applications such as industrial automation systems, scientific analysis and certain consumer products.

4.6 Advantages of GSM

- Mobility
- Easy availability
- High uptime
- It provides very cost effective product and solutions.
- The phone works based on SIM card and hence it is easy to change the different veraities of phones by users.
- It is easy to integrate GSM with other wireless technology based on devices such as CDMA, LTE etc.,

Applications of GSM

We now offering GSM based hardware and software development services. This include embedded GSM terminals, GSM modems, GSM module integration, GPRS communication integration, GSM based remote monitoring and management systems, GSM applications in industrial control, GSM security systems and more…

- Portable Computers.
- Low-Power Modems.
- Interface Translation.
- Battery-Powered RS-232 Systems.
- Multidrug RS-232 Networks.

CHAPTER – 05
HARDWARE UNITS

5.1 RELAY CIRCUIT

It is an electrical device, typically incorporated an electromagnet, which is activated by a current or signal in one circuit to open or close another circuit.

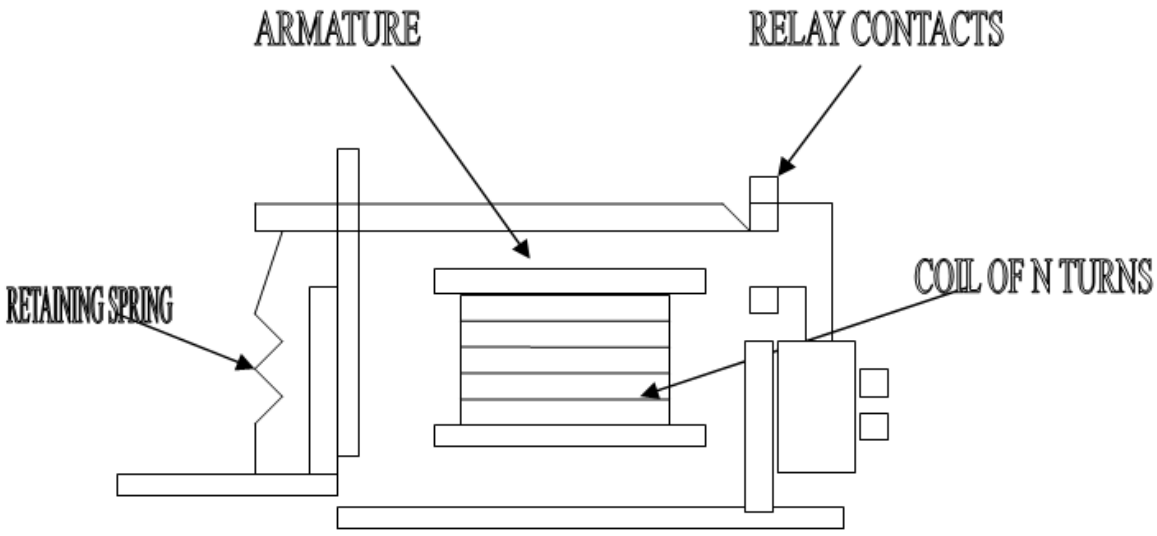
5.2 CLASSIFICATION OF RELAYS.

1. Electromagnet relays.

2. Solid state relays.

3. Hybrid relays.

ELECTROMAGNETIC RELAYS



Fig, 5.1.1: Electromagnetic Relays

Relays are switching devices operated by currents and employed to control large power or to perform switching operations.

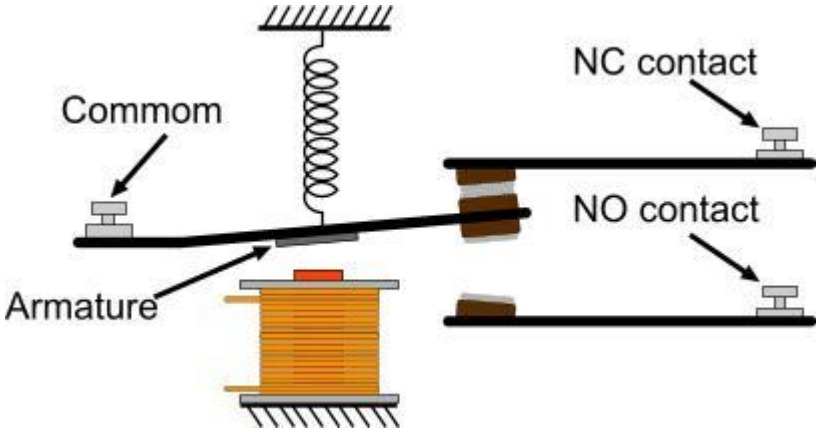
OPERATION:

Fig shows the construction features of a simple electromagnetic relay. It consists of a coil. A dc current passing through which produces a magnetic field. This magnetic field attracts an armature which in turn operates the contact, normally open contacts close and normally closed contacts open. As long as current flows, the two contacts remains closed. When the current is switched off, the attractive force on armature is no longer present and the contact is opened.

ELECTROMAGNETIC RELAY INTERFACING CIRCUIT.

Relay acts as electromagnetic switch, and can be used to control the external devices with isolation and the internal structure and working is shown below.

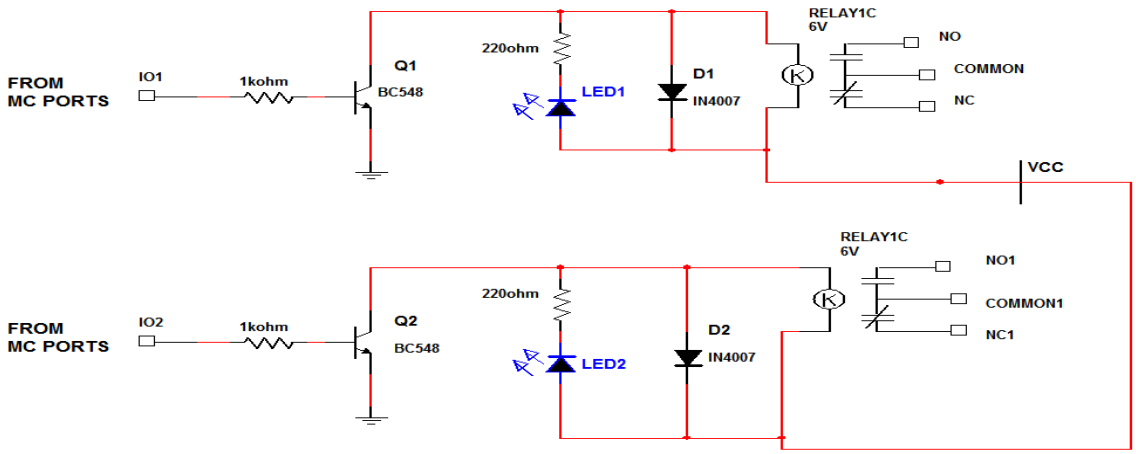
RELAY INTERNAL CONTACTS



Fig, 5.1.2: Relay Internal Contacts

The figure indicates the internal contacts of the relay. The relay shown in the figure is in off state. When the relay is off common is in contact NC contact (normally closed) and common is open with respect to NO contact (normally open).

5.3 RELAY INTERFACE



Fig, 5.3.1: Relay Interface Circuit

The circuit diagram shows the connection of Relay Driver Circuit. When the logic signal from controller or any other circuits like timers op amps is applied to base of the transistor through resistor 1KOhm .When base signal is high, transistor saturates and it

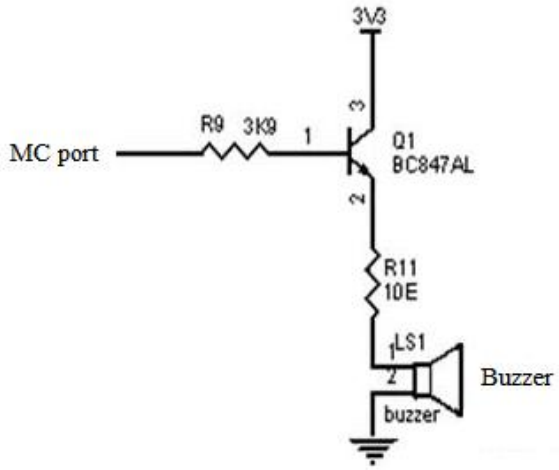
energizes the relay. The transistor act as a small signal amplifier resistor of 1KOhm is used to provide proper emitter base voltage to turn the transistor to ON state from OFF state.

5.4 BUZZER INTERFACE

Fig, 5.4.1: Buzzer

Buzzer is an electrical device that makes a buzzing noise and is used for signaling

Buzzer unit is connected to one of the o/p of decoder which is useful as a indicator for the areas .



5.5 DC Pump

The miniature pump used here is operated at 12v dc which is controlled through microcontroller and lifts the water from tank and push it to main pipes

Fig, 5.5.1: DC pump

Advantages of relay

- It is easy to install and repair.
- Its life is long
- It is cheaper than other type of wiring except cleat wiring.
- Conductors have strong installation.
- Smooth acceleration.

Disadvantages of relay

- The conductors are open and liable to mechanical injury; therefore this type of wiring cannot be used in work shop.
- Good workmanship is required to make a sound job in T.R.S wiring.
- Low torque efficiency.

Applications of relay

- Temperature control system: heating control and infrared heating control.
- Microprocessor based systems: CNC machine, automatic vending machines, induction molding machines.
- Medical equipments.
- Special purpose machines.

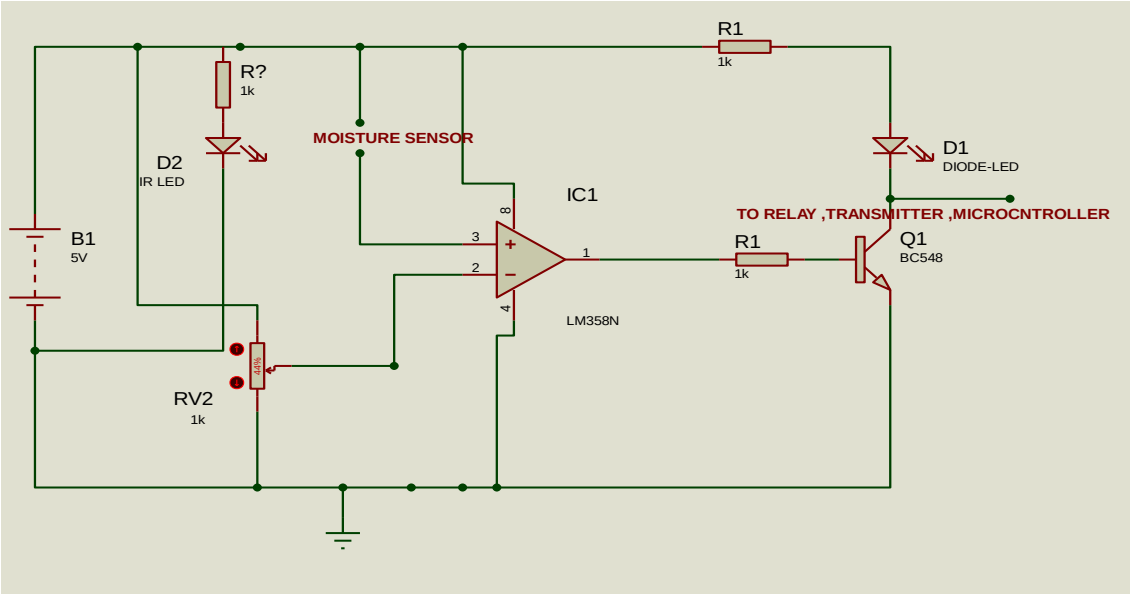
CHAPTER – 06

SENSORS

6.1 Definition

It is a device which defects or measures a physical property and records indicates or otherwise responds to it.

6.2 MOISTURE LEVEL SENSING CIRCUIT



A moisture level Sensing circuit is designed with simple copper conducting probes, OP_AMP(IC LM358), and Transistor. The wire probe sensor converts the moisture level in to difference in the resistance. The resistance variation is inversely proportional to moisture. Here the OP_AMP is used as a voltage comparator. The sensor is connected to the non-inverting terminal Pin No 3 of the OP_AMP to provide the potential difference. The inverting terminal Pin No 2 of the OP_AMP get the potential difference & variable resistor (10 KΩ), to adjust the Reference Voltage or a set value of the moisture. The LED connected at the collector gives an indication of sensing parameter when it exceeding the threshold value.

When the moisture level exceeds the predefined value because of this condition the voltage at Pin No 3 i.e. non-inverting terminal of the OP_AMP changes and its output goes high which in turn activate (Saturate) the transistor. This signal is given connected to buzzer, transmitter, and relay or microcontroller unit to take further actions like alert indication, pump control, sending message etc.

6.3 Working

A Sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be light, heat, motion, moisture, pressure, or any one of a great number of other environmental phenomena.

Here in this project we are use two different types of sensors. One for dry sensing and another one for wet sensing.

The problem can be solved by using a technique of sensing actual moisture level of the soil and action of pump can be controlled. The sensors which are inserted in to the soil absorb the level of moisture and in a driving stage this is further improved and fed to a microcontroller.

According to the moisture level of the soil there is a change in conductivity between two probes. So the microcontroller is designed in a such way that as the moisture level develops between probes reach a normal or abnormal values the output of microcontroller triggers the pump to irrigate the fields.

6.4 Advantages of sensor

- It can detect both metallic and non metallic targets.
- Good stability.
- High speed.
- Capacitive sensors are good in terms of power usage.
- Low cost.

Disadvantages of sensor

- They are affected by temperature and humidity.
- Difficulties in designing
- Capacitive proximity sensors are not as accurate compare to inductive sensors.

DATASHEETS

LM7805 - 3-Terminal 1A Positive Voltage Regulator

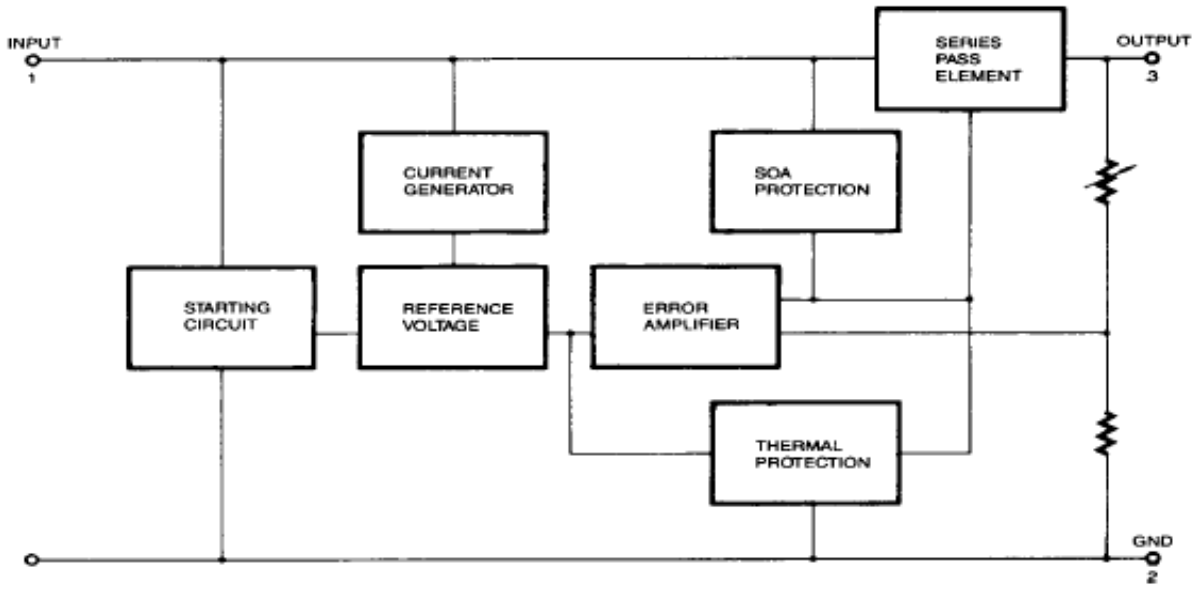
Features

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

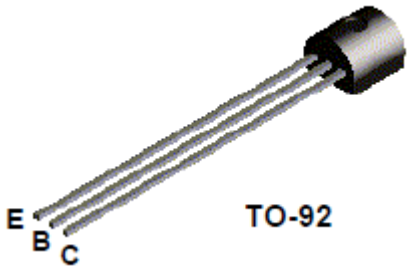
The MC78XX/LM78XX/MC78XXA series of three terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

Internal block diagram of LM7805



BC548 - NPN General Purpose Amplifier (transistor)

This device is designed for use as general purpose amplifiers and switches requiring collector currents to 300 mA. Sourced from Process 10. See PN100A for characteristics.



Symbol	Parameter	Value	Units
VCEO	Collector-Emitter Voltage	30	V
VCES	Collector-Base Voltage	30	V
VEBO	Emitter-Base Voltage	5.0	V
IC	Collector Current - Continuous	500	mA
TJ, Tstg	Operating and Storage Junction Temperature Range	-55 to +150	C

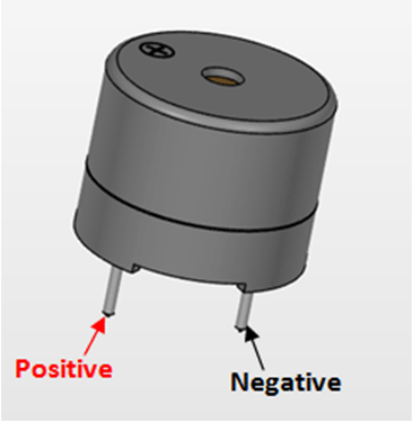
These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:

1) These ratings are based on a maximum junction temperature of 150 degrees C.

2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Buzzer



Features

- Black in color
- With internal drive circuit
- Sealed structure
- Wave solder able and washable
- Housing material: Noryl

Applications

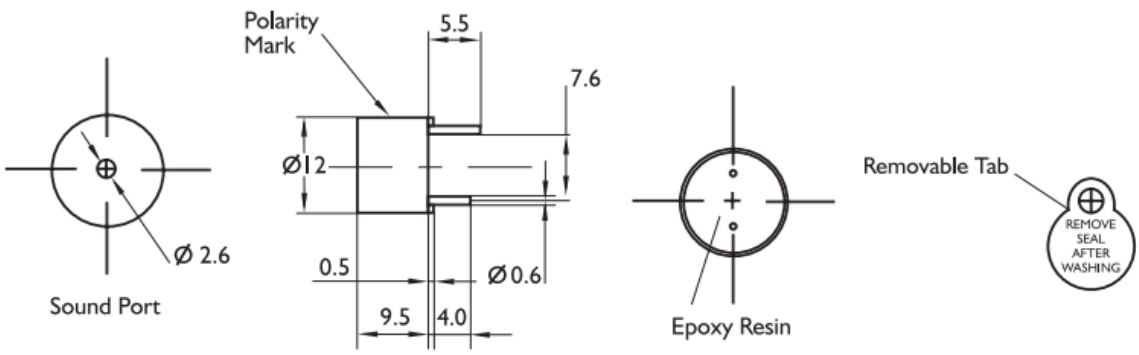
- Computer and peripherals
- Communications equipment
- Portable equipment
- Automobile electronics
- POS system
- Electronic cash register

Specifications:

- Rated Voltage : 6V DC
- Operating Voltage : 4 to 8V DC
- Rated Current* : ≤30mA
- Sound Output at 10cm* : ≥85dB
- Resonant Frequency : 2300 ±300Hz
- Tone : Continuous
- Operating Temperature : -25°C to +80°C
- Storage Temperature : -30°C to +85°C
- Weight : 2g

*Value applying at rated voltage (DC)

Structural Diagram



RELAY – 9V

FEATURES

- Compact with high capacity
- High capacity switching in a small package: 1 Form A, 10 A 250 V AC; 1 Form A 1 Form B and 2 Form A, 8 A 250 V AC.
- High sensitivity: 200 mW nominal operating power
- High breakdown voltage Independent coil and the contact structure improves breakdown voltage
- Latching types available
- Sealed construction allows automatic washing
- Sockets are available
- Complies with safety standards Complies with Japan Electrical Appliance and Material Safety Law requirements for operating 200 V power supply circuits, and complies with UL, CSA, and TÜV safety standards

TYPICAL APPLICATIONS

- Switching power supply
- Power switching for various OA equipment
- Control or driving relays for industrial machines (robotics, numerical control machines, etc.)
- Output relays for programmable logic controllers, temperature controllers, timers a

Operating capacity

Type	Switching capacity	Number of operations
1 Form A	10A 250V AC 10A 30V DC	Min. 1×10^5
1 Form A 1 Form B, 2 Form A	8A 250V AC 8A 30V DC	Min. 1×10^5

Relay – 9V:

Conclusion

Agriculture production systems and food systems must undergo significant transformations to meet the interlinked challenges of achieving sustainability, ensuring food security and addressing climate change. Increasing resource efficiency is essential to increase and safeguard food security in the long term and making a significant contribution climate change mitigation. With the increased risks from the impacts of climate change, efficiency and resilience have to be considered together at every scale and from environmental, economic and social perspectives. Climate-smart agriculture is a dynamic approach that guides the needed changes towards addressing the challenges of climate change. It is not a new agricultural system, nor a set of practices. It articulates globally applicable principles for managing agriculture for food security under changing climatic conditions, which can serve as the basis for policy support and recommendations by multilateral organizations. Climate-smart agriculture provides a framework for putting in place comprehensive policies, adequate institutions and proper governance to implement sustainable, climate-sensitive development strategies. The framework can also be used for channelling new financing to address the investment needs for research organizations and enable farmers to overcome the barriers, including up-front costs and temporarily foregone income, to the adoption of climatesmart agriculture practices.

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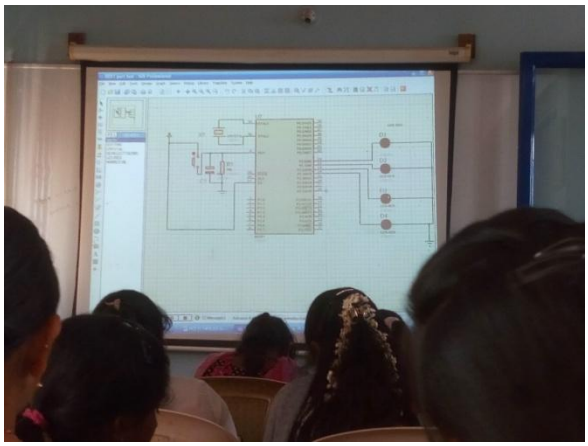

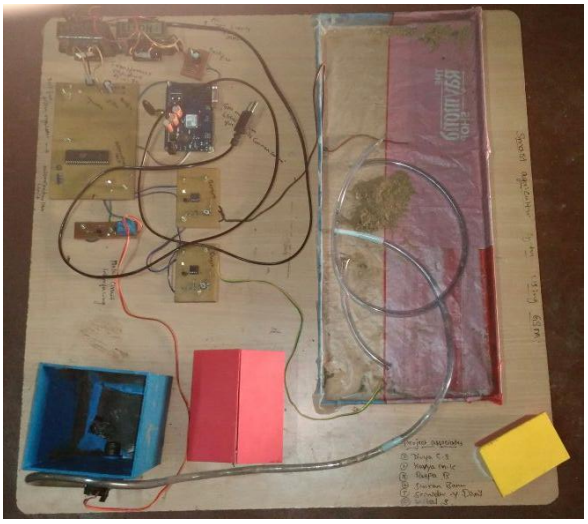

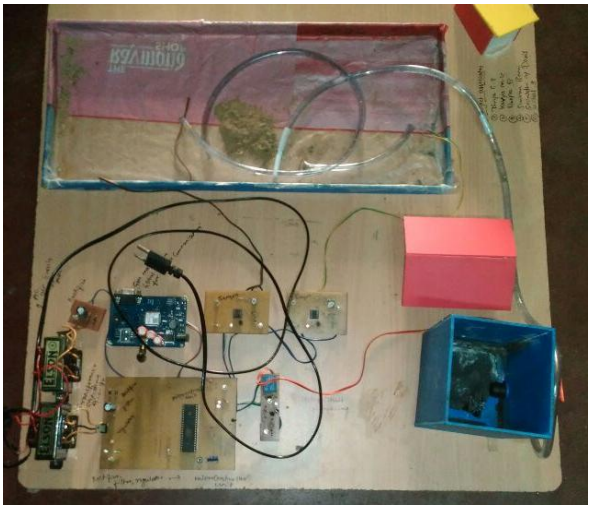

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