

NEW HORIZON COLLEGE OF ENGINEERING

MARATHAHALLI, BANGALORE

MINI PROJECT REPORT

TOPIC : SOIL MOISTURE TESTER

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CHAPTER 01

INTRODUCTION

SOIL MOISTURE TESTING DEVICE:

Soil moisture testing device is a circuit used to show the amount of water/moisture, present in the soil. It is very simple circuit, made using IC LM3915 to measure the moisture. The output is shown out on LED's. The Soil Moisture Sensor is utilized to gauge the volumetric water substance of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and biology.

For sign, the analyzer utilizes various LEDs driven by universal showcase driver IC LM3915 (IC1). The showcase board shows the general extent of conductance (corresponding of obstruction) between the two test tests when these are embedded in the dirt. The tester measures the dryness or wetness through soil resistance readings (0 to about 5 kilo-ohms) and indicates in dot mode by sequential lighting of LED1 through LED7. The first LED (LED1) (pin 18) lights up when the conductance is high (resistance is almost nil)

This tester is widely used in day to day life in farming. In the fastly developing world the farmers can adopt this to reduce their work and at the same time trying to get good yield. This is where this sensor is useful, by connecting this sensor along with some motor we can automatically drive water flow to the fields whenever the field gets dried.

The Soil Moisture Sensor utilizes capacitance to quantify dielectric permittivity of the encompassing medium. In soil, dielectric permittivity is an element of the water content. The sensor makes a voltage relative to the dielectric permittivity, and thusly the water substance of the dirt.

The test can be fueled with a DC supply or batteries in the scope of 3.5 to 20 volts. The yield is a voltage in the scope of 0 to 3V, so any multimeter can be utilized to gauge the dampness level.

CHAPTER 02

2.1 LITERATURE SURVEY

Paper number	author	year	Trial method And outcome
1.	Muhammad	2010	simple approach using artificial neural network controller but fails to perform well, but ANN systems showed very efficient control.
2.	Kalyan	2011	Useage of efficient like wireless sensor networking
3.	Prisilla	2012	Useage of artificial neural network systems.
4.	Priyanka	2012	sensors, LCD is used. All sensors will give analog output but the output is taken as digital signal and LCD will be used for display

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CHAPTER 03

3.1 PROPOSED METHODOLOGY:-

The aim of the project was to prepare a simple soil moisture tester with out any use of microcontroller and programming.

The process is done by a single IC which consists of comparators and the just compares the input voltage and shows the output reading.

This IC can be used to measure the input give, like this IC can be used to show the measure of audio output , this type of ic with the LED setup is seen in Mike sets ,where we get to see how loud the volume is coming.

Same goes with the soil, as the moisture content is high ,the top LED glows which means the soil has high moisture content.

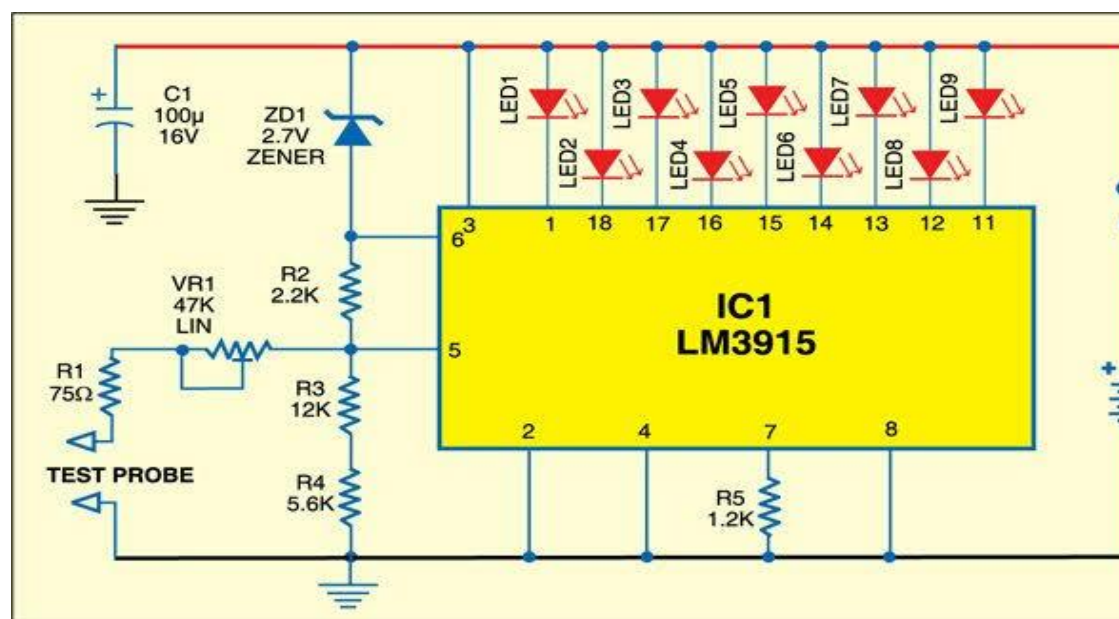


Fig 3.1:- Circuit diagram of soil moisture tester using IC LM3915

CHAPTER 04

PROJECT DESCRIPTION

SOIL MOISTURE TESTER USING ICLM 3915:-

The main aim of the project is to measure the moisture present in the soil. The indication of the moisture content present in the soil is done by led's. By using this tester we can help to detect the moisture content in the soil appropriately, it is very useful for modern farmers.

COMPONENTS REQUIRED:

1. IC LM3915
2. LED's: Red, Yellow, Green
3. Zener diode(2.7v)
4. Resistors:
 - i. 75 ohm
 - ii. 2.2k ohm
 - iii. 12k ohm
 - iv. 5.6k ohm
 - v. 1.2k ohm
5. Electrolytic capacitor.
6. 47k variable resistor (POT).
7. Testing probes (iron nails).
8. Other components (9v battery, connecting wires, bread board)

4.1 INTRODUCTION TO IC LM3915:

IC LM3915 is a dot/bar display driver monolithic integrated circuit that senses analog voltage levels and drives the LED's, LCD's, and vacuum fluorescent displays.

This IC operates with minimum 3v to maximum 25v DC.

It is a 18 pin IC, where (pin 2) is ground ,and (pin 3) is VCC.

PIN DIAGRAM OF IC LM3915:

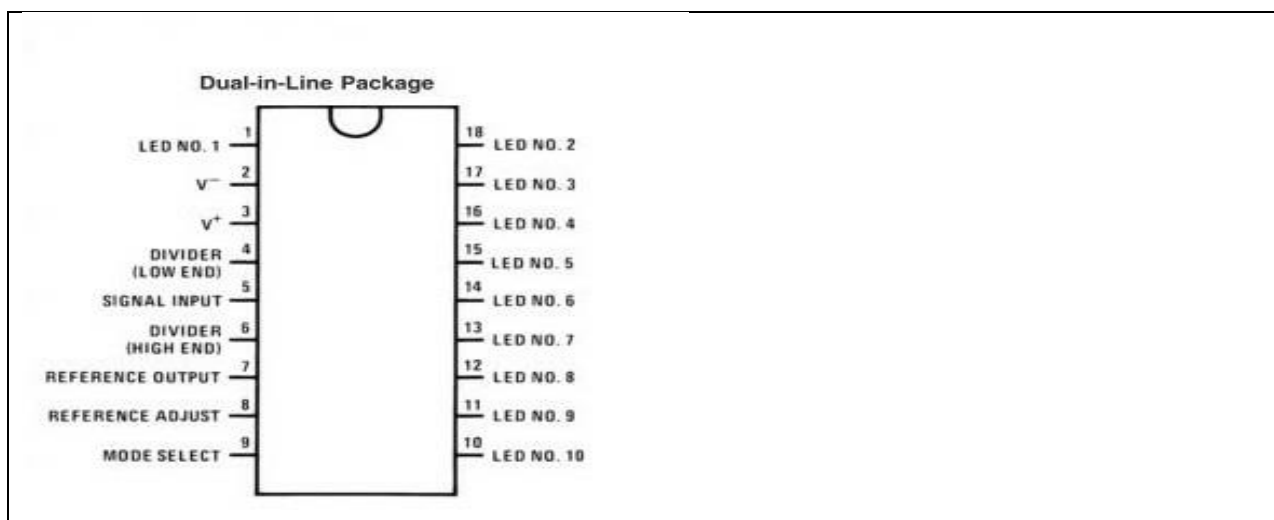


Fig 4.1 :- pin diagram of ICLM3915

PIN CONFIGURATION:

PIN NUMBER	PIN NAME	DESCRIPTION
1 AND 10 to 18	LED1, LED2, TILL LED 10	THE LED CONTROLLING PINS
2	GROUND	GROUND PIN OF IC
3	VCC	SUPPLY VOLTAGE OF(3V-18V)

4	RLO	LOW LEVEL VOLTAGE FOR POTENTIAL DIVIDER(GROUNDED)
5	SIGNAL	ANALOG SIGNAL INPUT PIN BASED ON WHICH LED IS CONTROLLED.
6	RHI	HIGH LEVEL VOLTAGE FOR POTENTIAL DIVIDER
7	REF OUT	OUTPUT REFERENCE VOLTAGE FOR LED CURRENT LIMITING (RESISTOR 1.2K ATTACHED)
8	REF ADJ	ADJUST PIN FOR VOLTAGE REFERENCE(GROUNDED)
9	MODE	SELECT PIN BETWEEN DOT/BAR MODE

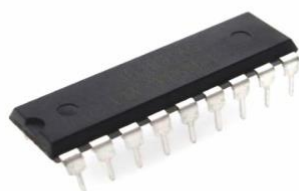


Fig 4.2 :- ICLM3915

IC :-

Background of IC :-

An integrated circuit, normally alluded to as an IC, is a minute cluster of electronic circuits and parts that has been diffused or embedded onto the outside of a solitary precious stone, or chip, of semiconducting material, for example, silicon. It is called an integrated circuit in light of the fact that the parts, circuits, and base material are altogether made together, or coordinated, out of a solitary bit of silicon, rather than a discrete circuit where the segments are made independently from various materials and collected later. ICs go in intricacy from straightforward rationale modules and speakers to finish microcomputers containing a large number of components. The integrated circuits were made in the late 1950s in light of an interest from the military for scaled down gadgets to be utilized in rocket control frameworks. At the time, transistors and printed circuit loads up were the cutting edge electronic innovation.

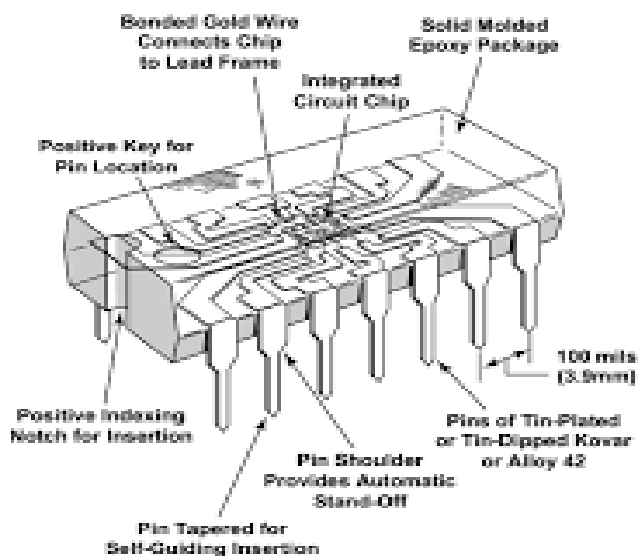


Fig 4.3 :- internal structure of an IC

Manufacturing process

Several incorporated circuits are made simultaneously on a solitary, slender cut of silicon and are then cut separated into singular IC chips. The assembling procedure happens in a firmly controlled condition known as a tidy up room where the air is sifted to expel remote particles. The couple of hardware administrators in the room wear build up free articles of clothing,

gloves, and covers for their heads and feet. Since some IC parts are touchy to specific frequencies of light, even the light sources are separated. In spite of the fact that assembling procedures may fluctuate contingent upon the incorporated circuit being made, the accompanying procedure is run of the mill.

The manufacturing of silicon wafer involves the following processes:-

1. Masking
2. Doping
3. Making successive layers
4. Making IC's

TLDR: You can think about the VCC as the working voltage of the circuit.

LM3915 description:-

Pins 1, 10 to 18: Each of these pins is associated with the cathode of the yield LED. The anode of the yield LEDs are associated with the 3V to 20V inventory.

pin 2: This stick is the negative simple voltage supply and is normally associated with ground.

pin 3 3: This stick is the positive voltage supply and as a rule the stock voltage is at min 3 V to max 20V

pin 4: This stick is normally grounded

pin 5: This stick is the sign information stick and the sound sign info is given to this stick.

pin 6 and Pin 7 are shorted together. The current through stick 7 chooses the current drawn by each LED.

pin 8: It is the stick utilized for changing the reference voltage. There is an obstruction of 1.2kohms between stick 7 and stick 8 with the end goal that a voltage of 1.25V is between the pins. A potential divider is associated with the resistor which is utilized to alter the reference voltage.

pin 9: This is the mode select stick and is utilized to choose either the spot mode or the bar mode. For the bar mode, the stick is associated legitimately to stick 3 , for example to the positive voltage supply. For speck mode, the stick is left open, with no association.

IC WORKING:-

LM3915 essentially gets simple voltage as contribution to the range between 0 to 1.5V and this is given to the Buffer enhancer which drives a progression of 10 comparators. There is a reference voltage source which can be modified. This reference voltage is given to each comparator utilizing a 1:10 Potential divider course of action. Each comparator contrasts the info voltage and a reference voltage and as needs be drives the relating LED associated with it. It can work in spot mode or bar mode. In bar mode, the LEDs are driven in ceaseless mode, for example the sparkling of LEDs shows up as though in consistent structure. In spot mode, a solitary LED sparkles one after another. Utilizing a LM3914/15 IC U2 – Dot/Bar Display Driver alongside signal speaker IC LM324 IC U1 to 4 a decent moving light according to sound sign are possible. High control lights can likewise be utilized by including opto coupler in arrangement with the LEDs and the diac of the opto driving the triac for 230 volt lights. The whole show framework can work from a solitary inventory as low as 3V or as high as 25V. Various components could be fell for a speck mode show or bar mode show with a degree of 60 dB or 90 dB. LM3915 can likewise be fell with LM3914 for a direct/log show or with LM3916s for an all-inclusive range VU meter.

Signal input is given at 5th pin here the input signal(analog signal) is obtained in the form of electrical resistance.9th pin is used to select the mde required i.e is dot mode or bar mode.

The LM3915 shows are utilized in sound applications, control meter and RF signal quality meters. What's more, these presentations are appropriate for signals with wide unique range, for instance sound level, control and so on.

Mode:-

The LM3914 and LM3916 are a two ICs in a series of monolithic, analog-controlled LED drivers. With these chips, all it takes is a single, analog signal to drive a string of 10+ LEDs, which can

be configured into either bar mode (where all LEDs below a certain point turn on) or dot mode (with only a single LED on at a time). Hook them up properly, and you can create all sorts of nifty multi-LED displays, like an audio-visualizing VU meter.

Ground and VCC in IC:-

Vcc represents voltage basic gatherer. This was an institutionalized term from the early(long stretches of semiconductors. Typically the gatherer leads of the transistors in the circuit were associated legitimately to the source voltage of a transistor circuit.

Ground is characterized as the normal point in a circuit where, when associated with the earth (truly a 8 foot long shaft crashed into the ground) the attributes of the circuit won't change.

In an ordinary DC circuit, with one wellspring of supply voltage, Vcc can be viewed as the working voltage source.

That being said—this doesn't really mean the battery voltage. Computerized electronic gadgets work on explicit voltages that are deliberately kept up and adapted. The battery in your telephone is most likely a 3.7 volt lithium battery which is charged by means of a charging circuit associated with a five volt divider mole control supply and is then managed inside to the charging voltage of the battery. The battery is directed to the working voltage of the telephone hardware which is most likely 3.3 volts DC. THAT is the Vcc of the telephone.

4.2LED:-

LED (light emitting diode) it is a diode which is used to drive light whenever is current is passed though it.

Photons(energy) are formed whenever electrons are combined with holes in a semi conductor .

This LED is invented by H, J Round in 1907, it is first time produced in 1962.

It consists of an anode and a cathode, its electronic symbol is mentioned below

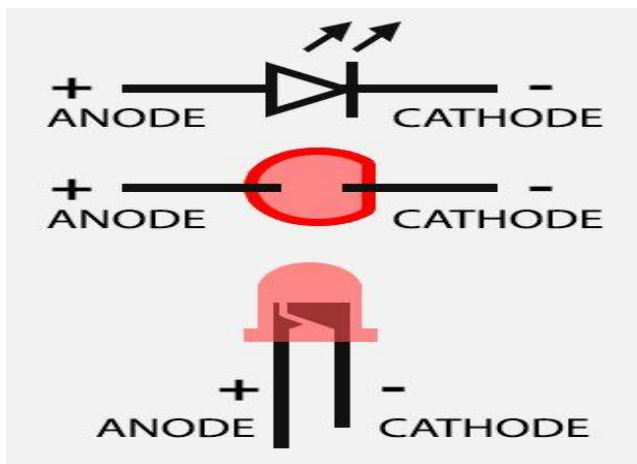


Fig 4.4 :- Electronic symbol and picture of LED

Internal explanation of LED :-

Conventional parts of the LED :-

Expoxy lens

Wire bond

Reflective cavity

Semiconductor die

Lead frame

Expoxy lens is used in LED for capturing most of the light from semiconductor, for guarding the semiconductor and for focusing the light.

Wire bond is the bond between positively and negatively side i.e anode and cathode

Reflective cavity – it is mainly used for focusing the emitted light to a single point

Semiconductor die – it is a block on which circuit for functioning is drawn, it is the main part of any electronic device, it contains a lot of internal integrated circuits.

Lead frame-lead frame consists of two leads which are used to give voltage to the input of the device. We can identify the positive part by noticing the longer lead which is referred as post, shorter lead which is called anvil.

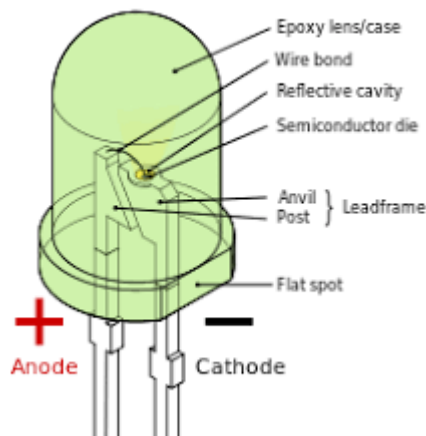


Fig 4.5 :- picture representing components in LED

The above picture is LED along with its internal components.

WORKING OF LED:-

Whenever tungsten filament is heated, light is emitted in an incandescent lamp, but in LED the working is completely contradiction to that of incandescent lamp. In lighting LED electroluminescence is employed, semi conductor is a type a material whose conductance lies in between that of a conductor and an insulator. it consists of both electrons and holes. Electroluminescence is a method in which light glows whenever an electron combines with hole, when this happens energy is evolved in the form of photons. The semiconductors employed in this are germanium or silicon. For controlling the no of holes and electrons in semiconductor, doping is used. By this process so called doping we can create two separate types of semiconductors in the same crystal, the separating part between this crystals is called a p-n junction. This junction is used to allow current in only one direction, this is why they are used as diodes.

APPLICATIONS OF LED:-

These are used to indicate the moisture level present in soil.

These are used in traffic lights

These are also employed in digital clocks

These are used on rare side of the car(lights) which will glow whenever we apply brakes

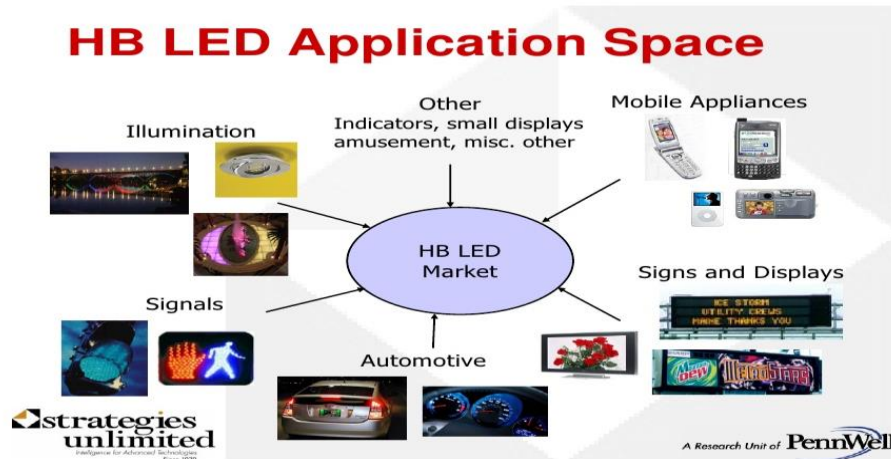


Fig 4.6 :- pic indicating applications of LED

ADVANTAGES AND DISADVANTAGES OF LED:-

ADVANTAGES:-

Productivity: LEDs transmit a larger number of lumens per watt than glowing lights. The proficiency of LED lighting apparatuses isn't influenced by shape and size, in contrast to glaring lights or cylinders.

Shading: LEDs can emanate light of an expected shading without utilizing any shading channels as conventional lighting techniques need. This is increasingly proficient and can bring down starting expenses.

Size: LEDs can be exceptionally little (littler than 2 mm²) and are effectively joined to printed circuit sheets.

Lifetime: LEDs can have a generally long valuable life. One report gauges 35,000 to 50,000 hours of valuable life, however time to finish disappointment might be longer

DISADVANTAGES:-

High beginning value: LEDs are as of now progressively costly (cost per lumen) on an underlying capital cost premise, than most customary lighting advancements. Starting at 2012, the expense per thousand lumens (kilolumen) was about \$6.

Light quality: Most cool-white LEDs have spectra that contrast essentially from a dark body radiator like the sun or a glowing light

Blue contamination: Because cool-white LEDs with high shading temperature transmit relatively more blue light than ordinary open air light sources

Use in winter conditions: Since they don't radiate a lot of warmth in contrast with conventional electrical lights, LED lights utilized for traffic control can have snow darkening them, prompting mishaps.

4.3 ZENER DIODE :-

It works on the principle of zener effect. It is an active component.

Zener effect:-It is the effect which occurs in reverse biased p-n junction diode ,when the Electric field sends the electrons from valency band to conduction band. The whole effect occurs in a semi conductor.when these electrons transfer there is an evolution of Minority charge carriers due to which suddenly reverse current increases.

Zener diode, it is a profoundly doped p-n intersection.

Why zener diode is special from other diodes :-

It is because it is designed in such a way that it will even works in the break down region, where as normal diodes will get destroyed.

These diodes are widely used in electronic equipments, to protect devices from over voltages.

It is invented by clarence Melvin Zener, who explained about zener effect in 1934.

The electronic symbol of zener diode is as below

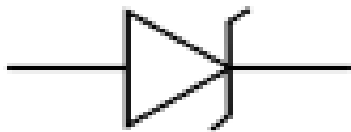


Fig 4.7 :- electronic symbol of Zener diode

There are many types of zener diodes which can vary from 1.2v to 200v,

The zener diode used in soil moisture tester is of range 2.7v.

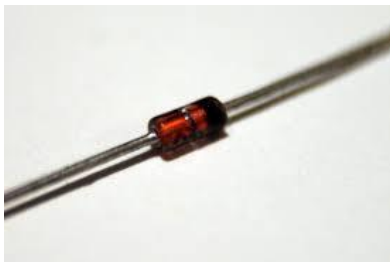


Fig 4.8 :- Zener diode (2.7v)

ADVANTAGES OF ZENER DIODE :-

The zener diode shunt is extremely monetary for what it's worth of minimal effort.

It requires just a few segments.

It has a basic circuit.

It gives a superior guideline over a more extensive scope of burden flows and info voltages.

It give higher current ability.

DISADVANTAGES:-

It has poor productivity for overwhelming burdens on the grounds that a lot of intensity is squandered in zener opposition (R_2) and arrangement resistor (R_S) in correlation with load control.

The DC yield voltage marginally changes due to zener opposition.

Changes in load current produce changes in zener current.

The interior impedance of the circuit is high.

The voltage guideline is poor.

The yield voltage isn't flexible in light of the fact that it has $V_O = V_Z$.

It can't be utilized for enormous burden current.

4.4 Resistors

Resistor is passive element which resists the flow of electrons. It is represented by letter R. Units of resistor are ohms. We can know the value of the resistor with help of color coding. Resistor are used to control the current flow, to adjust signal levels

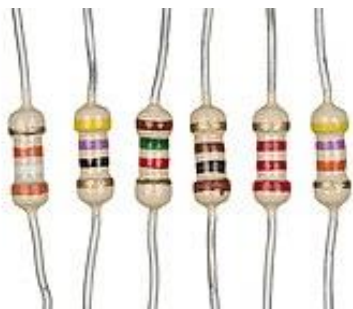


Fig 4.9 resistors

The electronic symbol of resistor is



Fig 4.10 :- electronic symbol of resistor

There are two types of resistors :-

Carbon resistors

Ceramic resistors

Variable resistor

The function of the resistor is defined by its resistance if the resistance is high then that means it allows very less current to flow through it. If the resistance is low then that means it allows more amount of current. This is by ohms law $V=IR$ where v is the voltage and R is the resistance, I is the current. The relationship between current and resistance is inverse proportionality.

If we connect a battery to an LED with out connecting it to resistor the led will blast because the voltage required by normal led is 5v, but the supply given from the battery is 9v, due to this the blast of the led occurs , so by connecting it to resistor we can avoid the damage of the led.

The person named OTIS FRANK BOYKIN was the behind the invention of electric resistor. The unit of resistor is ohm, it is George simon ohm. Passive component is the component which cant produce energy but it consumes energy these are the components which are connected to active components.

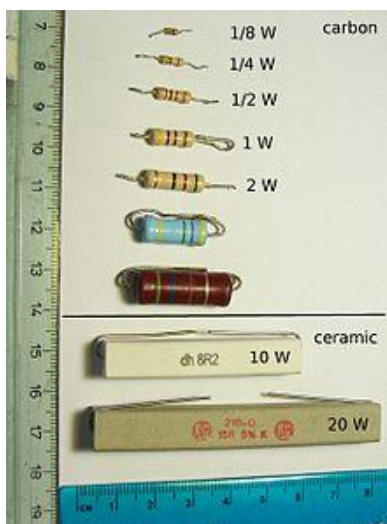


Fig 4.11 :- picture representing different types of resistors

Resistors connected in series and parallel:-

Whenever the resistors are connected in series then the total resistance is equal to sum of the individual resistances i.e $R_{eq} = R_1 + R_2 + \dots + R_n$

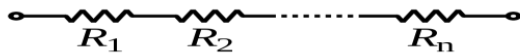


Fig 4.12 :- resistors connected in series

When they are connected in parallel the equivalent resistance is the sum of the reciprocal of the each resistor i.e $R_{eq} = 1/R_1 + 1/R_2 + \dots + 1/R_n$

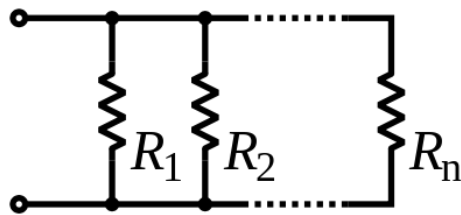


Fig 4.13 :- resistors connected in parallel

If we want to find the resistance of the resistor practically we can find it by using multi meter , there will be two nobs in multi meter we should turn the mode to resistance and we should place the nobs at two sides of the resistor then the resistance of the resistor is displayed on the screen.

Multimeter is an electronic device used for multiple purposes like finding the resistance, voltage and the current in an electric circuit.

When one want to find it theoretically it can be done by color coding, this colr coding was developed by Radio electronics television manufacturers in 1920's

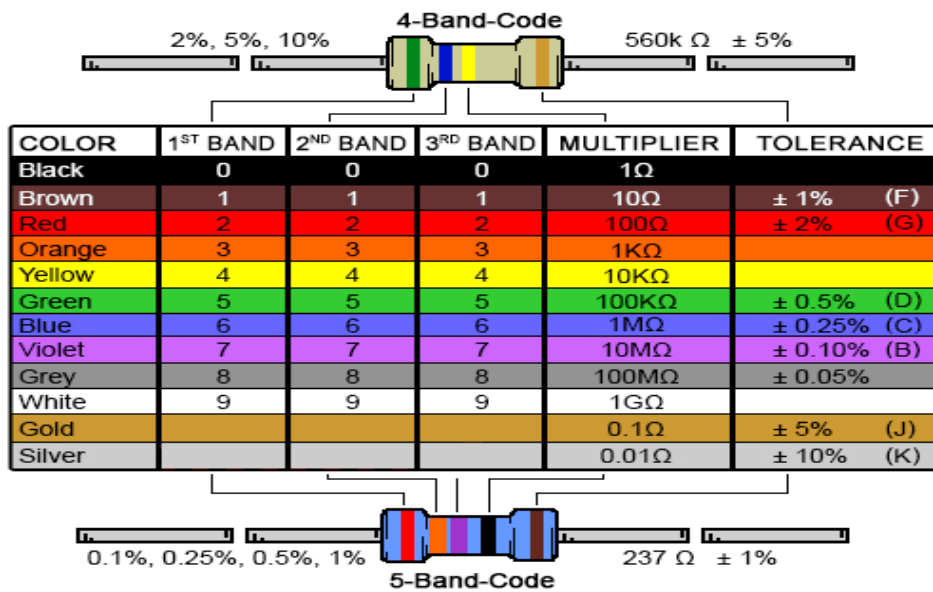


Fig 4.14 :- color coding

There is a cheat code to remember the order in colour coding i.e BBROY of Great Britan had a Very Good Wife ,wears Gold and Silver chain. In this cheat code capital letters indicates the colors.

The colors order starts from black and ends with silver.

There are many three types of resistors based on no of bands, they are 4band,5band, 6 band.

4 band resistor:-

In a 4 band resistor 1st and 2nd colors are normal band values, 3rd band value is multiplier,4th band value is tolerance.

5 band resistor:-

In a 5 band resistor 1st,2nd ,3rd colors represents normal band values 4th represents the multiplier where as 5th represents tolerance.

6 band resistor:-

In a 6 band resistor 1st ,2nd ,3rd significant digits represent normal band values ,4th represents multiplier,5th represents tolerance whereas 6th represents temperature coefficient.

Tolerance:-

Let us consider a resistor of value 1k ohms then its resistance won't exactly be 1k ohms, it may vary i.e. it might be slightly more or slightly less, so this uncertainty value is called tolerance.

APPLICATIONS OF RESISTORS :-

Carbon structure resistors are appropriate to withstand high voltage beats, while having a moderately little size. Therefore the carbon composition resistor is as yet utilized in numerous applications today. Applications incorporate the insurance of circuits (fault or release security), current restricting, high voltage control supplies, high power or strobe lighting, and welding.

ADVANTAGES OF RESISTORS :-

The huge favorable position of carbon composition resistors is their capacity to withstand high voltage beats. At the point when current moves through the resistor, the whole carbon piece body directs the voltage.

exceptionally modest, and simple to supplant. Since they form open circuit, a little low worth resistor can be utilized rather than an increasingly costly wire.

DISADVANTAGES OF RESISTOR :-

squander control, by going it to warm. On the off chance that you pursue the connection beneath and study the circuit graph you will see that current is streaming in both Rb1 and Rb2 in any event, when there is no sign being intensified. That "quiet current" is squandered in light of the fact that it isn't accomplishing anything and power is devoured through the generation of warmth.

CAPACITOR:-

It is a passive component which stores energy in the form of electric field.

The effect of capacitor is known in terms of capacitance.

How a Capacitor Is Made:

The image of the capacitor looks like how a capacitor is made. A capacitor is made out of 2 metal plates and a protecting material called dielectric. The metal plates are firmly set to one another, in parallel, yet the dielectric will sit in the middle of them and ensure the metal plates don't contact one another.

There are four types of capacitors:-

Electrolytic capacitor

Tantalum capacitor

Ceramic capacitor

Plastic film capacitor

Capacitor is denoted by the letter C. units of capacitor is farads.

4.5 Electrolytic capacitor:- it is available up to 47k μ F, its voltage rating is up to 350V. It is used to remove high ripple current so it is mainly used in power supplies. In this type of capacitor they indicate the capacitor value on capacitor itself. The terminal adjacent to black/blue colour is negative terminal and the other is positive terminal.

tantalum capacitor, it is famous for its high values of capacitance despite of its small size, it is available up to a voltage rating of 35V, it is not capable of removing high ripple current. The side in which there will be a line along with a +ve symbol that side is positive terminal, the other is negative terminal. If we connect it reversely the capacitor will damage.

Ceramic capacitors, this type of capacitors are available ranging from pico farad to 0.1 μ F, available up to a voltage rating of 1kV. It is mainly used in radio frequency applications. In this capacitors the values can be identified by the no given on it if it is 104 then it means 10

multiplied by 4 zeros later we can convert it to micro farads. same method is employed in case of plastic film capacitors.

Plastic film capacitor, It is mainly used in ac circuits.

How a Capacitor Works -

Stream of the electric charge is known as electric flow. At the point when electric charges stream into a capacitor, the charges stall out on the plates since they can't go through the dielectric medium. Electrons-the adversely charged particles stall out on one plate and the plate turns out to be contrarily charged. The huge measure of negative charges on one plate will push away charges on the other plate making the other plate decidedly charged.

CAPACITORS IN SERIES AND PARALLEL:-

The total capacitance of a circuit when they are connected in series is equal to the sum of inverse of the each capacitances i.e if we consider two capacitors C_1 and C_2

$$C_{eq} = 1/c_1 + 1/c_2$$

The total capacitance of a circuit when they are connected in parallel in a circuit is equal to the sum of the individual values of each capacitances, i.e $C_{eq} = c_1 + c_2$

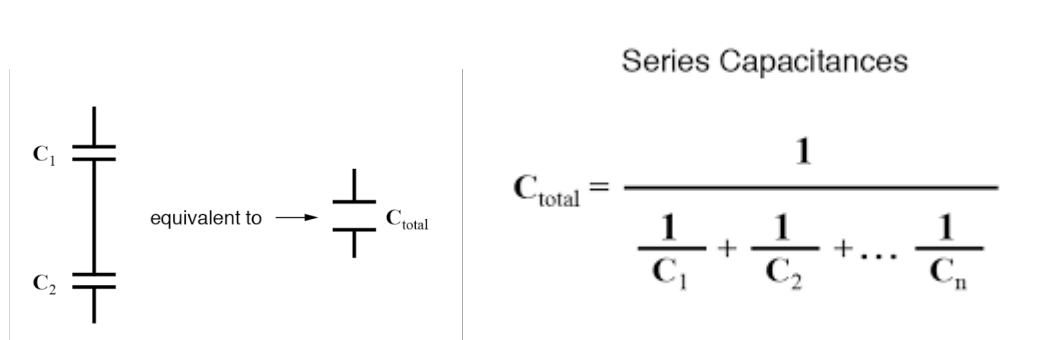


Fig 4.15 :- capacitors connected in series

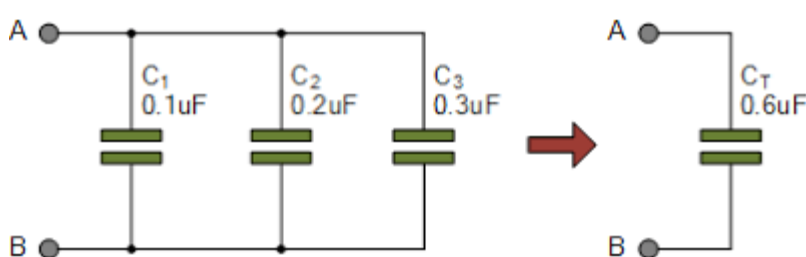


Fig 4.16:- capacitors are connected in parallel.

WORKING OF A CAPACITOR:-

Whenever we supply certain voltage positive charge is stored at one plate and negative charge is stored at another plate, these charges can't move from one side to another side due to the presence of insulator in between two plates. The amount of charge stored by the capacitor is dependent on its capacity, so capacitor 1st charges and later discharges.



Fig 4.16 :- different types of capacitors

In fixed capacitor there is no preference for signs we can connect it in either way. In polarized or electrolytic capacitor the signs play a key role if we replace the positive sign by negative sign it may lead to the damage of the circuit. Variable capacitor is a type of capacitor in which capacitance can be varied by rotating it we can vary the resistance values. If only two terminals out of three are used it will work as a rheostat.

It is a passive component, it is named as potentiometer because it is used to measure electric potential.

ADVANTAGES OF CAPACITOR:-

Capacitor in DC circuits is utilized to keep control signal voltage/current consistent and swell free as voltage over the capacitor can not change abruptly and when there is change in voltage, capacitor restricts this change and attempt to keep voltage unaltered.

DISADVANTAGES:_

Low vitality limit contrasted with batteries

Restricted vitality stockpiling per dollar cost

put away vitality will in the long run drain because of interior misfortunes

4.6POTENTIOMETER (variable resistor):-

It consists of three terminals with a rotating contact

TYPES OF POTENTIOMETER:-

ROTARY POTENTIOMETER

LINEAR POTENTIOMETER

The construction of both pots are different but the working principle is same. These are different types of pots that are employed in dc type.

Rotary type contains terminals on either side with a semi circular pattern placed uniformly.it also have a terminal in between which is connected to a sliding contact which indeed is connected to semi circular pattern. it is also used in battery charges where we can change the charging voltage of the battery.

Linear this type is almost same in functional part and working the only place where it differs from rotary is when it comes to construction as its name suggests it will be linear in shape. In this the two terminals that should be attached to straight resistor are connected to voltage source. In this the resistance can be varied by using sliding contact which can be slide on the resistor. The third terminal is connected to one end of the output terminal, resistor terminal is connected to other end of the output circuit.



Fig 4.17 :- potentiometer

ADVANTAGES OF POT:-

Potentiometer is an invalid technique device. At invalid point it doesn't draw any current from the cell and along these lines there is no potential drop because of the inner obstruction of the cell.

It gauges the potential distinction in an open circuit which is equivalent to the real emf of the cell.

While a voltmeter draws a little present from the cell for its operation. So it gauges the terminal p.d. in a shut circuit which is not exactly the emf of a cell.

DISADVANTAGES OF POT:-

The significant inconvenience is that it requires a huge power to move their sliding contacts for example wiper. There is mileage because of development of the wiper. It lessens the life of this transducer.

Additionally, there is restricted transmission capacity.

There is inertial stacking

4.7 Testing probes:-

Here we are using iron nails as test probes this test probes really measure the dielectric permittivity of the dirt. This property of soils is essentially how much electrical charge a dirt can hold or store. A dirt that has a higher water substance can conceivably store increasingly electrical charge. This, probes are inserted into the soil in order to find the moisture present in the soil.



Fig 4.18 :- test probes (iron nails)

4.8 OTHER COMPONENTS:-

The other components used in the circuit are connecting wires which are used to give the connections from VCC and ground and these are used to connect the passive components when they are not connected internally. 9v battery in the circuit is used to give the supply to the circuit. bread is used to make the connections .

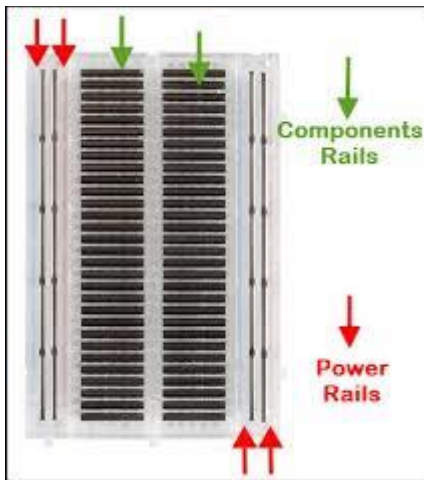


Fig 4.20 :- internal connections of bread board

This bread board is user friendly the connections are simple to do on it and can easily be analysed. In this bread board the left and right part of this are given for VCC and ground(which are indicated by red arrows in the fig).this should be shorted in between in order to use completely and the middle rows are components rails which are used for placing the components, the four points in this are internally connected.

4.9 Working of the circuit :

Assemble the circuit on a Bread board, the test probes can be constructed using a pair of nails, which should be fixed into the ground. One of the probe is connected to the 75 ohm resistor terminal and another probe is connected to the ground.

When the circuit is on, LED at (pin 11) will glow, indicating no moisture detected/dry;

When both the probes are shorted, LED at (pin 18) will glow, indicating the moisture content is high.

The LED's after pin 11, will glow sequentially as per the moisture detected in the soil.

Using of different color LED's to show different levels of output; Using white led to show the high moisture level (LED 1), and using red led to show low

water level (LED 7). The variable resistor is used to calibrate the resistance, it is connected between the two probes.

Applications of soil moisture tester circuit:

Agriculture:- Estimating soil dampness is significant for horticultural applications to assist ranchers with dealing with their water system frameworks all the more productively.

Knowing the careful soil dampness conditions on their fields, in addition to the fact that farmers are ready to commonly utilize less water to grow a harvest, they are likewise ready to increment yields and the nature of the harvest by improved administration of soil dampness during basic plant development stages.

Research

Soil dampness sensors are utilized in various research applications, e.g. in agricultural science and horticulture including irrigation planning, can be used as auxiliary sensors for soil respiration measurements.

Simple sensors for gardeners

Generally modest and straightforward gadgets that don't require a power source are accessible for checking whether plants have adequate dampness to flourish. Subsequent to embeddings a test into the dirt, the circuit demonstrates if the dirt is excessively dry or wet for plants.

Advantages of soil moisture tester:

- 1.Simple method of measurement.
- 2.It delivers the results immediately
- 3.Offers accurate results.
- 4.Cost effective.

Disadvantages of soil moisture tester:

1. It requires initial evaluation of site specific conditions before selection of appropriate moisture sensor.
2. The measured values depend on properties of various materials. The right understanding and utilization of dampness information is required.

CHAPTER 05**RESULT AND Discussion:**

The project is working perfectly on bread board. Initially when we the probes are kept in dry soil the led displayed red which indicates that the soil is dry, when tried keeping it in wet soil due to the electrical resistivity change , the led started showing green which indicates that the soil is wet. When we kept the probes inserted in the wet soil for some time and when we saw the Led's they started changing from green to yellow by which we got to know that the wetness of the soil is reduced .

RESULT:

The project of testing the soil moisture using soil moisture tester using IC LM3915 has been successful and favorable results are obtained.

Output pictures:

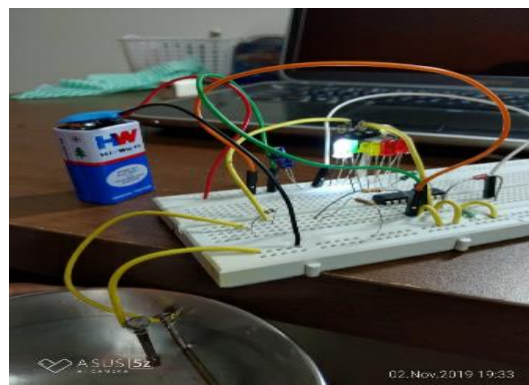
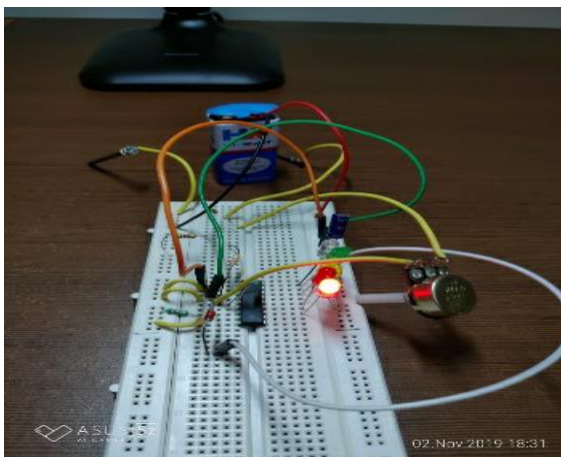


Fig 5.1:-When no moisture is detected**Fig 5.2 :-When moisture is detected**

CHAPTER 06

CONCLUSION AND FUTURE SCOPE

The project to test the moisture in the soil, using soil moisture tester circuit with IC LM3915

Is successful and favorable results are obtained.

The LED's in the circuit show the moisture present in the soil by glowing sequentially as the moisture is detected in the soil.

This is a home based and small scale usage device, which can be used in gardens , while researching on new plants, to keep track on moisture content of the plants.

FUTURE SCOPE:

For the future scope, we can cascade another IC to the present circuit, which will increase the number of LED's which can show much more precise reading and to monitor more amount of soil, like in gardens, long patches of plants , etc.

Can take larger probes to measure deep into the soil.

Can take larger POT to improve the sensitivity of the probes which will put into the soil.

REFERENCES

- [1] LM3915 data sheet, from www.electroSchematics.com
- [2] circuit diagram of the soil moisture tester from, www.theorycircuit.com,
www.electronicsforu.com