A

PROJECT REPORT ON

AUTOMATIC PLANT IRRIGATION SYSTEM

Submitted To

RAJIV GANDHI PROUDYOGIKI VISHAVIDYALAYA BHOPAL (MADHYA PRADESH)

In Partial Fulfillment of the Degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS & INSTRUMENTATION ENGINEERING

Submitted By-

Rahul Kumar (Roll No. 0905EI111060)
Rajat Sahu (Roll No. 0905EI111062)
Rohit Keswani (Roll No. 0905EI111070)

Under the Guidance of

Mr. N.S. Rana

Asst. Professor

DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING

INSTITUTE OF TECHNOLOGY AND MANAGEMENT, GWALIOR (M.P.)

(2011-2015)

CONTENT

Abstract

The motivation for this project came from the countries where economy is based on agriculture and the climatic conditions lead to lack of rains & scarcity of water. The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of the land. Even if the farm land has a water-pump, manual intervention by farmers is required to turn the pump on/off whenever needed. The aim of our project is to minimize this manual intervention by the farmer. Automated Irrigation system will serve the following purposes:

1. As there is no un-planned usage of water, a lot of water is saved from being wasted.
2. The irrigation is the only when there is not enough moisture in the soil and the sensors decides when the pump should be turned on/off, saves a lot time for the farmers. This also gives much needed rest to the farmers, as they don't have to go and turn the pump on/off manually.

Irrigation is the key to a successful garden. Long gone are the days of manual watering or relying on a friend to water when you are on vacation or away on business. The Project presented here waters your plants regularly when you are out for vocation. The circuit comprises sensor parts built using op-amp IC LM324. Op-amp is configured here as a comparator. Two stiff copper wires are inserted in the soil to sense the whether the Soil is wet or dry. The comparator monitors the sensors and when sensors sense the dry condition then the project will switch on the motor and it will switch off the motor when the sensors are in wet. The comparator does the above job it receives the signals from the sensors. A transistor is used to drive the relay during the soil wet condition. 5V double pole – double through relay is used to control the water pump. LED indication is provided for visual identification of the relay / load status. A switching diode is connected across the relay to neutralize the reverse EMF. This project works with 5V regulated power supply. Power on LED (Light Emitting Diode) is connected for visual identification of power status.

Motivation

The increasing demand of the food supplies requires a rapid improvement in food production technology. In many countries where agriculture plays an important part in shaping up the economy and the climatic conditions are isotropic, but still we are not able to make full use of agricultural resources. One of the main reasons is the lack of rains & scarcity of land reservoir water. Extraction of water at regular intervals from earth is reducing the water level as a result of which the zones of un-irrigated land are gradually increasing. Also, the unplanned use of water inadvertently results in wastage of water. In an Automated Irrigation System, the most significant advantage is that water is supplied only when the moisture in soil goes below a pre-set threshold value. This saves us a lot of water. In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump on/off when required. This process sometimes consumes more water and sometimes the water supply to the land is delayed due to which the crops dry out. Water deficiency deteriorates plants growth before visible wilting occurs. In addition to this slowed growth rate, lighter weight fruit follows water deficiency. This problem can be perfectly rectified if we use Automated Irrigation System in which the irrigation will take place only when there will be intense requirement of water, as suggested by the moisture in the soil.

Introduction

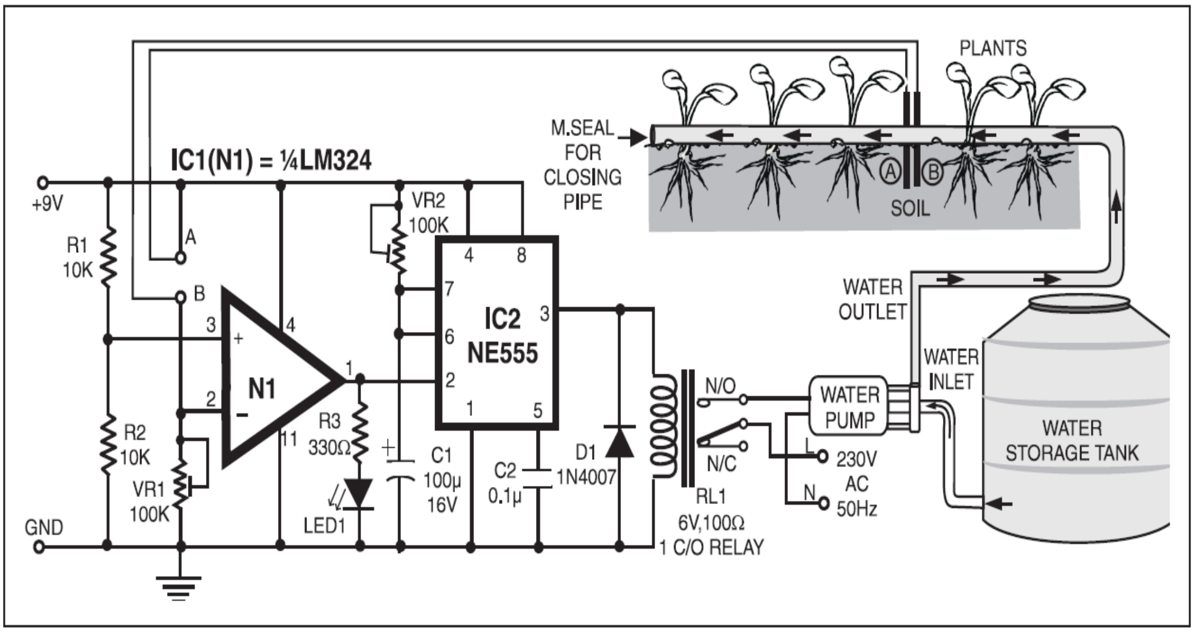
Irrigation is the key to a successful garden. Long gone are the days of manual watering or relying on a friend to water when you are on vocation or away on business. The project presented here waters your plants regularly when you are out for vocation .The circuit comprises sensor parts built using op-amp LM324. Op-amp is configured here as a comparator. Two stiff copper wires are inserted in the soil to sense the weather the soil is wet or dry .The comparator monitors the sensor and when sensor sense the dry condition then the project will switch on the motor and it will switch off the motor when sensor is wet. The comparator does the above job it receives the signals from the sensors.

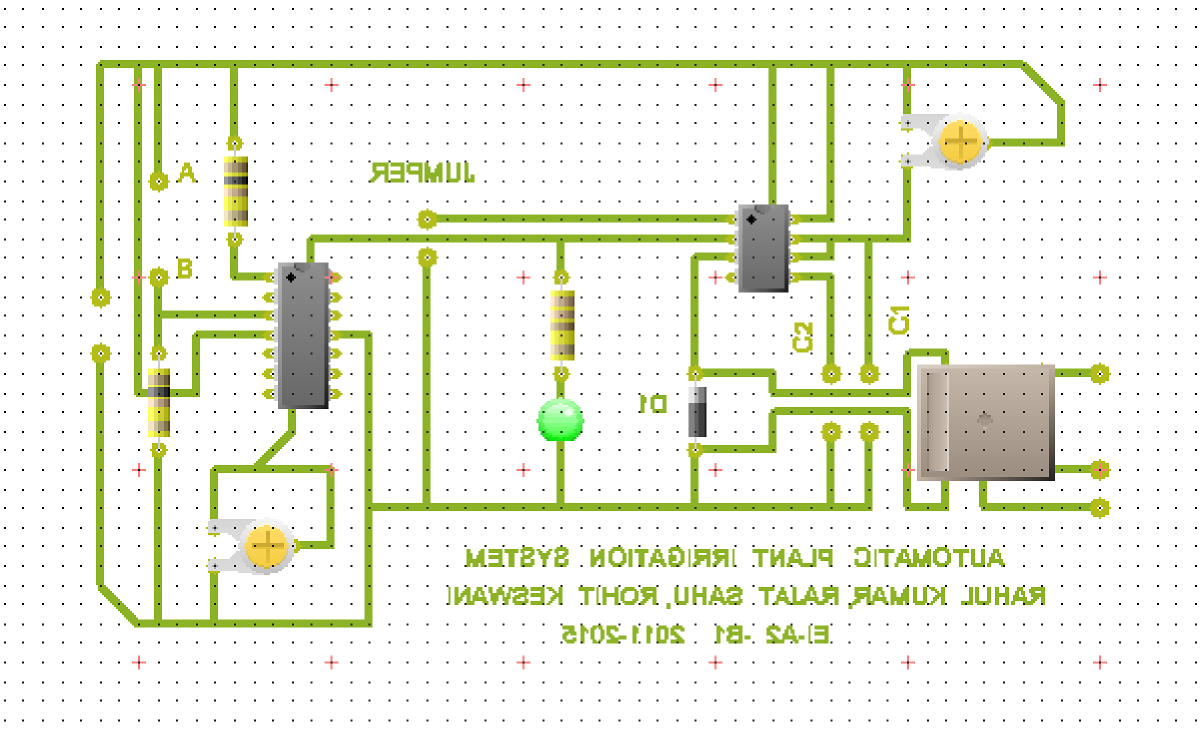
To arrange the circuit, insert copper wires in the soil to a depth of about 2cms, keeping them 3cms apart. For small areas a small pump such as the one used in air coolers is able to pump enough water within 5 to 6 seconds. The timing components for the timer are selected accordingly. The timing can be varied with the help of preset voltage.

The circuit is more effective indoors if one intends to use it for long periods. This

is because the water from reservoir (bucket, etc.) evaporates rapidly if it is kept in the open. For regulating the flow of water, either a tap can be used or one end of a rubber pipe can be blocked using M-seal compound, with holes punctured along its length to water several plants.

3. Circuit diagram





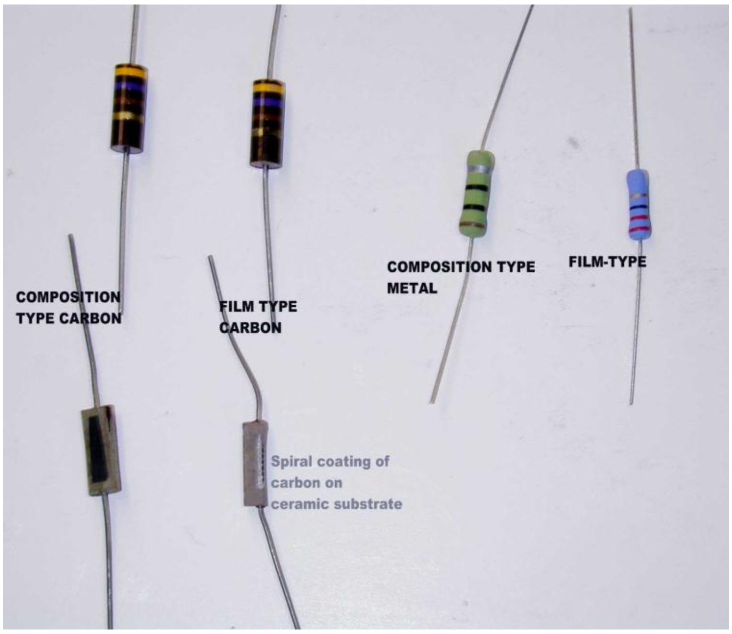
2. List of Components

Serial No.	Components	Value
1.	1R (Resister)	k Ω10
2.	R2(Resister)	k Ω10
3.	R3 (Resister)	Ω230
4.	C1(Capacitor)	100µF
5.	C2(Capacitor)	0.1 µF
6.	D (Diode)	IN4007
7.	VR1 (Potentiometer)	100K
7.	LED(Light Emitting Diode)	Red or Green
8.	RL1(Relay)	v5
9.	IC1(LM 324 Quad Op-amp)	LM324
10.	IC2(NE 555 IC Timer)	NE555
11.	Power Supply	9v

4. Specification of components

Resister

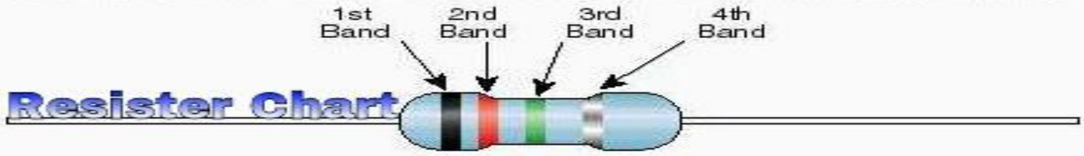
Resistors offers a resistance to the flow of current And act as voltage droppers or voltage dividers. They are "Passive Devices", that is they contain no source of power or amplification but only attenuates or reduce the voltage signal passing through them.



We mostly use resistance in this range even though more power rating high value resistors are available **(power up to 600 watt and resistor value up to 1 giga ohm).** So when you select a resistor its value and power rating should be the deciding parameter. Therefore for high current operations we use resistance of higher current ratings. The size of the resistor determines its power rating (i.e. as size/thickness increases power/current carrying capacity of

Resistance is the opposition that a substance offers to the flow of electric current. It is represented by the uppercase letter R. The standard unit of resistance is the ohm, sometimes written out as a word, and sometimes symbolized by the uppercase Greek letter omega. When an electric current of one ampere passes through a component across which a potential difference (voltage) of one volt exists, then the resistance of that component is one ohm.

Standard EIA Color Code Table 4 Band: ±2%, ±5%, and ±10%



Color	1st Band (1st figure)	2nd Band (2nd figure)	3rd Band (multiplier)	4th Band (tolerance)
Black	0	0	10^0	
Brown	1	1	10^1	
Red	2	2	10^2	±2%
Orange	3	3	10^3	
Yellow	4	4	10^4	
Green	5	5	10^5	
Blue	6	6	10^6	
Violet	7	7	10^7	
Gray	8	8	10^8	
White	9	9	10^9	
Gold			10^{-1}	±5%
Silver			10^{-2}	±10%

In general, when the applied voltage is held constant, the current in a direct-current (DC) electrical circuit is inversely proportional to the resistance. If the resistance is doubled, the current is cut in half; if the resistance is halved, the current is doubled. This rule also holds true for most low-frequency alternating-current (AC) systems, such as household utility circuits. In some AC circuits, especially at high frequencies, the situation is more complex, because some components in these systems can store and release energy, as well as dissipating or converting it. The electrical resistance per unit length, area, or volume of a substance is known as resistivity. Resistivity figures are often specified for copper and aluminium wire, in ohms per kilometre.

Capacitor

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electrostatically in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e., insulator). The conductors can be thin films of metal, aluminium foil or disks, etc. The 'no conducting' dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, paper, mica, etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, a capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

Theory and operation

A capacitor consists of two conductors separated by a non-conductive region.[10] The non-conductive region is called the dielectric. In simpler terms, the dielectric is just an electrical insulator. Examples of dielectric media are glass, air, paper, vacuum, and even a semiconductor depletion region chemically identical to the conductors. A capacitor is assumed to be self-contained and isolated, with no net electric charge and no influence from any external electric field. The conductors thus hold equal and opposite charges on their facing surfaces,[11] and the dielectric develops an electric field. In SI units, a capacitance of one farad means that one coulomb of charge on each conductor causes a voltage of one volt across the device.[12]

An ideal capacitor is wholly characterized by a constant capacitance C, defined as the ratio of charge $\pm Q$ on each conductor to the voltage V between them:[10]

$$C = \frac{Q}{V}$$

Because the conductors (or plates) are close together, the opposite charges on the conductors attract one another due to their electric fields, allowing the capacitor to store more charge for a given voltage than if the conductors were separated, giving the capacitor a large capacitance.

Sometimes charge build-up affects the capacitor mechanically, causing its capacitance to vary. In this case, capacitance is defined in terms of incremental changes:

$$C = \frac{\mathrm{d}Q}{\mathrm{d}V}$$

Types of Capacitor

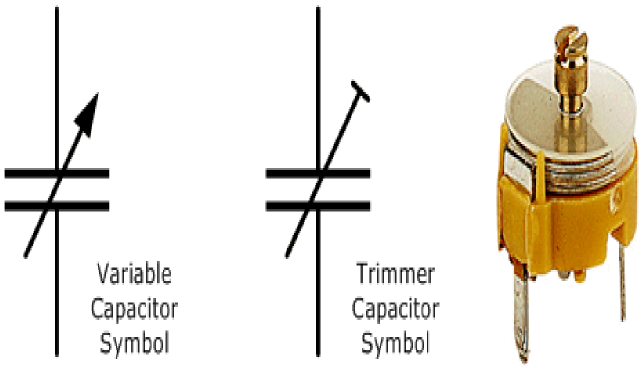
There are a very, very large variety of different **types of capacitor** available in the market place and each one has its own set of characteristics and applications, from very small delicate trimming capacitors up to large power metal-can type capacitors used in high voltage power correction and smoothing circuits.

The comparisons between the the different *types of capacitor* is generally made with regards to the dielectric used between the plates. Like resistors, there are also variable types of capacitors which allow us to vary their capacitance value for use in radio or "frequency tuning" type circuits.

Commercial types of Capacitor are made from metallic foil interlaced with thin sheets of either paraffin-impregnated paper or Mylar as the dielectric material. Some capacitors look like tubes, this is because the metal foil plates are rolled up into a cylinder to form a small package with the insulating dielectric material sandwiched in between them.

Small capacitors are often constructed from ceramic materials and then dipped into an epoxy resin to seal them. Either way, capacitors play an important part in electronic circuits so here are a few of the more "common" types of capacitor available.

<u>Dielectric Capacitor</u>



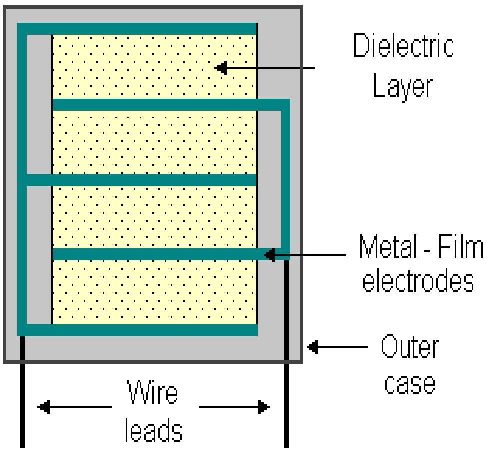
Dielectric Capacitors are usually of the variable type were a continuous variation of capacitance is required for tuning transmitters, receivers and transistor radios. Variable dielectric capacitors are multi-plate air-spaced types that have a set of fixed plates (the stator vanes) and a set of movable plates (the rotor vanes) which move in between the fixed plates.

The position of the moving plates with respect to the fixed plates determines the overall capacitance value. The capacitance is generally at maximum when the two sets of plates are fully meshed together. High voltage type tuning capacitors have relatively large spacings or air-gaps between the plates with breakdown voltages reaching many thousands of volts.

As well as the continuously variable types, preset type variable capacitors are also available called Trimmers. These are generally small devices that can be adjusted or “pre-set” to a particular capacitance value with the aid of a small screwdriver and are available in very small capacitance’s of 500pF or less and are non-polarized.

Film Capacitor

Film Capacitors are the most commonly available of all types of capacitors, consisting of a relatively large family of capacitors with the difference being in their dielectric properties. These include polyester (Mylar), polystyrene, polypropylene, polycarbonate, metalized paper, Teflon etc. Film type capacitors are available in capacitance ranges from as small as 5pF to as large as 100uF depending upon the actual type of capacitor and its voltage rating



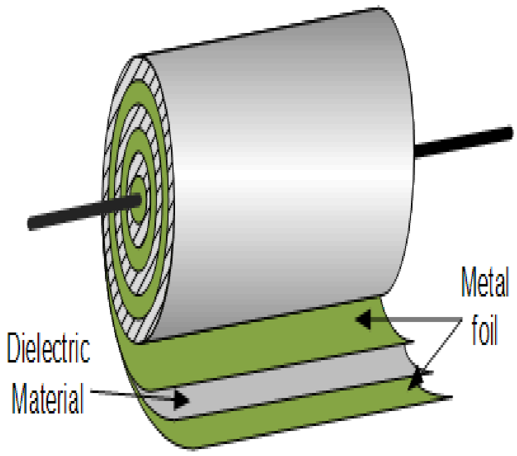


Fig Axial Lead Type

The film and foil types of capacitors are made from long thin strips of thin metal foil with the dielectric material sandwiched together which are wound into a tight roll and then sealed in paper or metal tubes.

This film type require a much thicker dielectric film to reduce the risk of tears or punctures in the film, and is therefore more suited to lower capacitance values and larger case sizes.

Metalized foil capacitors have the conductive film metalized sprayed directly onto each side of the dielectric which gives the capacitor self-healing properties and can therefore use much thinner dielectric films. This allows for higher capacitance values and smaller case sizes for a given capacitance. Film and foil capacitors are generally used for higher power and more precise applications.

Ceramic Capacitors

Ceramic Capacitors or **Disc Capacitors** as they are generally called, are made by coating two sides of a small porcelain or ceramic disc with silver and are then stacked together to make a capacitor. For very low capacitance values a single ceramic disc of about 3-6mm is used. Ceramic capacitors have a high dielectric constant (High-K) and are available so that relatively high capacitance's can be obtained in a small physical size.

Fig Ceramic Capacitor

They exhibit large non-linear changes in capacitance against temperature and as a result are used as de-coupling or by-pass capacitors as they are also non-polarized devices. Ceramic capacitors have values ranging from a few Pico farads to one or two microfarads, (μF) but their voltage ratings are generally quite low.

Ceramic types of capacitors generally have a 3-digit code printed onto their body to identify their capacitance value in Pico-farads. Generally the first two digits indicate the capacitors value and the third digit indicates the number of zero's to be added. For example, a ceramic disc capacitor with the markings 103 would indicate 10 and 3 zero's in Pico-farads which is equivalent to 10,000 pF or 10nF.

Likewise, the digits 104 would indicate 10 and 4 zero's in pico-farads which is equivalent to 100,000 pFor 100nF and so on. So on the image of the ceramic capacitor above the numbers 154 indicate 15 and 4 zero's in pico-farads which is equivalent to 150,000 pF or 150nF or 0.15uF. Letter codes are sometimes used to indicate their tolerance value such as: J = 5%, K = 10% or M = 20% etc.

Electrolytic Capacitors

Electrolytic Capacitors are generally used when very large capacitance values are required. Here instead of using a very thin metallic film layer for one of the electrodes, a semi-liquid electrolyte solution in the form of a jelly or paste is used which serves as the second electrode (usually the cathode).

The dielectric is a very thin layer of oxide which is grown electro-chemically in production with the thickness of the film being less than ten microns. This insulating layer is so thin that it is possible to make capacitors with a large value of capacitance for a small physical size as the distance between the plates, d is very small.

The majority of electrolytic types of capacitors are Polarised, that is the DC voltage applied to the capacitor terminals must be of the correct polarity, i.e. positive to the positive terminal and negative to the negative terminal as an incorrect polarisation will break down the insulating oxide layer and permanent damage may result.

All polarised electrolytic capacitors have their polarity clearly marked with a negative sign to indicate the negative terminal and this polarity must be followed.

Electrolytic Capacitors are generally used in DC power supply circuits due to their large capacitance's and small size to help reduce the ripple voltage or for coupling and decoupling applications. One main disadvantage of electrolytic capacitors is their relatively low voltage rating and due to the polarisation of electrolytic capacitors, it follows then that they must not be used on AC supplies. Electrolyte's generally come in two basic forms; **Aluminium Electrolytic Capacitors** and **Tantalum Electrolytic Capacitors**.

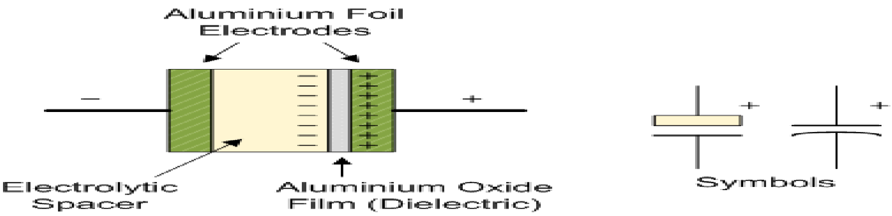


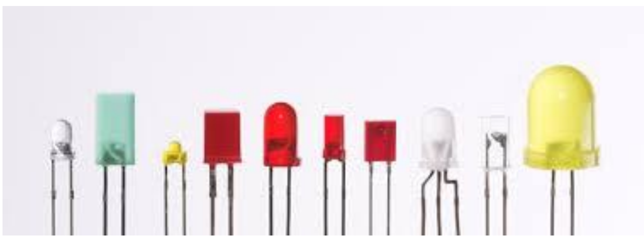
Fig Capacitor.

Diodes

Current flows from anode to cathode when the diode is forward biased. In a normal forward biased diode, energy is dissipated as heat in the junction, but in LED's energy dissipated as visible light. In robotics we use normal diodes as freewheeling diodes or to make power supply. LED's are of two types - IR led and normal LED. IR LED emits Infra-Red radiations while normal LED emits visible light. So first talk about a normal diode. Mostly we us 1N4001 or 1N4007 as freewheeling diodes for motors or relays, sometimes in H-bridge also.

Light Emitting Diode

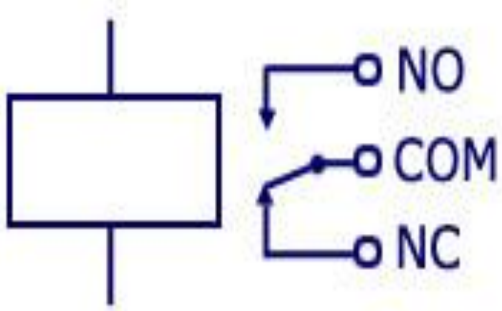
Now let's see LED's. The main specification of LED are its current rating=20mA, typical cut in voltage=2V, life time=2lakh hours, approx. voltage is around 4.5V. There is different color LED's depending on the semi conducting



material.
LED has two leads- cathode and anode. They are identified by the length of the lead. Cathode lead is of lesser length. But I have seen some LED's with manufacturing defect having cathode lead longer. So in order to identify the cathode of the LED see the figure below. In that you can see that cathode is of broader filament. I got some white LED's of cathode of small filament. So this convention can be right or wrong. Check LED in both ways to see that LED is good.
Don't connect LED to Vcc. Suppose if you connect the output of 7805 directly to an LED then the voltage output of 7805 reduces to 3.85V from 5.02 voltage output of 7805(I checked it with a white LED producing green light). So when you connect LED to the output of any IC connect a series resistor with it. The brightness of LED is controlled by the series resistance. If you want a good brightness use R=100,150ohm. If you want a medium. Light series resistance 330ohm. The maximum value of 470ohm can be inserted for a small light.
What is the difference when u connects resistor at anode side and resistor at cathode side. There is a difference in case of 7-segment displays.
See in the above diagram, you can see that resistance is connected at common cathode only. There is a difference between two. 7Segment display consist of 7 led's. Connecting a resistor in series with every LED and connecting a resistor in series with all LED's.
have a difference. In first case every LED has a series resistor, in this case the brightness of all LED's will be same, but in second case a series resistor with all LED's cause a different brightness with all, since all LED's are not identical. But in case of small 7segment LED's it won't create much problem, will have same brightness. But in case of big 7segments in railways etc.. will have problem, causing some slightly different brightness. But in student case, second is good instead of 7 resistors. Suppose if you apply Ohm's law in the diode connected series resistor, then you can see voltage across LED is very low because the forward resistance of the diode is very low. But in case of diode we can't apply Ohm's law because diode is a non-linear device.

Relay

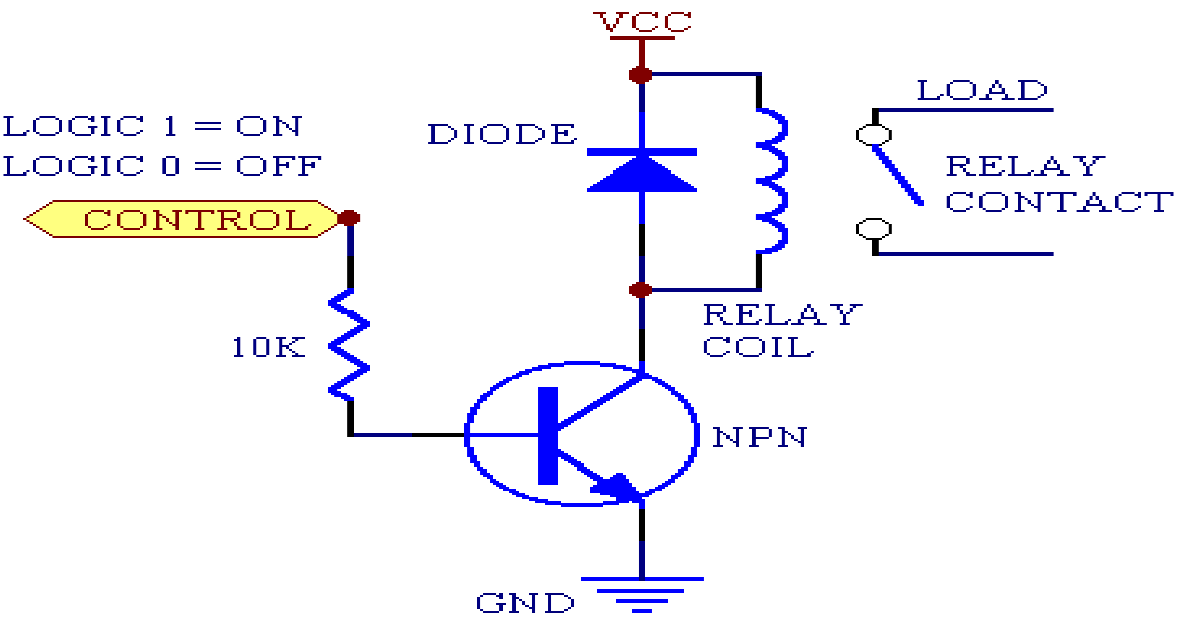
"A relay is an electrically controllable switch widely used in industrial controls, automobiles and appliances." The relay allows the isolation of two separate sections of a system with two different voltage sources i.e., a small amount of voltage/current on one side can handle a large amount of voltage/current on the other side but



there is no chance that these two voltages mix up.

Fig: Circuit symbol of a relay Operation- when current flows through the coil, a magnetic field are created around the coil i.e., the coil is energized. This causes the armature to be attracted to the coil. The armature's contact acts like a switch and closes or opens the circuit. When the coil is not energized, a spring pulls the armature to its normal state of open or closed. There are all types of relays for all kinds of applications.

Transistors and ICs must be protected from the brief high voltage 'spike' produced when the relay coil is switched off. The above diagram shows how a signal diode (eg 1N4148) is connected across the relay coil to provide this protection. The diode is connected 'backwards' so that it will normally not conduct. Conduction occurs only when the relay coil is switched off, at this moment the current tries to flow continuously through the coil and it is safely diverted through the diode. Without the diode no current could flow and the coil would produce a damaging

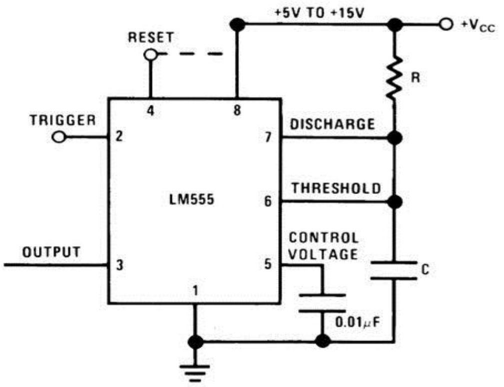


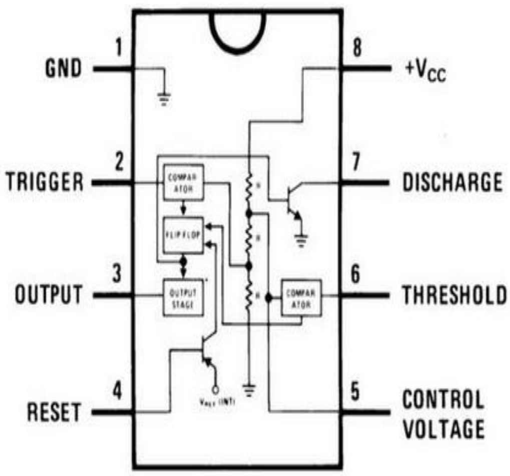
high voltage 'spike' in its attempt to keep the current flowing. In choosing a relay, the following characteristics need to be considered:

The contacts can be normally open (NO) or normally closed (NC). In the NC type, the contacts are closed when the coil is not energized. In the NO type, the contacts are closed when the coil is energized. Fig: Relay Operation and use of protection diodes 2. There can be one or more contacts. i.e., a different type like SPST (single pole single throw), SPDT (single pole double throw) and DPDT (double pole double throw) relays. 3. The voltage and current required to energize the coil. The voltage can vary from a few volts to 50 volts, while the current can be from a few milliamps to 20milliamps. The relay has a minimum voltage, below which the coil will not be energized. This minimum voltage is called the "pull-in" voltage. 4. The minimum DC/AC voltage and current that can be handled by the contacts. This is in the range of a few volts to hundreds of volts, while the current can be from a few amps to 40A or more, depending on the relay.

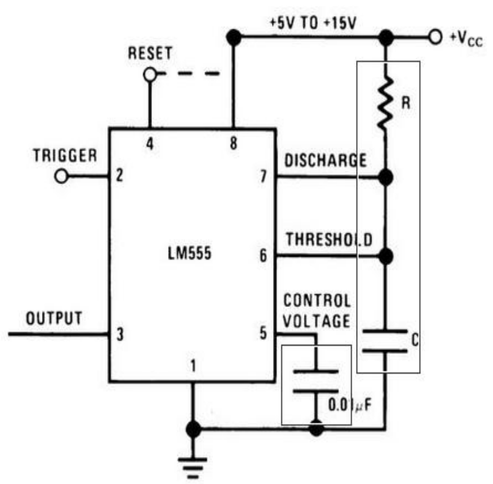
NE 555IC Timer

In monostable mode the 555 timer outputs a high pulse, which begins when the trigger pin is set low (less than 1/3Vcc, as explained in the previous step, this is enough to switch the output of the comparator connected to the trigger pin). The duration of this pulse is dependent on the values of the resistor R and capacitor C in the image above.





When the trigger pin is high, it causes the discharge pin (pin 7) to drain all charge off the capacitor (C in the image above). This makes the voltage across the capacitor (and the voltage of pin 6) = 0. When the trigger pin gets flipped low, the discharge pin is no longer able to drain current; this causes charge to build up on the capacitor according to the equation below. Once the voltage across the capacitor (the voltage of pin 6) equals 2/3 of the supply voltage (again, as explained in the previous step, this is enough to switch the output of the comparator connected to pin 6), the output of the 555 is driven back low. The output remains low until the trigger pin is pulsed low again, restarting the process I've just described.



(Voltage across Capacitor)

$Vcc * (1- e^{-t / (R*C)}$

This equation describes the time it takes to charge a capacitor of capacitance C when it is in series with a resistor of resistance R as explained above, we are interested in the time it takes for the voltage across the capacitor to equal 2/3Vcc,

$2/3*Vcc = Vcc * (1- e^{\wedge -t / (R*C)})$

which can be rearranged to:

$2/3 = 1- e^{-t / (R*C)}$

$e^{-t / (R*C)} = 1/3$

$-t / (R*C) = \ln(1/3)$

$t = 1.1*R*C$ seconds

9v Power Supply

The most common form of **nine-volt battery** is commonly called the **transistor battery**, introduced for the early transistor radios. This is a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in pocket radios, smoke detectors, carbon monoxide detectors, guitar effect units, electro-acoustic guitars and radio-controlled vehicle controllers. They are also used as backup power to keep the time in certain electronic clocks. This format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion. Mercury oxide batteries in this form have not been manufactured in many years due to their mercury content.

Most nine-volt alkaline batteries are constructed of six individual 1.5V LR61 cells enclosed in a wrapper. These cells are slightly smaller than LR8D425 AAAA cells and can be used in their place for some devices, even though they are 3.5 mm shorter. Carbon-zinc types are made with six flat cells in a stack, enclosed in a moisture-resistant wrapper to prevent drying.

As of 2007, 9-volt batteries accounted for 4% of alkaline primary battery sales in the US. In Switzerland as of 2008, 9-volt batteries totalled 2% of primary battery sales and 2% of secondary battery sales.

The Tenergy *Centura* 9V battery is, of course, the same size and shape as any other 9V battery. Its rated capacity is 200mAh, which is about half the capacity of a disposable 9V **alkaline battery**, and slightly below average among rechargeable 9V NiMH batteries.

Like any NiMH (or NiCd) 9V battery, the Tenergy *Centura* doesn't actually produce 9 Volts. This is because NiMH and NiCd batteries must be made up from individual NiMH or NiCd *cells*, each of which produces 1.2 Volts. Thus, the voltage of the entire *battery* must be a multiple of 1.2V.

A disposable alkaline 9V battery is made up of six 1.5V alkaline cells, giving a total of 9V. Many "9V" rechargeable batteries are similarly made of from six 1.2V NiMH cells, giving a total of only 7.2V. Some devices designed to operate from 9V batteries will not work with such a **Low Voltage.**

Potentiomete

A potentiometer informally a pot is a three-terminal resistor with a sliding contact that forms an adjustable voltage divider.[1] If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. A potentiometer measuring instrument is essentially a voltage divider used for measuring electric (voltage); the component is an implementation of the same principle, hence its name. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

As shown in the diagram a variable resistor consists of a track which provides the resistance path. Two terminals of the device are connected to both the ends of the track. The third terminal is connected to a wiper that decides the motion of the track. The motion of the wiper through the track helps in increasing and decreasing the resistance.

The track is usually made of a mixture of ceramic and metal or can be made of carbon as well. As a resistive material is needed, carbon film type variable resistors are mostly used. They find applications in radio receiver circuits, audio amplifier circuits and TV receivers. For applications of small resistances, the resistance track may just be a coil of wire. The track can be in both the rotary as well as straight versions. In a rotary track some of them may include a switch. The switch will have an operating shaft which can be easily moved in the axial direction with one of its ends moving from the body of variable resistor switch.

The rotary track resistor with has two applications. One is to change the resistance. The switch mechanism is used for the electric contact and non-contact by on/off operation of the switch. There are switch mechanism variable resistors with annular cross-section which are used for the control of equipments, Even more components are added onto this type of a variable resistor so as to make them compatible for complicated electronic circuits. A high-voltage variable resistor such as a focus pack is an example. This device is capable of producing a variable focus voltage as well as a screen voltage. It is also connected to a variable resistance circuit and also a fixed resistance circuit [bleeder resistor] to bring a change in the applied voltage. For this both the fixed and variable resistor are connected in series.

A track made in a straight path is called a slider. As the position of a slider cannot be seen or confirmed according to the adjustment of resistance, a stopping mechanism is usually included to prevent the hazards caused due to over rotation.

Circuit operation

When the soil dries out, theresistance between the copper wires (sensor probes A and B) increases. If the resistance increases beyond a preset limit, output pin 1 of op amp N1 goes low. This triggers the timer IC2 (NE555) configured as a monostable multivibrator. As a result relay RL1 is activated for preset time the water pump starts immediately to supply water to the plants. As soon as the soil becomes sufficiently wet, the resistance between sensor probes decreases rapidly. This causes pin 1 of op-amp N1 to go 'high'. LED1 glows to indicate the presence of adequate water in the soil. The threshold point at which the output of op-amp N1 goes 'low' can be changed with the help of preset VR.1

Advantages

- Highly sensitive
- Works according to the soil condition
- Fit and Forget system
- Low cost and reliable circuit
- Complete elimination of manpower
- Can handle heavy loads up to 7A
- System can be switched into manual mode whenever required

Applications

- Roof Gardens
- Lawns
- Agriculture Lands
- Home Gardens

Conclusion

The circuit is more effective indoors if one intends to use it for long periods.
This is because the water from reservoir (bucket, etc.) evaporates rapidly if it is kept in the open. For regulating the flow of water, either a tap can be used or one end of a rubber pipe can be blocked using M-seal compound, with holes punctured along its length to water several plants.

Bibliography

- http://www.electronics-manufacturers.com
- http://www.datasheetcatalog.org
- http://www.wikipedia.com
- www.kpsec.freeuk.com
- Principles of electronics by V.K.Mehta
- www.google.com
- Basic electronics by Boyleste.d