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Faculty of Engineering

Department of Electrical and Electronic Engineering

Water Activated Alarm

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ABSTRACT

As the life is getting more complicated, every one in this world searches for the safety for his environment and that leads to designing some protection instruments such as alarm systems.

One of these alarms systems is water alarm and which considered as an important tool in our life to give us in the protection and safety.

The water alarm system, its simple circuit that is designed to detect water which makes a small electrical current which passes through a conductive medium when it comes in to contact with both probes that leads to operate the alarm system.

This project presents a water detection that activates an alarm and a pump to remove the water that has activated the alarm.

INTRODUCTION

Generally, electronic security alarm systems are recognized in all the world as an important contributor to the securing of life, property and possessions. A security system is an effective tool when used in conjunction with other sensible, it contribute to a safer environment for you and your family. An alarm system is installed to deter and detect intruders or the nature events that effect the environment. A basic security system will consist of both perimeter and space protection to secure your premise. The first stage secures vulnerable perimeter access points such as doors and windows fires, flood; the second stage consists of space detection such as interior motion detectors which monitor movement inside the premise. The level of security you purchase is determined by the number of protective devices and the sophistication of the system you will have installed.

The aims of this project is to design, modify, build and test a working water activity alarm. In addition, real-life application will be simulated where a case of flooding is assumed and the alarm would give a warning and activated a water pump.

Chapter one will represent components which will be used in building the circuits of the alarms, their characteristics, properties and functions will also be discussed. Also safety guidelines, which must be kept in mind when working on electronic projects, will be described.

Chapter two will present general information about alarm systems. Different types of alarm systems will be briefly introduced.

Chapter three will represents the hardware approach in detail the operation of the circuit, starting with the input and how it is processed, through each component until it is ready to leave the circuit as a sound. (Alarm) and the modification that has been done where it will reverse the operation.

CONTENTS

CHAPTER ONE

ELECTRONIC COMPONENTS

1.1 Overview

This chapter presents an introduction to electronic components that are commonly used in hardware projects. Safety guidelines for electronic projects will also be described.

1.2 Components

In this section a detailed explanation will be given for each hardware component used in setting up the electronic circuit.

1.3 Resistors

Resistors are electronic components used extensively on the circuit boards of electronic equipment. Resistors are usually used to limit current.

Resistors are electronic components used extensively on the circuit boards of electronic equipment. They are color coded with stripes to reveal their resistance value (in ohms) as well as their manufacturing tolerance.

Resistors, like diodes and relays, are another of the electrical components that should have a section in the installer's parts bin. They have become a necessity for the mobile electronics installer, whether it is for door locks, timing circuits, remote starts, or just to discharge a stiffening capacitor.

Resistors are components that resist the flow of electrical current. The higher the value ofresistance (measured in ohms) the lower the current will be.

Resistors are color coded to read the color code of a common 4 band IK ohm resistor with a 5% tolerance, start at the opposite side of the GOLD tolerance band and read from left to right. Write down the corresponding number from the color chart low for the 1st color band BROWN. To the right of that number, write the orresponding number for the 2nd band BLACK. Now multiply that number (you should have 10) by the corresponding multiplier number of the 3rd band (RED) (100). Your answer will be 1000 or 1K. As shown in figure 1.1

If a resistor has 5 color bands, write the corresponding number of the 3rd band to the right of the 2nd before you multiply by the corresponding number of the multiplier band. If you only have 4 color bands that include a tolerance band, ignore this column and go straight to the multiplier.

The tolerance band is usually gold or silver, but some may have none. Because resistors are not the exact value as indicated by the color bands, manufactures have included a tolerance color band to indicate the accuracy of the resistor. Gold band indicates the resistor is within 5% of what is indicated. Silver = 10% and None = 20%. Others are shown in the chart below. The 1K ohm resistor in the example above, may have an actual measurement any where from 950 ohms to 1050 ohms. If a resistor does not have a tolerance band, start from the band closest to a lead. This will be the 1st band. If you are unable to read the color bands than you'll have to use your multimeter. Be sure to zero it out first [7].

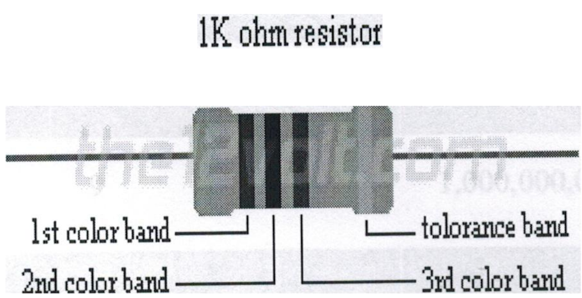


Figure1.1 Resistor.

How to read resister color codes:

Table 1.1 Resistor color code.

Band Color	1st Band #	2nd Band #	*3rd Band #	Multiplier x	Tolerances ± %
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Brown	1	1	1	10	± 1%
Red	2	2	2	100	± 2 %
Orange	3	3	3	1000	
Yellow	4	4	4	10,000	
Green	5	5	5	100,000	± 0.5 %
Blue	6	6	6	1,000,000	± 0.25 %
Violet	7	7	7	10,000,000	± 0.10 %
Grey	8	8	8	100,000,000	± 0.05 %
White	9	9	9	1,000,000,000	
Gold				0.1	± 5 %
Silver				0.01	± 10 %
None					± 20 %

1.3.1 Types of Resistor

- **Carbon film resistor:** cheap general purpose resistor, works quite well also on high frequencies, resistance is somewhat dependent on the voltage over resistor (does not generally have effect in practice).

- **Composite resistor:** usually some medium power resistors are built in this way. Has low inductance, large capacitance, poor temperature stability, noisy and not very good long time stability. Composite resistor can handle well short overload surges.

- **Metal fılın resistor:** good temperature stability, good long time stability, cannot handle overloads well.

- **Metal oxide resistor:** mostly similar features as metal film resistor but better surge handling capacity, higher temperature rating them metal film resistor, low voltage dependently, low noise, better for RF than wire wound resistor but usually worse temperature stability

- **Thick fılm resistor:** similar properties as metal film resistor but can handle surges better, and withstand high temperatures,
- **Thin fılm resistor:** good long time stability, good temperature stability, good voltage dependently rating, low noise, not good for RF, low surge handling capacity.

- **Wire wound resistor:** used mainly for high power resistors, can be made curate for measuring circuits, high inductance because consists of wound wire.

1.3.2 Variable Resistors

Variable resistors consist of a resistance track with connections at both ends and a wiper which moves along the track as you turn the spindle. The track may be made from carbon, cermets (ceramic and metal mixture) or a coil of wire (for low resistances). The track is usually rotary but straight track versions, usually called sliders, are also available. Variable resistors may be used as a rheostat with two connections (the wiper and just one end of the track) or as a potentiometer with all three connections in use. Miniature versions called presets are made for setting up circuits which will not require further adjustment. Variable resistors are often called potentiometers in books and catalogues. They are specified by their maximum resistance, linear or logarithmic track, and their physical size. The standard spindle diameter is 6mm. The resistance and type of track are marked on the body

- **4K7 LIN** means 4.7 kΩ linear track.

- **1M LOG** means 1 MD logarithmic track.

Some variable resistors are designed to be mounted directly on the circuit board, but most are for mounting through a hole drilled in the case containing the circuit with stranded wire connecting their terminals to the circuit board.

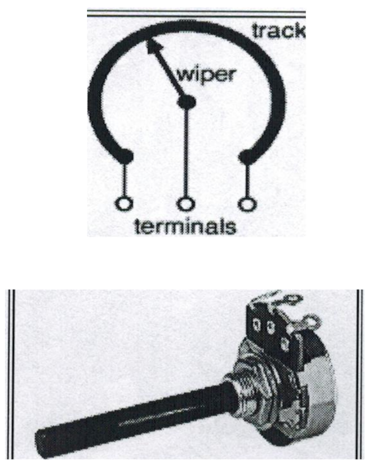
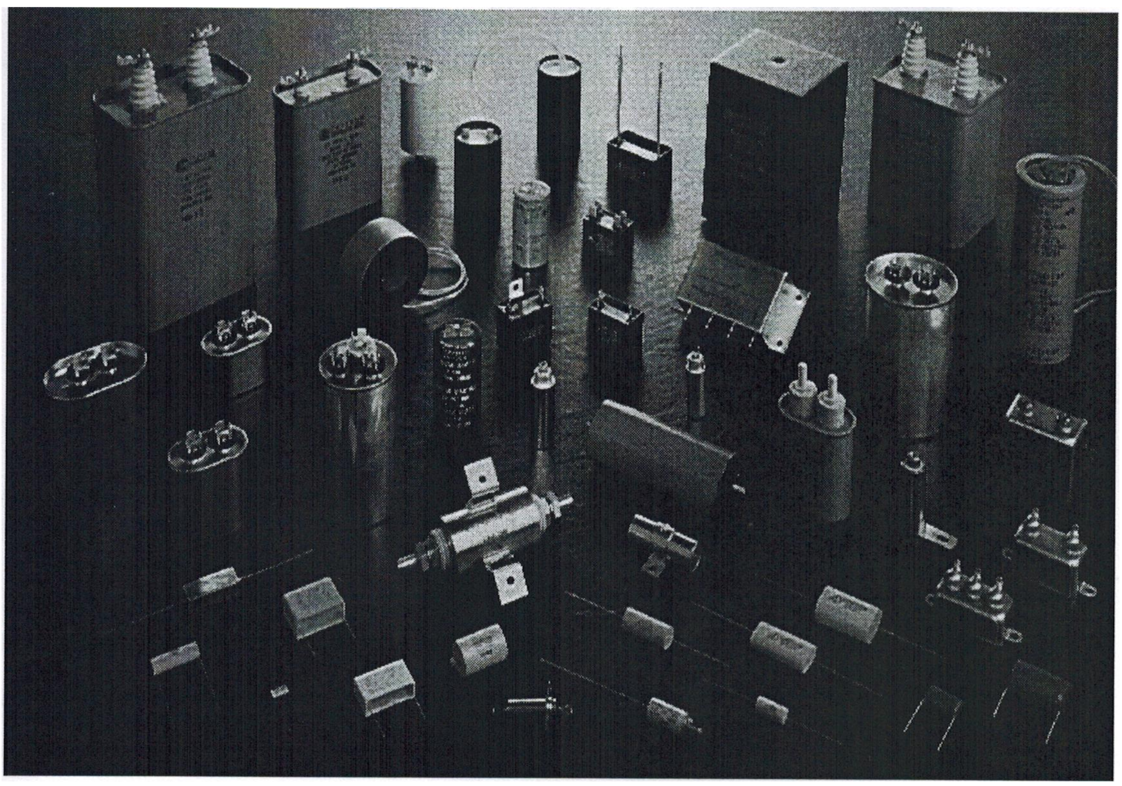


Figure1.2 Standard Variable Resistor

1.4 Capacitors

A capacitor is an electronic device which consists of two plates (electrically conductive material) separated by an insulator. The capacitor's value (its 'capacitance') is largely determined by the total surface area of the plates and the distance between the plates (determined by the insulator's thickness).

A capacitor's value is commonly referred to in microfarads, one millionth of a farad. It is expressed in micro farads because the farad is such a large amount of capacitance that it would be impractical to use in most situations. In figure 1.3 shown the types of capacitors [2].



. **Figurel.3** Types of capacitors.

1.4.1 Capacity

This analogy should help you better understand capacity. In the following diagram (Figure 1.4), you can see 2 tanks (capacitors) of different diameter (different capacitance). You should readily understand that the larger tank can hold more water (if they're filling to the same level (voltage)). The larger capacitor has more area in which to store water. Just as the larger capacitor's larger plate area would be able to hold more electrons.

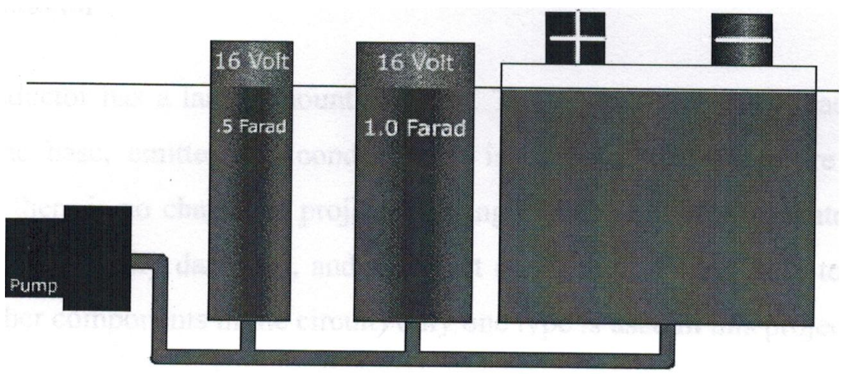


Figure 1.4 Capacities.

1.4.2 Capacitor and DC voltage

When a DC voltage source is applied to a capacitor there is an initial surge of current, when the voltage across the terminals of the capacitor is equal to the applied voltage, the current flow stops. When the current stops flowing from the power supply to the capacitor, the capacitor is 'charged'. If the DC source is removed from the capacitor, the capacitor will retain a voltage across its terminals (it will remain charged). The capacitor can be discharged by touching the capacitor's external leads together. When using very large capacitors (1/2 farad or more) in your car, the capacitor partially discharges into the amplifier's power supply when the voltage from the alternator or battery starts to fall. Keep in mind that the discharge is only for a fraction of a second. The capacitor can not act like a battery. It only serves to fill in what would otherwise be very small dips in the supply voltage [2].

1.4.3 Capacitors and AC voltage

Generally, if an AC voltage source is connected to a capacitor, the current will flow through the capacitor until the source is removed. There are exceptions to this situation and the A.C. current flow through any capacitor is dependent on the frequency of the applied A.C. signal and the value of the capacitor.

1.5 Semiconductor

Semiconductor has a large amount of types. Transistors have three lead-out wires are called the base, emitter and conductor. It is essential that these are connected correctly, as there is no chance of project working if they are not. Fortunately modem transistors are not easily damaged, and incorrect connection is not likely to damage a device (or other components in the circuit) only one type is used in this project.

1.5.1 Diodes

Diodes are non-linear circuit elements. It is made of two different types of semiconductors right next to each other. Qualitatively we can just think of an ideal diode has having two regions: a conduction region of zero resistance and an infinite resistance non-conduction region. For many circuit applications, the behavior of a (junction) diode depends on its polarity in the circuit. If the diode is reverse biased (positive potential on N-type material) the current through the diode is very small. The following figure is shown the characteristic of diode.

H

Figure 1.5 Diode.

- **Forward Biased P-N Junction:** forward biasing the p-n **junction** drives holes to the junction from the **p-type** material and electrons to the junction from the **n-type** material. At the junction the electrons and holes combine so that a continuous current can be maintained.

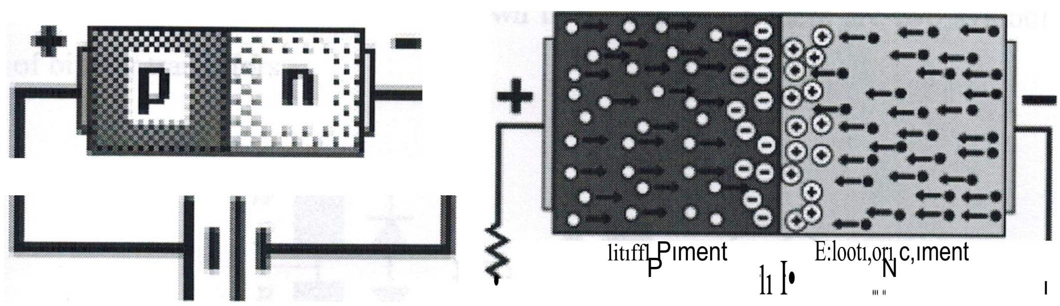


Figure 1.6 Forward Biased P-N Junction

- **Reverse Biased P-N Junction:** the application of a reverse voltage to the p-n **junction** will cause a transient current to flow as both electrons and holes are pulled away from the junction. When the potential formed by the widened depletion layer equals the applied voltage, the current will cease except for the small thermal current

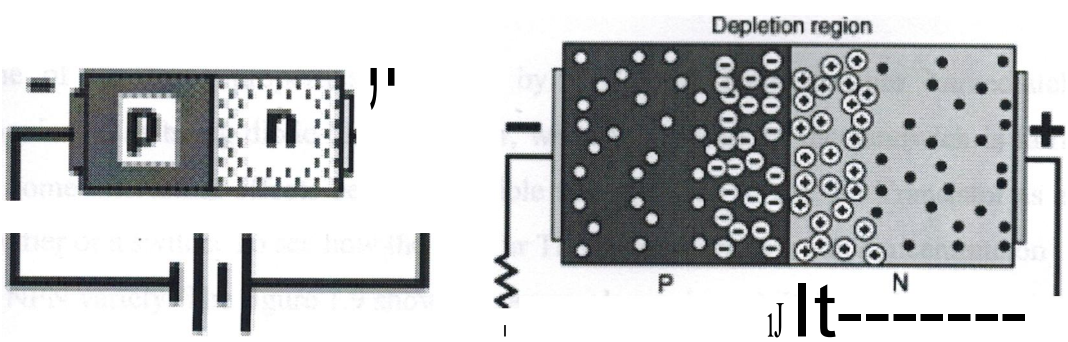


Figure 1.7 Reverse Biased P-N Junction

1.5.2 Transistors

A Bipolar Transistor essentially consists of a pair of PN Junction Diodes that are joined back-to-back. This forms a sort of a sandwich where one kind of semiconductor is placed in-between two others. There are therefore two kinds of bipolar sandwich, the NPN and PNP varieties. The three layers of the sandwich are conventionally called the Collector, Base, and Emitter. The reasons for these names will become clear later once we see how the transistor works. As shown in the figure 1.8 there are two symbol of type of bipolar transistors.

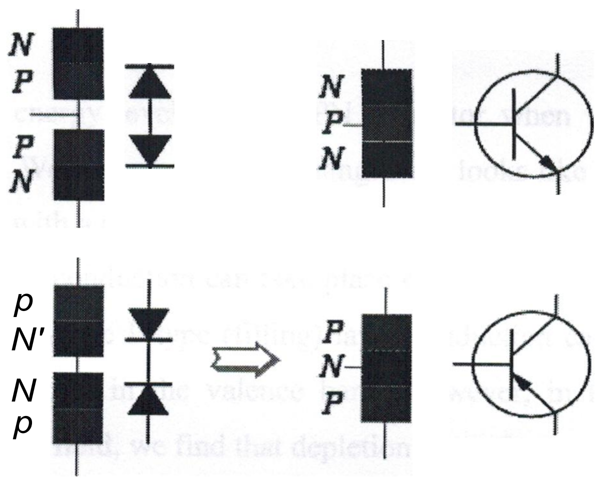


Figure 1.8 Symbol of NPN and PNP transistors.

Some of the basic properties exhibited by a Bipolar Transistor are immediately recognizable as being diode-like. However, when the 'filling' of the sandwich is fairly thin some interesting effects become possible that allow us to use the Transistor as an amplifier or a switch. To see how the Bipolar Transistor works we can concentrate on The NPN variety. The figure 1.9 shows the energy levels in an NPN transistor.

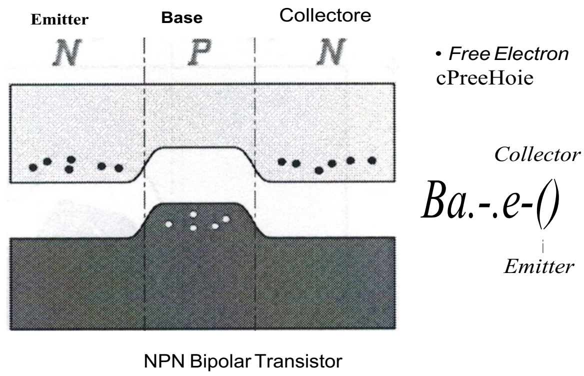


Figure 1.9 the energy levels in an NPN transistor.

Figure 1.9 shows the energy levels in an NPN transistor when we aren't externally applying any voltages. We can see that the arrangement looks like a back-to-back pair of PN Diode junctions with a thin P-type filling between two N-type slices of 'bread'. In each of the N-type layers conduction can take place by the free movement of electrons in the conduction band. In the P-type (filling) layer conduction can take place by the movement of the free holes in the valence band. However, in the absence of any externally applied electric field, we find that depletion zones form at both PN-Junctions, so no charge wants to move from one layer to another [3].

Consider now what happens when we apply a moderate voltage between the Collector and Base parts of the transistor. The polarity of the applied voltage is chosen to increase the force pulling the N-type electrons and P-type holes apart. (I.e. we make the Collector positive with respect to the Base.) This widens the depletion zone between the Collector and base and so no current will flow. In effect we have reverse-biased the Base-Collector diode junction. The precise value of the Base-Collector voltage we choose doesn't really matter to what happens provided we don't make it too big and blow up the transistor! So for the sake of example we can imagine applying a 10 Volt Base-Collector voltage. As shown in the figure 1.10 the applying collector-base voltage.

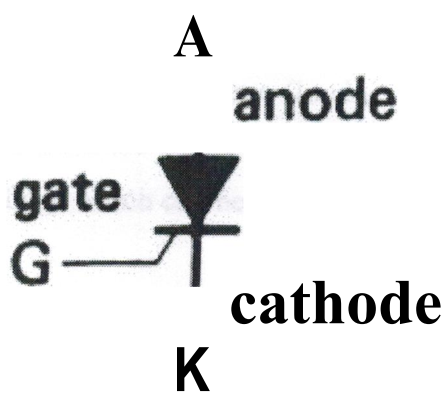


Figure 1.11 the Thyristors

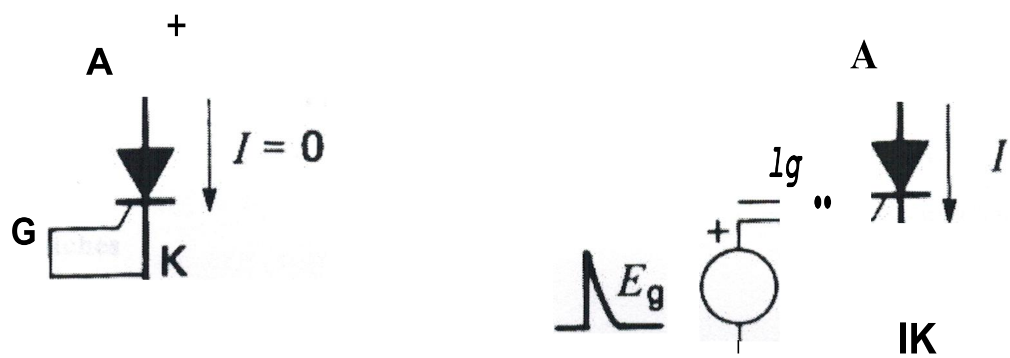
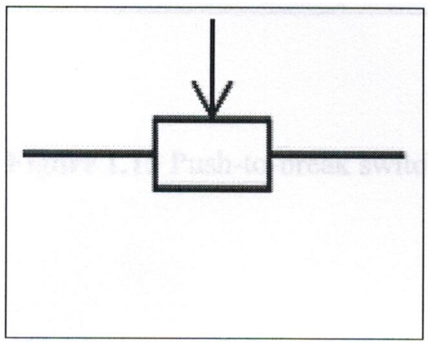


Figure 1.12 operations of the thyristors

1.6 Potentiometer

Variable resistors used as potentiometers have all three terminals connected. This arrangement is normally used to vary voltage, for example to set the switching point of a circuit with a sensor, or control the volume (loudness) in an amplifier circuit. If the terminals at the ends of the track are connected across the power supply then the wiper terminal will provide a voltage which can be varied from zero up to the maximum of the supply.



Figurel.13 Potentiometer Symbol

1.7 Switches

1.7.1 (ON)-OFF Push-to-make

A push-to-make switch returns to its normally open (off) position when you release the button, this is shown by the brackets around ON. This is the standard doorbell switch.

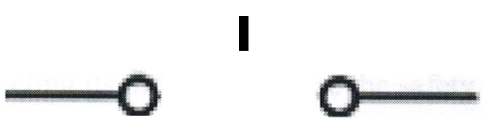


Figure 1.14 Push-to-make switches

1.7.2 ON-(OFF) Push-to-break

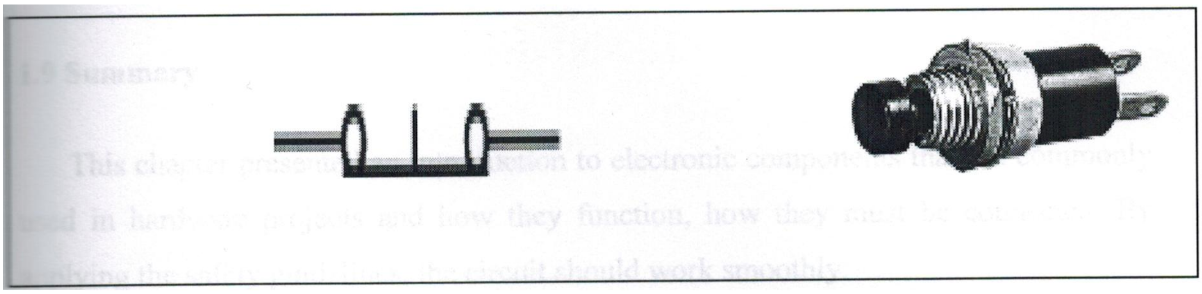


Figure 1.15 Push-to-break switches

1.8 Safety Guidelines

In this project, low voltage applications are used. Thus, safety guidelines are not in concern of human safety but in components safety, although we cannot avoid the technical mistakes witch can occur during connecting parts and soldering them to the ircuit, so we have to be careful from current and heat.

- One of the components which are used in this circuit is the chemical capacitor, this element has two poles and when connected to the circuit we have to care about its polarity so as to avoid damaging it.

- An other component used in this circuit is Buzzer, which has to be chosen suitable to the out put signal so as not to destroy diaphragm.

- While connecting the circuit components to the power supply we have to be aware of misconnecting its polarity to assure the safety of used components.

- While the circuit is on, avoid touching the sensitive components like the transistor, diodes to avoid interfering with the out put signal.

- While soldering the parts to the circuit we have to be careful so as not to burn the parts which are sensitive and can be harmed by heat.

1.9 Summary

This chapter presented an introduction to electronic components that are commonly used in hardware projects and how they function, how they must be connected. By applying the safety guidelines, the circuit should work smoothly.

2.ALARM SYSTEMS

2.1 Overview

This chapter will present general information about alarm systems. Different types of alarm systems will be briefly introduced.

2.2 Alarm System Categories

The Alarm System it's a detection signaling system that is considered to be the combination of interrelated signal initiating devices, signal indicating devices, control equipment, and interconnecting wiring installed for a particular application monitored Alarm System.

An alarm system which reports detected conditions to a monitoring facility monitoring facilities are usually located off-site from the protected premises. When a monitoring facility is located within the building or complex that includes the protected premises, the alarm system is called a Proprietary system. Protected Premises the physical site at which an alarm system is installed and operational [9].

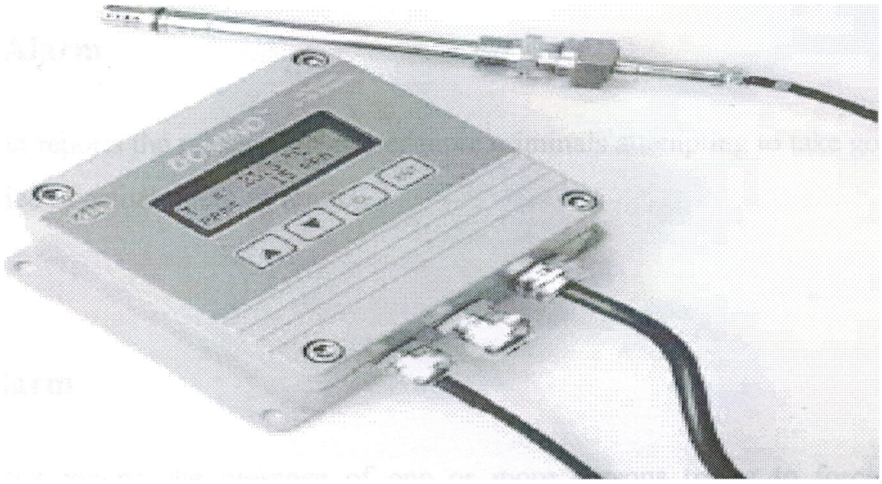


Figure 2.1 It Presented Water Activity Alarm Device [10]

2.3 Types of Alarm Systems

Alarm systems are divided into several broad categories, as listed below. The terms ed to identify each type may vary, depending on who is using the term; however, the stem we will description as we see later.

2.3.1 Fire Alarm

A system that detects and reports a fire in the protected premises, detects and reports water flowing in a sprinkler system, or detects and reports dangerous conditions such as smoke or overheated materials that may combust spontaneously. Household Fire Alarm: A fire alarm system that protects a household, as opposed to any other type of occupancy.

2.3.2 Hold-Up Alarm

A system that reports the presence of one or more criminals attempting to take goods or funds with implied or actual threat of force.

2.3.3 Duress Alarm

A system that reports the presence of one or more persons trying to force an individual to enter, or re-enter, a facility against the individual's will. Note: Although the triggering devices for hold-up, duress, and panic alarms are often the same or similar, police response may differ. A duress alarm, for example, may be designed to detect and silently report an employee being forced back into a protected facility to provide access to a safe, vault, drug storage area, or area containing confidential records. The intent is generally not to make the criminal aware that a call for help is being triggered to the monitoring facility. In a residential environment, a duress alarm could signal an abduction or rape attempt [9].

2.3.4 Panic Alarm

A system that reports a more general type of perceived emergency, including the presence of one or more unruly or inebriated individuals, unwanted persons trying to gain entry, ob-served intruders in a private yard or garden area, or a medical emergency. Provides police with little specific information, but is often the only way a user can call for assistance under abnormal conditions.

2.3.5 Medical Emergency (Service) Alarm

A system that reports a medical problem for response by relatives, friends, neighbors, or by a community's EMS personnel, paramedics, or ambulance, depending on arrangements made with the monitoring facility.

2.3.6 Heating, Ventilation, Air Conditioning (HVAC) Alarm

These systems are reports heating and ventilation as well as the air conditioning system problems, rather than life-threatening emergencies.

2.3.7 Single Sensor Alarm

Those types from (2.3.7-2.3.9) are important in my project because it is including some information about it.

A sensor detects the emergency condition and causes an alarm to be transmitted to the monitoring facility or to be indicated audibly or visually. Some sensors use single switches to trigger the alarm; other sensors require that two switches activate before the alarm is triggered. Some sensors use two or more detection technologies and require that two or more technologies sense the emergency condition before the alarm is triggered. All of these are single sensors.

2.3.8 Multiple Sensor Alarm

An alarm generated when at least two separate sensors detect the condition before the alarm is triggered. In some instances, redundant sensors in different system zones must trip before the alarm is triggered. However, activation of one sensor may trigger a trouble or pre-alarm signal.

For example: Smoke detectors that is cross-zone-wired so that two or more zones must detect the smoke before an alarm condition is created.

Public emergency response or dispatch personnel are not normally contacted when these alarm systems detect a problem; protected property maintenance personnel tend to be notified by the monitoring facility.

2.3.9 Sequential Alarm

When two or more sensors sequentially detect a condition and each triggers an alarm. When this happens, there is a high probability that a real emergency exists.

2.3.10 Industrial Process Alarm

A system that provides supervision for a wide variety of commercial and industrial processes, including sump-pump operations, water levels, pressures and temperatures, chemical processes, and special furnace operations, to name but a few. Normally, user employees or sub-contractors are notified when these systems report problems. in this type we will focus on it because this type it important about my project .

2.4 Event Types

We will presents some information about event types alarms it is including explaining all types. The Event is one or more related alarm or trouble signals.

Alarm an electronic signal, transmitted to the monitoring facility. Indicates that an emergency requiring follow-up has been detected. When an alarm system is not monitored, the alarm condition activates one or more sounding or visual indicating devices.

2.4.1 Dispatch able Event

An unexpected alarm that triggers an event. An alarm does not become a dispatch able event until the monitoring facility has followed its established procedures such as verification or other confirmation that the alarm requires further action. Subsequent signals from the same type of alarm system are part of the original dispatch able event until the event is resolved and the system has been reset. When an alarm is determined to be a dispatch able event, a request for response is made to the appropriate response agency or agencies.

2.4.2 False Alarm

An alarm event indicating the presence of an emergency condition when none exists. Please visit our False Alarm Information page for more information.

2.4.3 Test

The act of activating one or more sensors, devices, controls, communicating devices, or other components of an alarm system in an effort to confirm proper operation of the equipment.

2.4.4 Transmission Test

Verification of the ability of a system control to send signals to the monitoring facility which it is intended to notify.

2.4.5 Inspection

A visual survey of the appearance of an alarm installation intended to discover any obvious problems. Typically these might be alarm system wires that have been covered up during building construction or remodeling, loose doors or windows that may cause false alarms during storms, sprinkler risers and controls that may be blocked by merchandise making fire department access difficult or impossible during emergencies, etc. An inspection may include actual tests of alarm system sensors, controls, or transmitters.

2.4.6 Reset

A return to normal operation for an alarm system that has been in a trouble condition, out of service, or in an alarm condition. When a system has been "reset" it is back in full operation and subsequent signals received from the system will be treated normally. A reset more than merely the restoration-to-normal of a sensor, or an abort message or call from e user. With a reset event, the system is back in full and normal operation

2.4.7 Abort

A telephoned voice call or an electronically transmitted message, with appropriate safeguards as to authenticity that indicates a just-transmitted alarm event is not to be reacted to as an emergency. An abort is also a procedure to prevent an alarm signal from being sent to the monitoring facility.

2.5 Users of Alarm Systems

User: The person responsible for the correct operation of the alarm system (the boss, the buyer). Not necessarily the person who actually operates the alarm system. System Operator: A person who operates an alarm system. Such person is assumed to have been taught how to arm, or how to arm and disarm the system, and how to prevent alarm signals from being transmitted to the monitoring facility unnecessarily or by mistake. A system operator may, or may not, be an authorized user agent.

2.6 Control Equipment at Protected Location

Equipment and devices that make the system at the user location function properly. We will explain about control equipment start by keypad.

Keypad: The portion of the arming station containing numbered push buttons similar to those on telephones or calculators. These control the arming or disarming of the system. They may also perform other functions. And about key switch it is used an alternate device used to arm or disarm the alarm system, instead of a keypad.

2.6.1 Signal Indicating Device

A device that provides an audible or visual indication that an emergency condition has been detected. Audible devices include electronic sounders, bells, horns, and sirens. Visual devices include incandescent or strobe lights. Signal indicating devices also include panels that provide lamps or schematic building diagrams to identify the specific location of the sensor or sensors that detected an emergency, or that are in.

2.6.3 Delay Zone

One or more sensors in an alarm circuit that are wired so that, when triggered, a specific time delay results before an alarm condition is generated. Delay zones are often created for the most frequently used exit and entry doors to allow for sufficient time for normal entry and exit without causing alarm conditions.

2.6.4 Zone (with sensors)

An identifiable sensor or group of sensors, connected to an alarm control that can be addressed and manipulated from the control, from the monitoring facility, or from an arming station.

2.7 Sensors (In Alarm Systems)

Double-Action Trigger: A sensor that requires separate simultaneous actions, or closely-spaced sequential actions before an alarm is transmitted to the monitoring facility. If only one action is taken, a trouble signal may be transmitted or logged and annunciated.
Dual-Technology Trigger: A sensor that uses two or more separate technologies, two of which must sense the designated condition before the device triggers an alarm signal. If only one technology senses the condition, a trouble signal may be transmitted or logged and annunciated.

Multiple-Activation Trigger: This is not really a special type of sensor. Rather it is a system-designed feature that requires two or more sequential activations of the sensor before an alarm signal is transmitted to the monitoring facility.

The mercury Switch: A set of electrical contacts that are opened or closed as a sphere of liquid mercury encompasses them or is re-moved from them inside a hermetically sealed enclosure. Usually the enclosure is tilted in one direction to close the switch and in the opposite direction to open it. The Capacity Sensor: A sensor that detects a change in capacitance when a person touches or comes in close proximity to an object, such as a safe or file cabinet, insulated from electrical ground potential. Vibration Sensor: A sensor that detects vibrations generated during forced entry or an attempted forced entry.

2.7.1 Fire Alarm Sensors

Flame Detector: A sensor that "sees" the flicker of light emanating from a fire. Manual Fire Alarm Station: A device that permits a fire alarm signal to be triggered manually.

2.7.2 Sprinkler System Water Flow Sensors

A sensor that detects the flow of water in a sprinkler system this type is present a one applied important in my project, so we will explain this in chapter three , The Wet-Pipe Flow Sensor, A sensor that detects the flow of water in a wet-pipe sprinkler system. Dry-Pipe Flow Sensor: A sensor that detects the flow of water in a dry-pipe sprinkler system. Open-Pipe (Deluge) Flow Sensor: A sensor that detects the flow of water in an open-pipe sprinkler system.

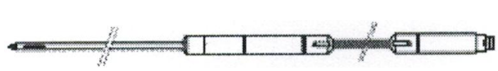


Figure 2.2 One Form Sensors

2.8 Summary

This chapter presented some information about alarm system. We have seen some ypes of Alarm Systems. One of which is related to the alarm in my project: Single Sensor Alarm, As well as there is information about event types, and how we can use the alarm systems in general. We have seen using alarm systems as well as sprinkler system water flow sensors, have also been describes in this chapter.

3. WATER ACTIVATED ALARM

3.1 Overview

This chapter presents an explanation for our circuit diagram, as well the modification, its parts, aim of each part, and its result.

3.2 Integrator and Differentiator

An op-amp integrator simulates mathematical integration, which is basically a summing process that determines the total area under the curve of a function.

- An operational amplifier (usually abbreviated op-amp) is an integrated circuit (IC) which amplifies the signal across its input terminals.
- Op-amps are widely used in the electronics industry, and are thus rather inexpensive.
- Op-amps are analog, rather than digital devices, although they are used in many digital instruments.
- In this learning module, no details are given about the internal structure of the op-amp. Rather, the purpose of this module is to summarize the many useful applications of op-amps.

3.2.1 Description

A triangle is used as the universal symbol for an op-amp in schematic circuit diagrams shown in figure 3.1.

- The supply voltage terminals are at the top and bottom of the schematic diagram. Supply voltage is necessary because the op-amp draws power to run its internal circuitry. Both a positive and negative supply voltage is required, typically+/- 15 V. In other words, V\upply = 15 V, and V-supply= -15 V.
- In real applications, any + and - voltage between about 10 to 20 V can be used, depending on the manufacturer's specifications.

- The signal input terminals are on the left. There is a positive input terminal, V_p, and a negative input terminal, V_n. Note however, that the actual input voltages do not need to be positive and negative for inputs V_P and V_n, respectively.
- In fact, the V_P input is usually referred to as the no inverting input and the V_n input as the inverting input, respectively.

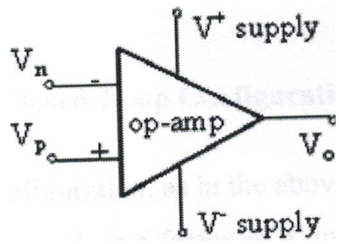


Figure 3.1 Op-Amps in Schematic Circuit Diagram

3.2.2 Ideal versus Actual Op-Amps

- An ideal op-amp has infinite input impedance, so that it has no effect on the input voltage. This is called no input loading.
- An actual op-amp has very high, though not infinite, input impedance (typically millions of ohms), so that it has little effect on the input voltage. This is called minimal input loading.
- A direct result of the high input impedance is that we may assume negligible current flowing into (or out of) either op-amp input, V_P or V_n. This result helps us to analyze op-amp circuits, as discussed below.
- An ideal op-amp has zero output impedance, so that whatever is done to the output signal further downstream in the circuit does not affect the output voltage V_0. This is called no output loading.
- An actual op-amp has very low, though not zero, output impedance (typically tens of ohms), so that what is done downstream of the op-amp has little effect on the output voltage. This is called minimal output loading.

- An ideal op-amp has infinite gain, g (Note that a lower case g is used here for the op-amp gain so as not to be confused with G, the gain of amplifier or filter circuits.) This gain, g, is usually called the open loop gain.
- An actual op-amp has a very high, though not infinite, gain. Gain g is typically in the 10^5 to 10^6 range.
- In the examples and circuits discussed below, ideal op-amp performance will be assumed.

3.2.3 Open-Loop versus Closed-Loop Configurations

- In an open-loop configuration, as in the above schematic diagram, $V_o = (V_p - V_n)g$ i.e. the output voltage V_O is a factor of g times the input voltage difference, $V_P - V_n$. This might be useful if the incoming signal is extremely small (micro volts) in need of high amplification.

In practice, however, circuits are built with a feedback loop (closed-loop configuration), which results in $V_n \sim V_P$ otherwise the op-amp will saturate. Saturation means that the output voltage clips at some maximum value, typically a couple of volts lower than the positive supply voltage $V_{+supply}$. Likewise, saturation can occur at the low end as well, clipping at a couple volts greater than the supply voltage $V_{-supply}$.

3.3 Why we need this device?

We can use this device to detect the water in any place, for example in our homes we all have water pipes in kitchens all this may need to detect when we are have been the loss of water, in this case we can use this device to put in all places may occur water lack

Also we can use this device in swimming pools as we seen before in first case, we can put many sensors for any place around the pool, and it will be signal by LED or by hearing to alarms audios in the speaker's device.

Just one device like my device it will use for measuring water level in any water tanks in our homes or any other place, for example we can use it in the homes water tanks as we see (electrical circuit of pump).

3.4 Components of project (Water Activity alarm)

- R1 100K (Brown, Black, Yellow, Gold)
- R2 100K (Brown, Black, Yellow, Gold)
- R3 33K (Orange, Orange, Orange, Gold)
- R4 33K (Orange, Orange, Orange, Gold)
- R5 2.7M (Red, Violet, Green, Silver)
- R6 1K (Brown, Black, Red, Gold)
- R7 10K (Brown, Grey, Orange, Gold)
- R8 18K (Brown, Grey, Orange, Gold)

There are four capacitors, with different values and connected within the circuit:

- C1 100 'VIF Polyester (Brown, Black, Yellow, Black, Red)
- C2 33 µF 10 V Tantalum
- C3 10 'VIF Polyester (Brown, Black, Yellow, Black, Red)
- C4 10 µF 25V Electrolytic

We have two Integrated circuits and two Transistors.

- IC 1 TL 081 CP
- IC 2 LM380N
- Tr 1 BC 109 C
- Tr 3 BC 179

The switch that will be used in the circuit is:

- S1 (SPST) Miniature toggle type

There is also a loud speaker that will sound the alarm:

- LS1 The value between (40 - 80 ohms)

The power supply for the circuit in a 9_volt battery:

- B1 PP6 Size 9 volt and connector to suit

The Miscellaneous (sensor) is made using two non insulated wires placed on a plastic or other insulated base, with the smallest possible gap between the two wires. Alternatively a small piece of strip board or a sensor made from printed circuit board could be used.

3.5 ICl TL081CP

The Wien-bridge oscillator circuit can be viewed as a noninverting amplifier configuration with the input signal fed back from the output through the lead-lag network. Its gain is determined by the voltage divider.

$$A_{cl} = \frac{1}{B} = \frac{1}{R_2/(R_1+R_2)} = \frac{R_2+R_1}{R_2} \qquad (3.1)$$

The unity-gain condition in the feedback loop is met when

$$A_{cl} = 3$$

This offsets the 1/3 attenuation of the lead-lag network, thus making the gain around the positive feedback loop equal 1.To achieve a closed loop gain of 3,

$$R_1 = 2R_2$$

Then

$$A_{cl} = \frac{1}{B} = \frac{1}{Js\, l(R_1 + R_1)} = \frac{Js + R_1}{R_1} = \frac{3Js}{Js} = 3$$

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$$A_{cl} = \frac{1}{B} = \frac{R_1 + R_2 + R_3}{R_2} = \frac{3R_2 + R_3}{R_2} = 3 + \frac{R_3}{R_2} \qquad (ç£)$$

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3.8 **Brief explanation**

The sensor simply consists of two pieces of metal placed very close together and separated by an insulating material. Thus there is normally an extremely high resistance between the two metal electrodes, but if they are bridged by water which has significant impurity content there will be a fairly low resistance between them. Therefore, TR2 is normally cut off and passes only minute leakage currents, but if the sensor is activated TR2 is biased hard into conduction and supplies virtually the full supply voltage to the alarm generator circuit which is based on ICI and IC2.

IC2 is used as the tone generator and its output is coupled to LS1 by C4. The operating frequency of IC2 can be varied up and down by increasing and decreasing the base current fed to TRI. This modulation is provided by IC1 which is used as a simple very low frequency oscillator having an operating frequency of only about 0.5 Hertz.

The output of IC1 simply switches from the high state to the low one and back again, producing a square wave output. This is not suitable as the modulation signal as it would simply switch the tone between the frequencies, rather than giving the smooth variation in pitch which we require here. The signal across C3 is a form of sawtooth waveform which steadily rises as C2 charges, and falls as C2 discharges.

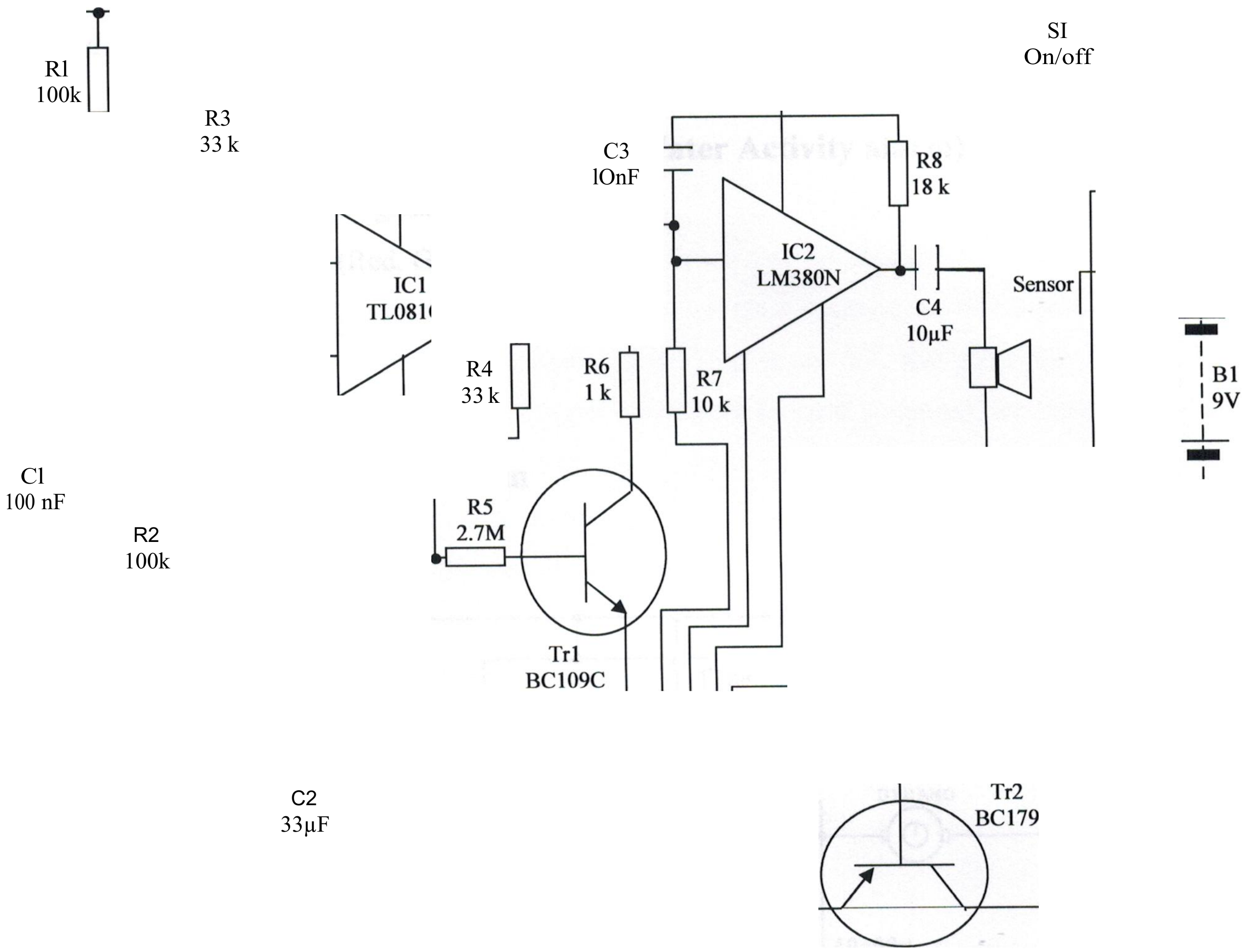

Figure 3.2 Circuit Diagram of Water-Activated Alarm

3.9 Modification of the Circuit

Water -activated alarm can be modified by adding new components to the circuit in order to reverse the main aim of the circuit, components and the design of the circuit are presented.

3.9.1 Components of Modification Project (Water Activity alarm)

The modification on this original project in clued:

- Two LED photocells (Red, Green).
- Resistor 500 ohm.
- Dynamo.

3.9.2 The Modified Circuit Diagram

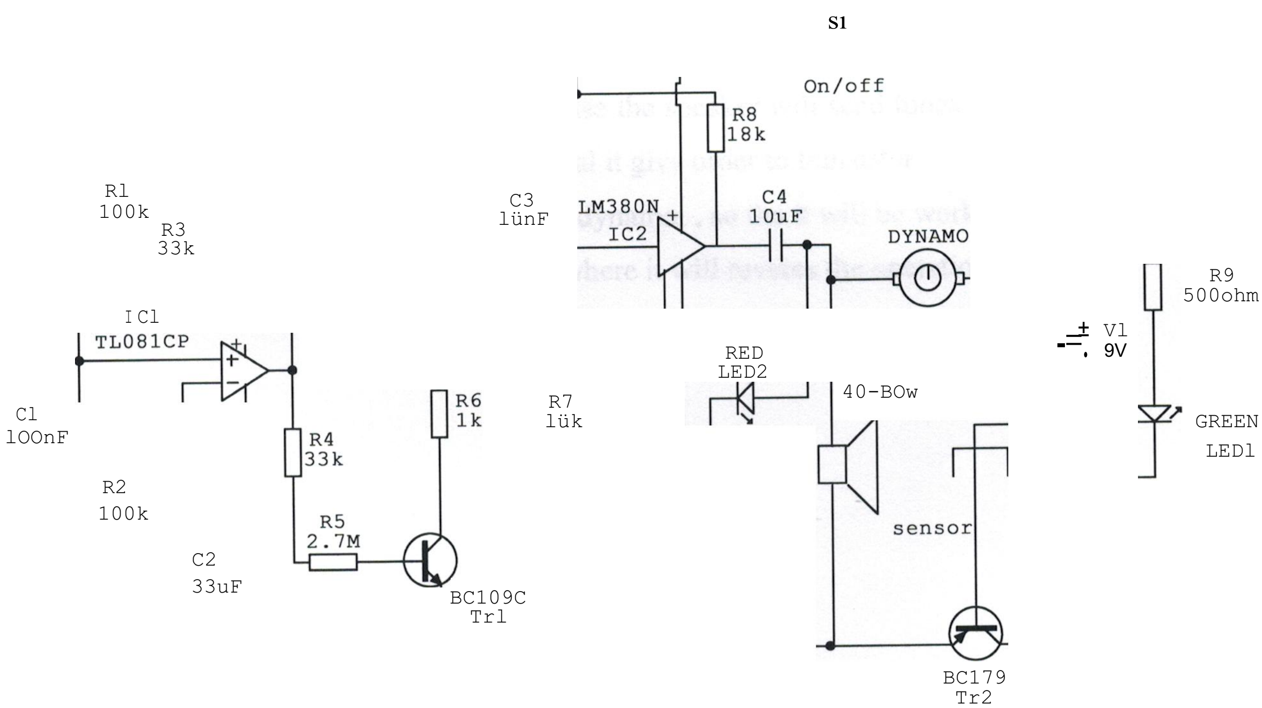

Figure 3.3 Circuit Diagram of the Modified Water -Activated Alarm

3.9.3 Explanation of the Modified Circuit

We have here two LED photocells. The LED red dictates here the signal alarm, when the sensor detects as well as the dynamo; The green LED works when ever power supply to, give the circuit is available. The dynamo simulates a water pump that will pump out flooded area when the detector is activated.

3.10 Result and Analysis

We will describe the results of our project as we see in figure 3.4. We chose this form to illustrate how the project will work, as we see below there is glass water or cup and there is a sensor putting from there, the level of water in the cup is not full, that mean the sensor it is outside cup level, in this case the alarm it not work (normal situation), we see just the green LED is working in that case. Note, The circuit it is successful which tested practically, by doing this testing practical with our self.

But when we increase the water in the cup where connected the sensor in this time the sensor will send two signals to circuit, the first signal to transistor (BCl 78AB) where allowing to pass current from speaker, in this case the speaker will send tones as well as we will see the red LED will be on, another signal it give order to transistor (K.2G C3198) allowing to pass current to feed dynamo , so the it will be working and it will change contact from open to another case where it will reveres the operation.

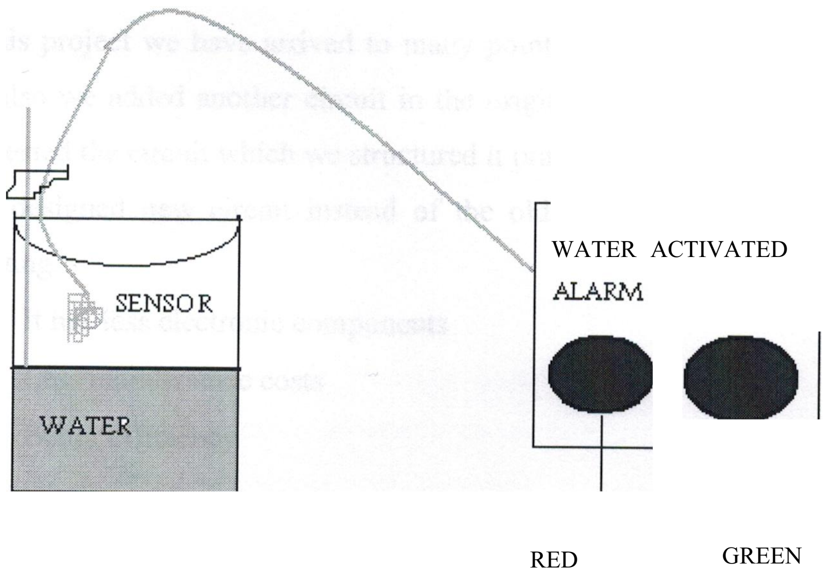

Figure 3.4 Diagram illustrates the water alarm

3.11 Summary

This chapter presented detailed technical information about the water-activated alarm and the modification. We have included the components of this project. As well as the circuit diagrams, results of testing the circuit were also shown.

CONCLUSION

In this project we have arrived to many points. We tried to develop the original circuit. And also we added another circuit in the original one (water activity alarm). Further, we have tested the circuit which we structured it practically where it was successful.

We designed new circuit instead of the old one since it has better properties as the following:

- It has less electronic components
- Less maintenance costs
- Better efficiency
- Smaller size

We presented information about electronic components by showing photo about it, which we used in structure project, as well as we have been described safety guidelines. Also had been presented information about systems alarm in general; where we focused on waters systems alarm types, by describe all types which it is used in alarm systems. Also we had been explaining circuit of water activity alarm from through helping circuit maker programs. The results which we presented it including some electronic components as dynamo, leds, and transistor, by structure it; we had a new circuit.

The aims of this project were successful, where, we had done test for device, we tried and arrived to sub division of the aims. From through the searching and development we got information about alarm systems, also we can able by this design to helping in practical life, we arrived also to some modification; that was one of smart addition on the original project. The aim of this project was to design, modify, build and test a working water activity alarm. In addition, real-life application will be simulated where a case of flooding is assumed and the alarm would give a warning and activated a water pump.

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