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WATER ACTIVATED ALARM

Graduation Project
EE – 400

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ACKNOWLEDGEMENT

First of all, I want to pay my regards and to express my sincere gratitude to my supervisor Assoc. Prof. Dr Adnan Khasman. And all persons who have contributed in the preparation of this project so to complete it successfully. I am also thankful to those who helped me a lot in my task and gave me full support toward the completion of my project.

I would like to thank my family who gave their lasting encouragement in my studies and enduring these all expenses and supporting me in all events, so that I could be successful in my life time. I specially thank to my mother whose prayers have helped me to keep safe from every dark region of life. Special thank to my father who help me in joining this prestigious university and helped me to make my future brighter.

I am also very much grateful to all my friends and colleagues ENG.Tala Khader, ENG.Baha Khalaf, Omar Enbawi, ENG.Ala'a Mansour, Khaled Abuzaghleh, Fawaz Alabadi, ENG.Mohammad Maslat who gave their precious time to help me and giving me their ever devotion and all valuable information which I really need to complete my project.

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Introduction

The topic of this project is water activated alarm, so we are talking here about one type of the alarms which deals with water. The importance of this project placed in the material which we are dealing with which water. As we know the water is the most basic reason for the creatures in the earth, so keeping the water away from wasting and to prevent the reason of living from the serious danger that the whole world faces which is the fear from ending the water in the earth planet which is the only place where the only life existing .

First chapter of the project present the electronic components especially the components were used in this project such as resistor, capacitor, diodes, integrated circuits ICs and switches. Safety guideline also showed the ways that leads how to use the components in correct way, because if it done in wrong way it will burn or break the components. So that before doing any electrical project this chapter should be taken care.

The second chapter contains the alarm system categories, types of alarms, event types users of alarm systems, control equipment at protected location and sensors in alarm systems. It talks about such topics in a brief way and it has some definitions which are related with the main topic of this part of project.

The next part is the third chapter which is important that presents the circuit which we are dealing with in a good way of explanation and it contains Integrator and Differentiator, description, Components of project (Water Activity alarm), IC1 TLO81CP, Start-up Conditions, Tr1 BC109C, IC2 LM380N and it contains the basic diagram of the circuit which we drew it using the circuit maker program.

The last chapter is the fourth chapter which is the most important part that deals with the final shape of the water activated alarm and its modifications which I have added to the original circuit, the final explanation of the alarm circuit, the added devices and the last diagram of the circuit which had been drown by the circuit maker program.

Finally, we give the conclusion of the project.

CHAPTER ONE
ELECTRONIC COMPONENTS

1.1 Overview

In this chapter an introduction to electronic components will be presented. As in this chapter some knowledge about electronic components history will be given and information about its functions as well.

1.2 Components

Explanation about hardware components used will be shown by setting up the electronic circuit projects in general.

1.2.1 Resistors

The resistor's function is to reduce the flow of electric current. This symbol —/\/\/— is used to indicate a resistor in a circuit diagram, known as a schematic. The unit for measuring resistance is the OHM. (the Greek letter Ω). Higher resistance values are represented by "k" (kilo-ohms) and M (meg ohms). For example, 120 000 Ω is represented as 120k, while 1 200 000 Ω is represented as 1M2. The dot is generally omitted as it can easily be lost in the printing process. In some circuit diagrams, a value such as 8 or 120 represents a resistance in ohms. Another common practice is to use the letter E for resistance. For example, 120E (120R) stands for 120 Ω, 1E2 stands for 1R2 etc [1].

The resistance value of the resistor is not the only thing to consider when selecting a resistor for use in a circuit. The "tolerance" and the electric power ratings of the resistor are also important. The tolerance of a resistor denotes how close it is to the actual rated resistance value. For example, a ±5% tolerance would indicate a resistor that is within ±5% of the specified resistance value.

Resistors are color coded to read the color code of a common 4 band 120 k 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 below for the 1st color band BROWN. To the right of that number, write the corresponding number for the 2nd band RED. Now multiply that number (you should have 12) by the corresponding multiplier number of the 3rd band (yellow) (10,000). Your answer will be 120000 or 120K. As shown in figure 1.1.

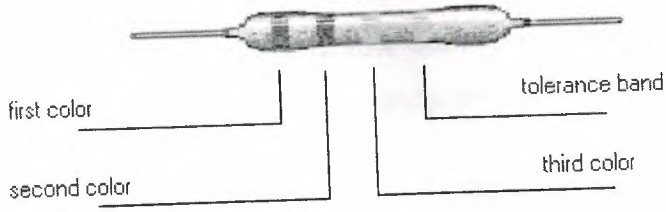


Figure 1.1: Resistor [1]

The following table shows the colors used to identify resistor values:

Table 1.1: Resistor color code.[1]

Color	Value	Multiplier	Tolerance (%)
Black	0	0	-
Brown	1	1	±1
Red	2	2	±2
Orange	3	3	±0.05
Yellow	4	4	-
Green	5	5	±0.5
Blue	6	6	±0.25
Violet	7	7	±0.1
Gray	8	8	-
White	9	9	-
Gold	-	-1	±5
Silver	-	-2	±10
None	-	-	±20

Marking the resistance with five bands is used for resistors with tolerance of 2%, 1% and other high-accuracy resistors. First three bands determine the first three digits, fourth is the multiplier and fifth represents the tolerance.

For some electrical circuits, the resistor tolerance is not important and it is not specified. In that case, resistors with 5% tolerance can be used. However, devices which require resistors to have a certain amount of accuracy, need a specified tolerance[1].

1.2.1.1 Types of Resistor

- Carbon film resistor: cheap resistor the purpose for use it. It can work on the voltage over resistor, also works without noise on high frequency perfectly.
- Metal film resistor: are used when more accurate value is needed, it depends on low voltage. Works much more accurate in value than other resistors.
- Variable resistor: are used to adjust the operating condition by controlling the volume. Its rotation angle usually about 300 degrees, its value is very easy to adjust.
- Wire wound resistor: used mainly for high power resistors, can be made by curate for measuring circuits, high inductance because consists of wound wire.
- Chip resistor: is passive resistor with a form factor as an integrated circuit (IC chip). They are also known as surface mount resistors.
- Thick film resistor: has medium capacitance, a good long time stability and can survive relatively high temperatures.
- Thin film resistor: it has good voltage dependently rating, good long time stability, low noise and low surges handle capacity.

1.2.2 Capacitors

The capacitor's function is to store electricity, or electrical energy. The capacitor also functions as a filter, passing alternating current (AC), and blocking direct current (DC).This symbol —||— is used to indicate a capacitor in a circuit diagram.

The capacitor is constructed with two electrode plates facing each other, but separated by an insulator. When DC voltage is applied to the capacitor, an electric charge is stored on each electrode. While the capacitor is charging up, current flows.

The current will stop flowing when the capacitor has fully charged.The value of a capacitor (the capacitance), is designated in units called the Farad (F).

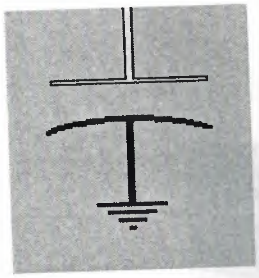


Figure 1.2: Capacitor shape in electronic circuit [2]

The capacitance of a capacitor is generally very small, so units such as the microfarad (10-6F), nano _farad (10-9F), and pico _farad (10-12F) are used. Recently, an new capacitor with very high capacitance has been developed. The Electric Double Layer capacitor has capacitance designated in Farad units. These are known as "Super Capacitors."

Sometimes, a three-digit code is used to indicate the value of a capacitor. There are two ways in which the capacitance can be written. One uses letters and numbers, the other uses only numbers. In either case, there are only three characters used. and denote the same value of capacitance. The method used differs depending on the capacitor supplier. In the case that the value is displayed with the three-digit code, the 1st and 2nd digits from the left show the 1st figure and the 2nd figure, and the 3rd digit is a multiplier which determines how many zeros are to be added to the Capacitance

1.2.2.1 Capacitor Color Code

A colour code was used on polyester capacitors for many years. It is now obsolete, but of course there are many still around. The colours should be read like the resistor code, the top three colour bands giving the value in pF. Ignore the 4th band (tolerance) and 5th band (voltage rating).

For example:

Brown, black, orange means 10000pF = 10nF = 0.01μF.

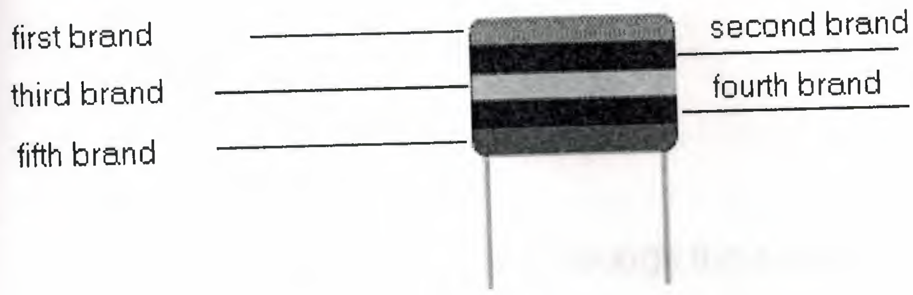


Figure 1.3: capacitor color code [2]

Table 1.2: Capacitor color code [2]

	Colour Code
Colour	Number
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

1.2.2.2 Capacitors and Calculus.

Capacitors do not have a stable "resistance" as conductors do. However, there is a definite mathematical relationship between voltage and current for a capacitor, as follows:

"Ohm's Law" for a capacitor

$$i = C\frac{dv}{dt}$$

Where,

i = Instantaneous current through the capacitor

C = Capacitance in Farads

$\frac{dv}{dt}$ = Instantaneous rate of voltage change (volts per second)

1.2.2.3 Series capacitance

When capacitors are connected in series, the total capacitance is less than any one of the series capacitors' individual capacitances. If two or more capacitors are connected in series, the overall effect is that of a single (equivalent) capacitor having the sum total of the plate spacing of the individual capacitors.

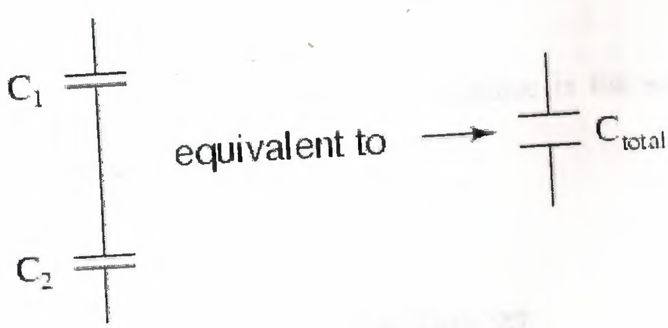


Fig 1.4: Series capacitance.[2]

The formula for calculating the parallel total capacitance is the same form as for calculating series resistances:

Series Capacitances

$$C_{total} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \ldots \frac{1}{C_n}}$$

1.2.2.4 Parallel Capacitance

When capacitors are connected in parallel, the total capacitance is the sum of the individual capacitors' capacitances. If two or more capacitors are connected in parallel, the overall effect is that of a single equivalent capacitor having the sum total of the plate areas of the individual capacitors [2].

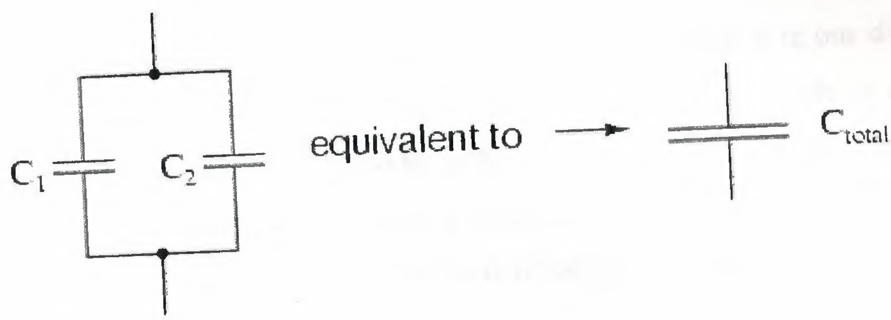


Fig 1.5: Parallel capacitance.[2]

The formula for calculating the series total capacitance is the same form as for calculating parallel resistances:

Parallel Capacitances

$$C_{total} = C_1 + C_2 + \ldots C_n$$

1.2.3 Semiconductor

Are materials which have conductivity between conductors (generally metals) and nonconductors or insulators (such as most ceramics). Semiconductors can be pure elements, such as silicon or germanium, or compounds such as gallium arsenide or cadmium solenoid. In a process called doping, small amounts of impurities are added to pure semiconductors causing large changes in the conductivity of the material

Doping can produce two types of semiconductors depending upon the element added. If the element used for doping has at least one more valence electron than the host semiconductor, then an n-type (negative type) semiconductor is created.

. If the semiconductor is doped with an element having at least one less electron than the host material, then a p-type (positive type) semiconductor

1.2.3.1 Diodes

A diode is an electrical device allowing current to move through it in one direction with far greater ease than in the other. The most common type of diode in modern circuit design is the semiconductor diode, although other diode technologies exist. diodes are essentially "pressure-" operated (voltage-operated) devices. The essential difference between forward-bias and reverse-bias is the polarity of the voltage dropped across the diode.

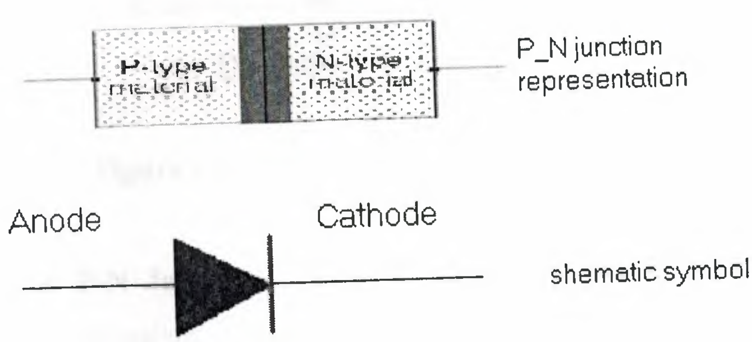


Figure 1.6: Diode [9]

Semiconductor diodes are symbolized in schematic diagrams as such:

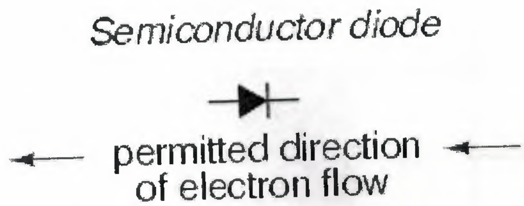


Figure 1.7: Semi conductor diode. [9]

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 [3].

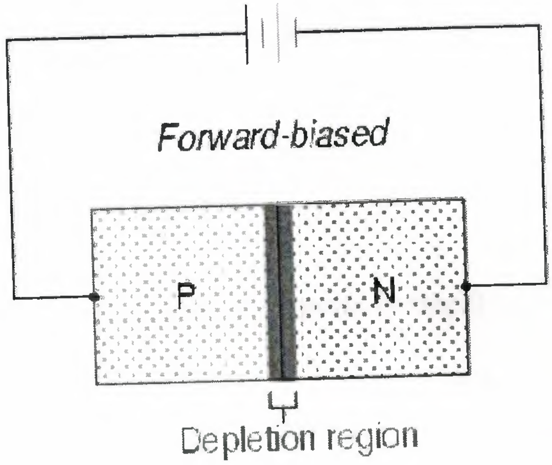


Figure 1.8: Forward biased P-N junction. [7]

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.

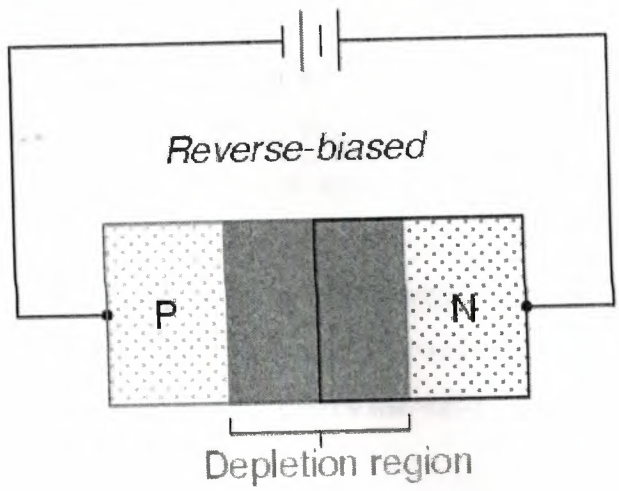


Figure 1.9: Reverse biased P-n junction. [7]

1.2.3.2 Diode Equation.

In actuality, things are more complex than this. There is an equation describing the exact current through a diode, given the voltage dropped across the junction, the temperature of the junction, and several physical constants. It is commonly known as the *diode equation*:

Id = Is (e^qVd/NkT – 1)

Where:

Id =Diode current in amps.

Is =Saturation current in amps (typically current in amps).

e =Euler's constant (2.718281828).

q =charge of electron (1.6*10^-19 coulombs).

Vd =voltage applied across diode in volts.

N =”No ideality” or emission coefficient (typically between 1 and 2).

K =Boltzmann's constant (1.38*10^-23).

T =Junction temperature in degrees Kelvin.

1.2.3.3 LM380N

The LM380Nis a power audio amplifier for consumer applications. In order to hold system cost to a minimum, gain is internally fixed at 34 dB. A unique input stage allows ground referenced input signals. The output automatically self-centers to one-half the supply voltage.

The output is short circuit proof with internal thermal limiting. The package outline is standard dual-in-line. The LM380N uses a copper lead frame. The center three pins on either side comprise a heat sink. This makes the device easy to use in standard PC layouts.

Uses include simple phonograph amplifiers, intercoms, line drivers, teaching machine outputs, alarms, ultrasonic drivers, TV sound systems, AM-FM radio, small servo drivers, power converters, etc. A selected part for more power on higher supply voltages is available as the LM380N.

```
                          +--()--+
             BYPASS | 1   14| VCC
    NON-INV INPUT | 2   13| NC
                 GND | 3   12| GND
                 GND | 4   11| GND
                 GND | 5   10| GND
INVERTING INPUT | 6     9| NC
                 GND | 7     8|
VOUT
                          +------+
```

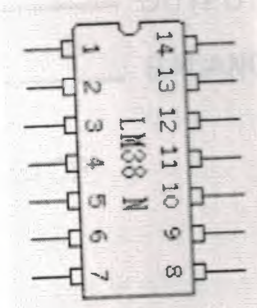


Figure 1.10: LM380N construction. [5]

1.2.3.4 TL081CP

The TL081 is a low cost high speed JFET input operational amplifier with an internally input offset voltage(BI_FET IITM technology). The device requires a low supply current and yet maintains a large gain band with product and fast stew rate.

In addition will matched high voltage JFET input device provide very low input bias and offset currents.

The TL081compatable with the standard LM741 and uses the same offset voltage adjustment circuit. This feature allows designers to immediately upgrade the over all performance of existing LM741 designs.

TheTL081 may be used in applications such as high speed integators,fast D/A converters, sample and hold circuits and many other circuits requiring low input offset voltage, low input bias current high input impedence, high stew rate and wide bandwidth. The device has low noise and offset voltage drift, but for applications, where these requirements are critical, the LF356 is recommended if maximum supply current is important, however the TL081CP is the better choice [3].

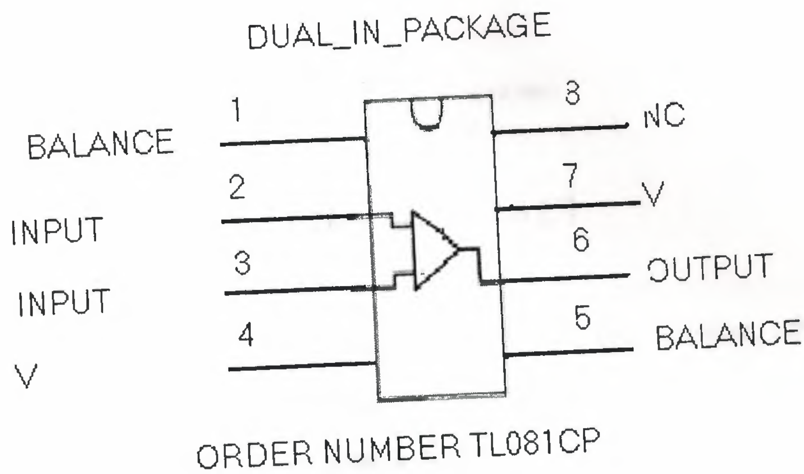


Figure 1.11: TL081CP Construction. [7]

1.2.4 Loudspeaker Details

The loudspeakers are almost always the limiting element on the fidelity of a reproduced sound in either home or theater. The other stages in sound reproduction are mostly electronic, and the electronic components are highly developed. The loudspeaker involves electromechanical processes where the amplified audio signal must move a cone or other mechanical device to produce sound like the original sound wave. This process involves many difficulties, and usually is the most imperfect of the steps in sound reproduction.

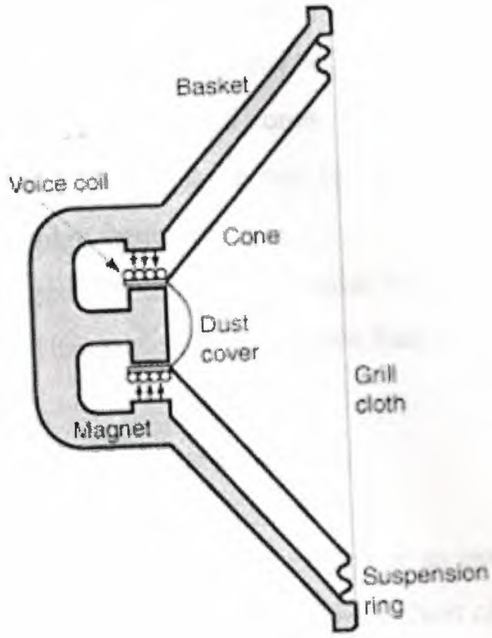


Figure 1.12: Loud speaker.[5]

The most common type of loudspeaker is the MOVING COIL speaker, where a coil of wire is suspended in the magnetic field of a circular magnet. When a speech current is passed through the coil a varying magnetic field is generated by the coil. The two magnetic fields interact causing movement of the coil (see the page on the MOTOR PRINCIPLE). The movement of the coil causes a cone, which is attached to the coil, to move back and forth. This compresses and decompresses the air thereby generating sound waves.

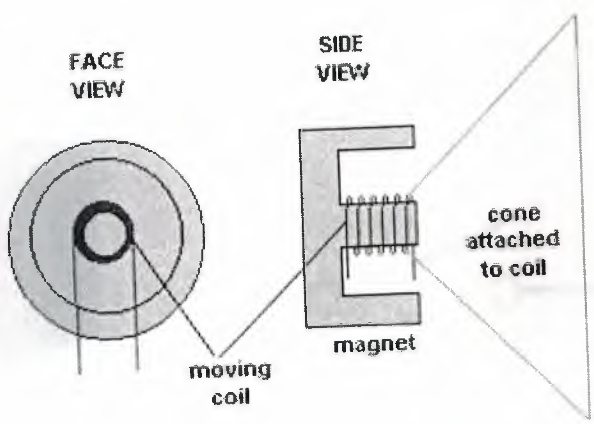


Figure 1.13: Moving Coil Speaker.[5]

The loudspeaker is a TRANSDUCER converting one form of energy to another.

Loudspeakers have Impedance, typically 40 or 80 ohms.Large speakers cannot reproduce high frequencies and small ones cannot reproduce low frequencies. Therefore two speakers are used, a large one (a Woofer) for low frequencies, and a small one (a Tweeter) for high frequencies[4].

Speakers can be connected in series and parallel but the total impedance must match the amplifier impedance. Using a lower impedance than the correct one can blow up the amplifier.

1.2.5 Switches

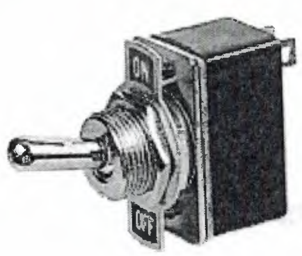
Switches are devices that create a short circuit or an open circuit depending on the position of the switch. For a light switch, ON means short circuit (current flows through the switch, lights light up and people dance.) When the switch is OFF, that means there is an open circuit (no current flows, lights go out and people settle down. This effect on people is used by some teachers to gain control of loud classes.) When the switch is ON it looks and acts like a wire. When the switch is OFF there is no connection[5].

1.2.5.1 Types of SPST Switches

ON-OFF

Single Pole, Single Throw = SPST

A simple on-off switch. This type can be used to switch the power supply to a circuit. When used with mains electricity this type of switch must be in the live wire, but it is better to use a DPST switch to isolate both live and neutral.



SPST toggle switch

Single Pole symbol

Figure 1.14: SPST Toggle Switch and Symbol.[2]

ON-OFF

Push-to-make = SPST Momentary

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

Push-to-make switch

Push_to_make symbol

Figure 1.15: Push_to_make Switch. [2]

ON-(OFF)

Push-to-break = SPST Momentary

A push-to-break switch returns to its normally closed (on) position when the button is released.

Push-to-break switch

Push_to_break symbol

Figure 1.16: Push_to_break Switch. [2]

1.3 Safety Guidelines

In this project applications of low voltage are used. So here safety guidelines are not included human safety but included components safety. Also the technical mistakes which can occur during connecting parts to the circuit cannot be avoided, so heat and current should be taken carefully.

- One of the component which are used in this circuit is the I.C., which is so sensitive, so while connecting its pins to the circuit they have to be attached in accordance with the manufacturing instructions layouts in order to keeping it working properly and without damaging it.
- An other component used in this circuit is loudspeaker, which has to be chosen suitable to the out put signal so as not to destroy diaphragm.
- An other component used in this circuit is capacitor. It should be taken care about connecting it in right way to avoid damaging it
- 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 diodes and capacitors and I.C. 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.

1.4 Summary

This chapter presented an introduction to electronic components that are used in electronic projects, how they function, and how they are built and connected. Safety guidelines are also described.

CHAPTER TWO

INFORMATION ABOUT ALARM SYSTEMS

2.1 Overview

This chapter will present general information about alarm systems.

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].

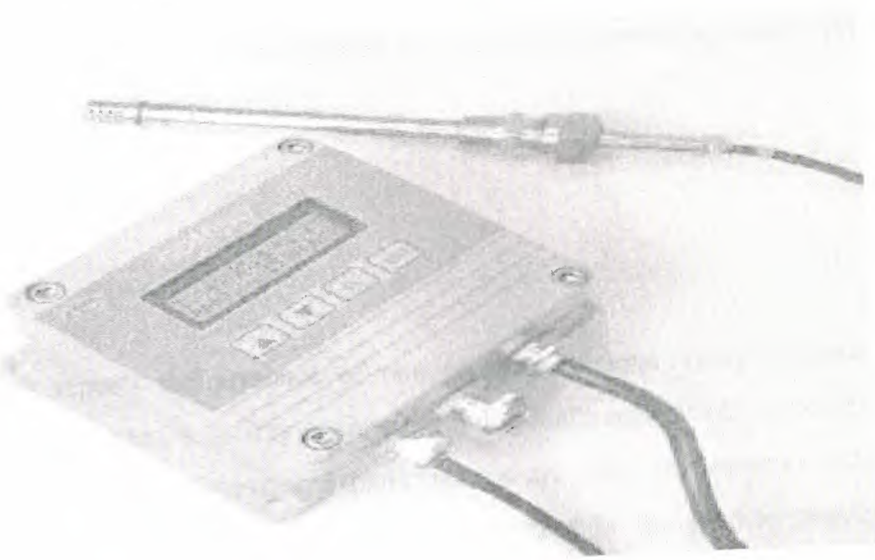


Figure 2.1 It Presented Water Activity Alarm Device [10]

2.3 Types of Alarm Systems

Alarm systems are divided into several broad categories, as listed below. The terms used to identify each type may vary, depending on who is using the term; however, the system 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.

2.4.2 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 is more than merely the restoration-to-normal of a sensor, or an abort message or call from the 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.

2.6.2 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.

2.6.3 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.

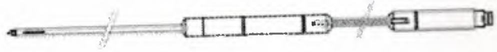


Figure 2.2 One Form Sensors [4]

2.8 Summary

This chapter presented some information about alarm system. We have seen some types 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.

Chapter three

WATER ACTIVATED ALARM

3.1 Overview

This chapter presents an explanation for our circuit diagram, 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 are required, typically +/- 15 V. In other words, $V^{+}_{supply} = 15$ 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.

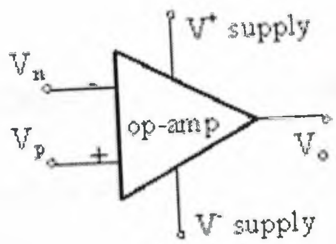


Figure 3.1 Op-Amps in Schematic Circuit Diagram

.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_o. 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.

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 (microvolts) in need of high amplification.

ractice, however, circuits are built with a feedback loop (closed-loop configuration), ı results in $V_n \approx V_p$ otherwise the op-amp will saturate. Saturation means that the ıt voltage clips at some maximum value, typically a couple of volts lower than the ive supply voltage V^+_{supply}. Likewise, saturation can occur at the low end as well, ing at a couple volts greater than the supply voltage V^-_{supply}.

Why we need this device?

We can use this device to detect the water in any place, for example in our homes we ave water pipes in kitchens all this may need to detect when we are have been the of water, in this case we can use this device to put in all places may occur water lack lso we can use this device in swimming pools as we seen before in first case, we can many sensors for any place around the pool, and it will be signal by LED or by ring 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 our homes or any other place, for example we can use it in the homes water tanks as see (electrical circuit of pump).

mponents 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)

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

- C1 100 ɳF Polyester (Brown, Black, Yellow, Black, Red)
- C2 33 μF 10 V Tantalum
- C3 10 ɳF 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 LM 380N
- 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)

ne 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 c or other insulated base, with the smallest possible gap between the two wires. natively a small piece of strip board or a sensor made from printed circuit board l be used.

C1 TLO81CP

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

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

unity-gain condition in the feedback loop is met when

$$A_{cl} = 3 \tag{3.2}$$

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

$$R_1 = 2R_2 \tag{3.3}$$

n

$$A_{cl} = \frac{1}{B} = \frac{1}{R_2/(R_1+R_2)} = \frac{R_2+R_1}{R_2} = \frac{3R_2}{R_2} = 3 \tag{3.4}$$

rt-up Conditions

itially, the closed-loop gain of the amplifier must be more than 1 until the output lds up to a desired level, which is happened through R_2 (variable resistor).

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e that the voltage divider network has been modified to include an additional or, R_3. This places R_3 in series with R_1, thus increasing the closed-loop gain follows.

$$A_{cl} = \frac{1}{B} = \frac{R_1 + R_2 + R_3}{R_2} = \frac{3R_2 + R_3}{R_2} = 3 + \frac{R_3}{R_2} \tag{3.5}$$

Tr1 BC109C

e bypass capacitor viewed from the base, R_{in} is the ac resistance. The actual stance seen by the source includes that of bias resistors.

addition to seeing the ground through the bypass capacitor, the signal also sees und through the dc supply voltage source, V_{cc}. It does so because there is zero signal age at the V_{cc} terminal. Thus, the $+V_{cc}$ terminal effectively acts as ac ground. As a ult R_4 and R_5, appear in parallel to the S1 (switch), because one end of R_5 goes to ual ground and one end to R_4.

IC2 LM380N

Oscillators (Class c Amplifiers) are biased so that conduction occurs for much less than 0^0. Class C amplifiers are normally limited to applications as tuned amplifiers at radio equencies (RF).

In this case, two RC lag networks have a total phase shift of 180°. The common emitter ansistor contributes a 180° phase shift. The total phase shift through the amplifier and eedback circuit therefore is 360°, which is effectively 0°. The attenuation of the RC etwork and the gain of the amplifier must be such that of the overall gain around the eedback loop is equal to 1 at the frequency of oscillation.

xplanation

sor simply consists of two pieces of metal placed very close together and by an insulating material. Thus there is normally an extremely high resistance he two metal electrodes, but if they are bridged by water which has significant content there will be a fairly low resistance between them. Therefore, TR2 is cut off and passes only minute leakage currents, but if the sensor is activated ased hard into conduction and supplies virtually the full supply voltage to the nerator circuit which is based on IC1 and IC2.

sed as the tone generator and its output is coupled to LS1 by C4. The operating y of IC2 can be varied up and down by increasing and decreasing the base ed to TR1. This modulation is provided by IC1 which is used as a simple very uency oscillator having an operating frequency of only about 0.5 Hertz.

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

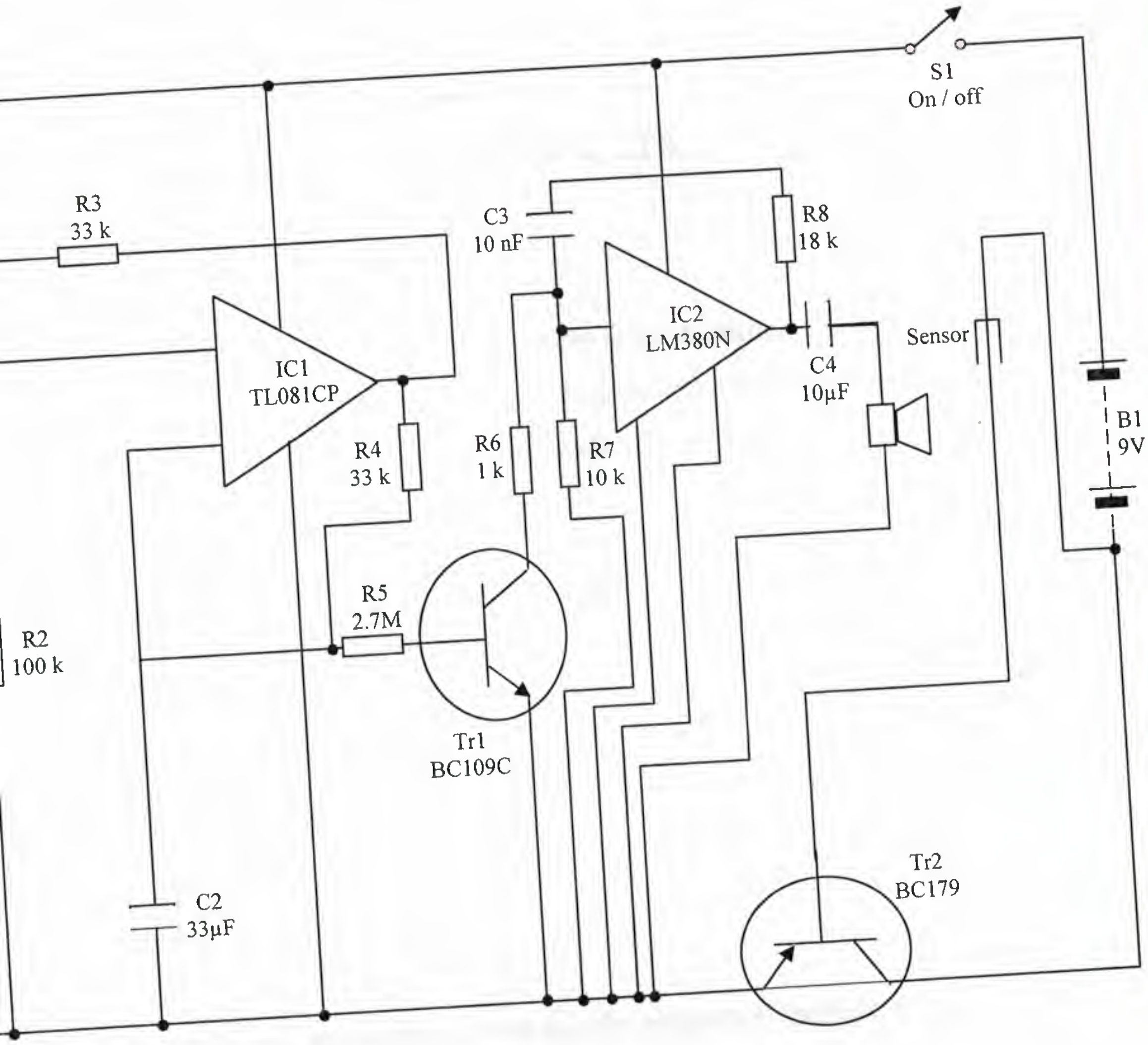

Figure 3.2 Circuit Diagram of Water-Activated Alarm

mary

his chapter presented detailed technical information about the water-activated
We included the components of this project. As well as the circuit diagrams, Circuits
put graphs of various parts of the circuit.

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CHAPTER FOUR

MODIFICATIONS & RESULTS

verview

This chapter is the fourth chapter and it will specialize in the modifications we included : water activated alarm, the new components and instruments we have been added to the decided goal which is the modification we want, we will include also the final es for the project from its inside and outside form.

lodification components of the water activated alarm

The modification components are:

- RELAY 1: 12 V-DC-SL-C, 240VAC, 7A
- R1, R2, R3: 500 OHM
- LED1, LED2, LED3
- PUMP: 12V

Ve have one resistor; a potentiometer it is a manually-adjustable, variable resistor. It is nonly used for volume and tone controls in stereo equipment. But here we use it to make ice or equilibrium point for the circuit, we will explain this later.

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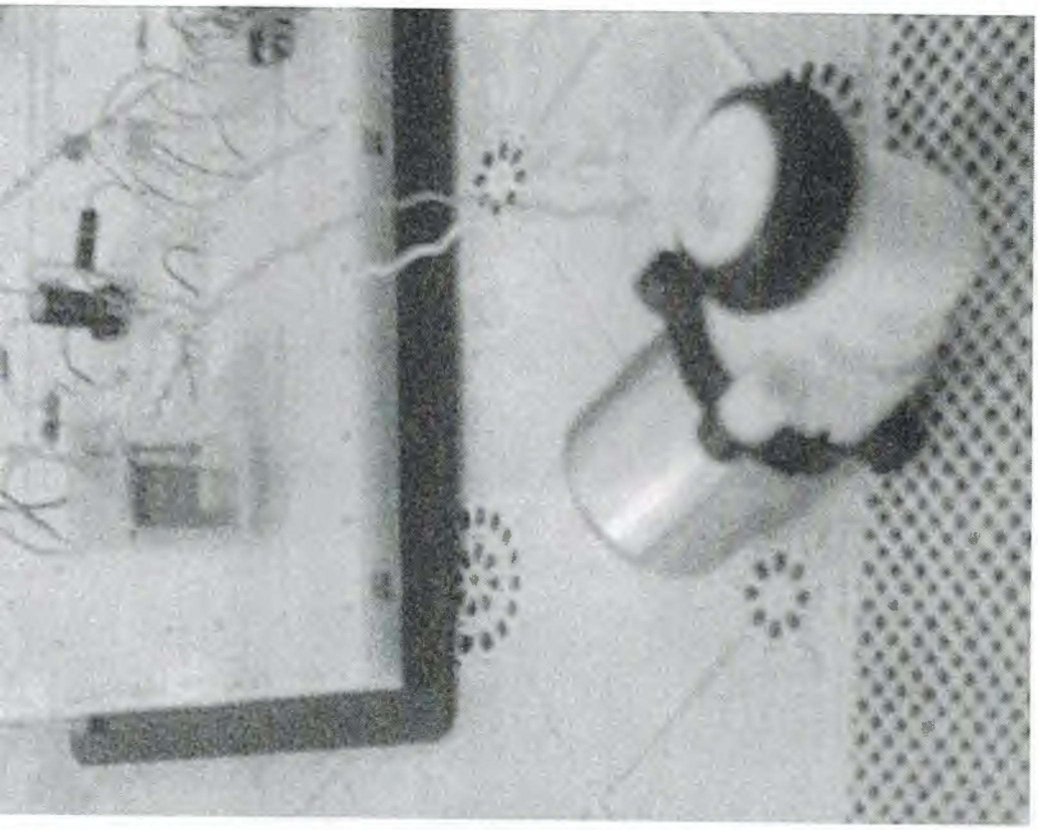

Figure 4.1 the pump and relay on the brat board (white board).

The explanation of the water activated alarm

The circuit which we were dealing with (without modification) was working when any er detection happen between the tow sides of the sensor (the base side and the collector).

The modification that we added to the project is the pump which is working with a relay ve labeled before, the duty of the pump is emptying the water from the first tank to the ond tank and this application is useful to avoid the water flowing and for saving water.

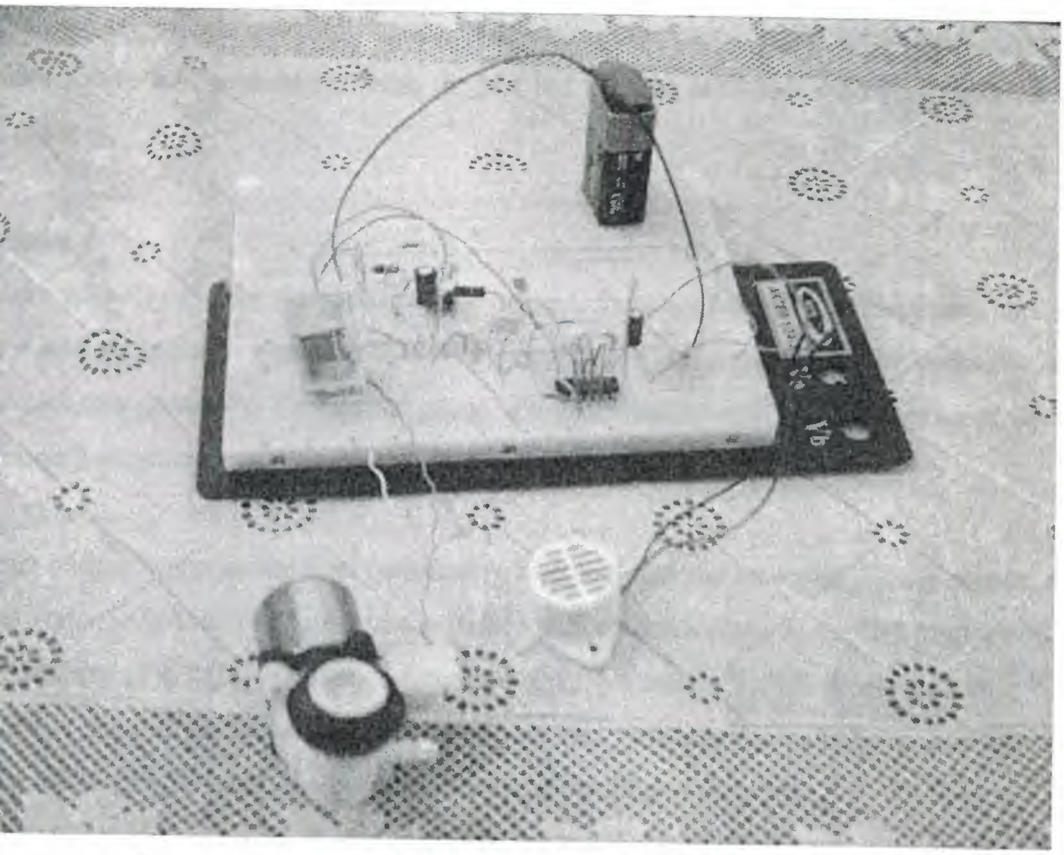

Figure 4.2 the modificated circuit of water activated alarm.

the figure shown above there is a pump which is connected to the relay, the job of the s ensuring the performance of the pump with 12V, because the circuit is adjusting to ith 9V (the battery volt).

v sides of the core are being connected together when the 9V which coming from the is flowing among the core so the pump will work with 12V given from the relay this

evious figure (4.2) shows the modificated form of the project, as we see the pump is ed; we have three leds the red led (LED1), the yellow led (led2), the green led .

e yellow led is the rest led that means it will work even the circuit is on or off, that's ed will operate when the circuit is on (there is water detection) and the green led will

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e when the circuit is off (no water detection), in the case the red led is working pump /ork so we will understand from the red led that the action of emptying the water is place.

esults

Iere we will describe the testing of the project, there are tow plastic containers, the first : container includes the tow sides of the sensor are being put inside the container, and en the tow containers there is the pump, the green led is working only that mean we are normal situation.

tart putting water in the first container which includes the tow sides of the sensor, and ie water level will increase and the sensor will send tow signals, the first signal will go transistor (TR BC179C) then the current will flow among the speaker which will make id also the red led will be on, the second current will pass through the coil of the relay en the relay will work, the pump will work according to the relay.

'he yellow led will work in this case even we made rest to the circuit.

Summary

The fourth chapter which we were dealing with included the performed modifications :he water activated alarm, the new components used in the modifications and some tos and pictures for the different forms of the project.

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CONCLUSION

finished the water activated alarm with the desired modifications, and we t the modifications we had added are very useful now a day and in the future. is very important so the pump which we added will help for saving the water r side the project was so useful for me because I learned too many new things e electrical wiring, using new components I did not use before and the main de is to increase my knowledge in different fields.

of this project were:

ljust the pump which is working with 12V on the circuit which is working with battery volt (9V), we were able to do this by using the relay we labeled before.

void the water flow and to save the most valuable thing in the world which is ter.

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