NEAR EAST UNIVERSITY

Faculty of Engineering

Department of Electrical and Electronic Engineering

Water Activated Alarm
EE-400'

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The root of this success lies under the most uncomplaining of my loving FATHER. I am grateful to him to assist me to grow in knowledge.

I would also like to thank all my friends for their help and for their patience.

ABSTRACT

As the life is getting more complicated, every one is 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 system is water activated alarm and which is consider as an important tools in our life to give us in the protection and safety.

First the water activated system, its simple circuit that is designed to feel the sensitivity of 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.

For the flood warning system there a small obstacle in connecting the relay.

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CHAPTER TWO

INFORMATION ABOUT ALARM SYSTEMS

Introduction

Generally, electronic security alarm systems are recognized in the entire world as an important interrupter to securing life, property and possessions. The alarm system is an effective tool when used in conjunction with other sensible, overall expectation measures. Independent studies clearly show that premises with alarm systems are less likely to be broken into. As illustrated by these studies, electronic alarm systems, without question, contribute to a safer environment for you and your family. An alarm system is installed to deter and detect intruders. 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; 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.

In this project we are designing simple alarm systems such as flood warning system which has a lot of application in our real life.

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 represent 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).

CHAPTER ONE
ELECTRONIC COMPONENTS

1.1 Overview

This chapter includes the basic electronic components that are commonly used in projects like some semiconductors, capacitors and resistors. And present safety guidelines for electronic projects.

1.2 Basic Definitions

1.2.1 Resistance is the opposition to current

The schematic symbol for resistance is shown in figure 1.1.
When current flows through any material that has resistance, heat is product by the collisions of electrons and atoms. Therefore, wire, which typically has a very small resistance, becomes warm when there is current through it.

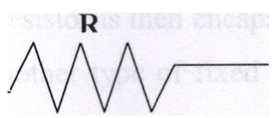


Figure 1.1 Resistances / Resistor Symbol.

1.2.2 Ohm: The Unit of Resistance

Resistance, R, is expressed in the unit of **ohms,** named after George Simon Ohm and is symbolized by the Greek latter omega (O.).

One ohm (10.) of Resistance exits when one ampere (IA) of current.flows in a material when one volt (1 VJ is applied across the material.

.2.3 Resistors

Components that are specifically designed to have a certain amount of Resistance are ~..•lled resistors. The principle applications of resistors are to limit current, divide voltage, d, in certain cases, generate heat. Although there are a variety of different types of resistors that come in many shapes and size, they can all be placed in one of two main :ategories: fixed or variable.

.2.3.1 Fixed Resistors

The fixed resistors are available with a large selection of resistance values that are set ~uring manufacturing and cannot to be changed easily. Fixed resistors are constructed ing various methods and materials. Several common types are shown in figures 1.2.

e common fixed resistor is the carbon-composition type, which is made with a mixture or finally ground carbon, insulating filler, and a resin binder. The ratio of carbon to .asulaıing filler sets the resistance value. The mixture is formed into rods, and lead connections are made. The entire resistor is then encapsulated in an insulated coating for rotection. The chop resistor is another type of fixed resistor and is in the category of ::vIT (surface mount technology) components. It has the advantage of a very small size or compact assemblies.

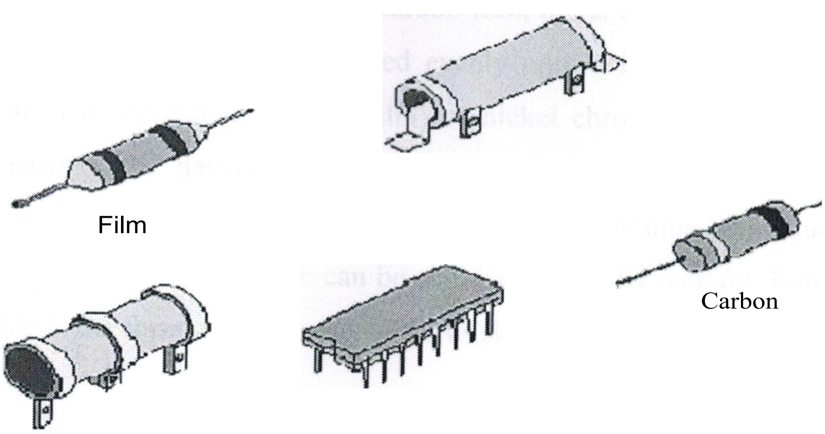
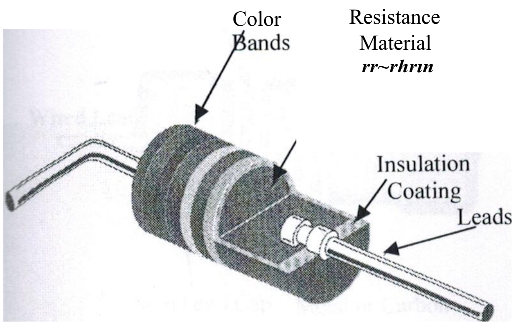
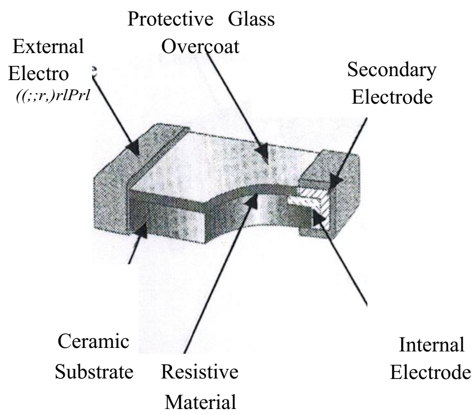


Figure 1.2 Typical Fixed Resistors. Parts (a) and (b) Courtesy of Stack pole Carbon Co. (c) Resistor Network



(a)



(b)

Figure 1.3 Two Types of Fixed Resistors (a) Cutaway View of a Carbon-Composition Resistor, (b) Cutaway View of a Chip Resistor

Figure 1.3 (a) shows the construction of a typical carbon -composition resistor and figure 1.3 (b) shows the construction of a chip resistor.

Other types of fixed resistors include carbon film, metal film, and wire wound. ln film esistors, a resistive material is deposited evenly onto a high-grade ceramic rod. The resistive film may be carbon (carbon film) or nickel chromium (metal film). In these pes of resistors, the desired resistance value is obtained by removing part of the resistive material in helical pattern along the rod using a spiraling technique as shown in figure 1.4 (a). Very close tolerance can be achieved with this method. Film resistors are also available in the form of resistor networks as shown in figure 1.4 (b).

1.2.3.2 Resistor Color Codes

Many types of fixed resistors with value tolerances of 5%, 10%, or 20% are color coded with four bands to indicate the resistance value and the tolerance.

This color-code band system is shown in figure 1.6, and the color code is listed in Table 1.1.

The color code is read as follows:

1. Beginning at the banded end, the first band is the first resistance value. If it is not clear which is the banded end, start from the end that does not begin with a gold or silver band.
2. The second band is the second digit.

Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Gray	White
0	1	2	3		5	6	7	8	9

Table 1.1 Resistor Color Code

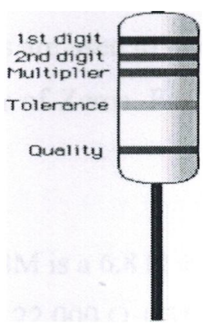


Figure 1.6 Color-Code Bands on a Resistor

1. The third band is the number of zeros following the second digit, or the multiplier.
2. The fourth band indicates the tolerance and is usually gold or silver.

For example, a 5% tolerance means that the actual resistance value is within± 5% of the color-coded value. Thus, a 100 n resistor with a tolerance of± 5% can have acceptable value as low as 95 n and as high as 105 O.

For resistance values Jess than 10 n, the third band is either gold or silver. Gold represents a multiplier of 0.1, and silver represents O.Ol. For example, a color code of red, violet, gold, and silver represents 2.7 n with a tolerance of± 10%.
Certain precision resistors with tolerance of 1% or 2% are color coded with five bands. Beginning at the bands end, the first digit of the resistance value, the second band is the second digit, the third is the third digit, the fourth band is the multiplier, and the fifth band indicates the tolerance. Table 1.1 applies, except that gold in the fourth band indicates a multiplier of 0.1 and silver indicates a multiplier of O.Ol.
Brown in the fifth band indicates 1% tolerance and red indicates 2% tolerance.

Numerical labels are also commonly used certain types of resistors where the resistance value and tolerance are stamped on the body of the resistors. For example, a common system uses R to designate the decimal point and letters to indicate tolerance as follows:
F =± 1%, G=±2%, J = ± 5%, K=± 10%, M=±20%

For values above 100 D, *three digits* are *used to indicate resistance value, fa/lowed by* a fourth digit that specifies the number of Zeros. For values less than 100 O, R indicates the decimal point.

Some examples are as follows: 6R8M is a 6.8 n± 20% resistor; 3301F is a 3300 n± 1% resistor; and *22021* is a 22,000 n± 5% resistor.

1.2.3.3 Resistor Reliability Band

A fifth band on some color-coded resistors indicates the resistor's reliability in failures per 1000 hours (1000 h) of use. The fifth-band reliability color code is listed in Table 1.2. For example, a brown fifth band means that if a group of like resistors are operated under tandard conditions for 1000 h, 1% of the resistors in that group will fail.

Table 1.2 Fifth-Band Reliability Color Code

Color	Failures During 1000 Hof Operation
Brown	1.0%
Red	0.1%
Orange	O.Ol%
Yellow	0.001%

1.2.3.4 Variable Resistors

Variable resistors are designed so that their resistance values can be changed easily with a manual or an automatic adjustment.

Two basic uses for variable resistors are to divide voltage and to control current. The ariable resistor used to divide voltage is called a **Potentiometer.** The variable resistor used to control current is called a rheostat. Schematic symbols for these types are shown in figure 1.7. The potentiometer is a three-terminal device, as indicated in part (a). Terminals 1 and 2 have a fixed resistance between them, which is the total resistance. Terminal 3 is connected to a moving the contact up or down.

Figure 1.7 (b) shows the rheostat as a two-terminal variable resistor. Part (c) shows 1 or terminal 2. Part (d) shows a basic simplified construction diagram of a potentiometer. Some typical potentiometers are pictured in figure 1

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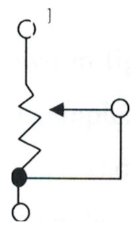
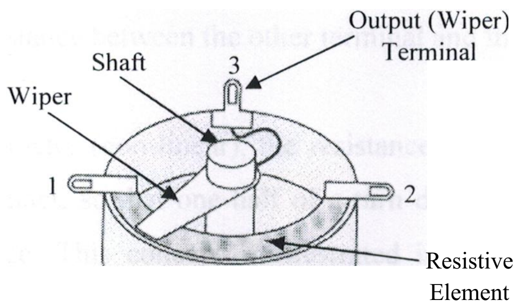
(a) Potentiometer

(b) Rheostat



(c) Potentiometer connected as rheostat



(d) Basic Construction

Figure 1.7 Potentiometer and Rheostat Symbols and Basic Construction of One Type of Potentiometer

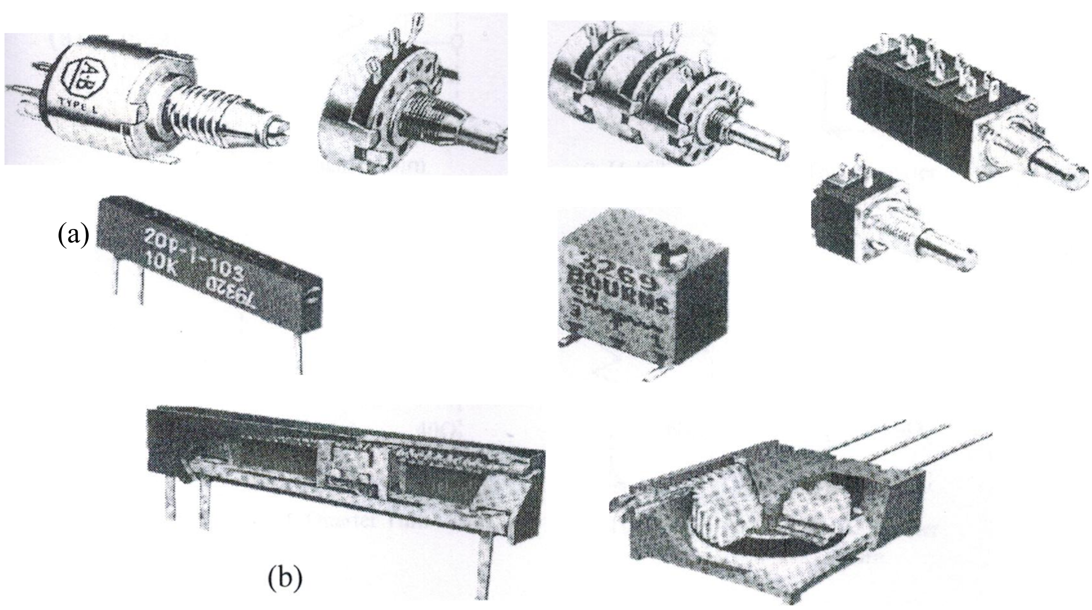


Figure 1.8 (a) Typical Potentiometers, (b) Trimmer Potentiometer

Potentiometers and rheostats can be classified as linear or tapered, as shown in figure -~, where a potentiometer with a total resistance of 100 Ω is used as an example. As snown in part (a), in a linear potentiometer, the resistance between both terminal and the ..oving contact varies linearly with the position of the moving contact. For example, one- -alf of a turn results in one-half the total resistance. Three-quarters of a turn results in ıaree-quadrates of the total resistance between the moving contact and one terminal, or ne-quarter of the total resistance between the other terminal and the moving contact.

ln the **tapered** potentiometer (non-linear), the resistance varies nonlinearly with the osition of the moving contact, so that one-half of a turn does not necessarily result in ne-half the total resistance. This concept is illustrated in figure 1.8 (b), where the nonlinear values are arbitrary.

The potentiometer is used as a voltage-control device because when a fixed voltage is pplied across the end terminals, a variable voltage is obtained at the wiper contact with respect to either end terminal.

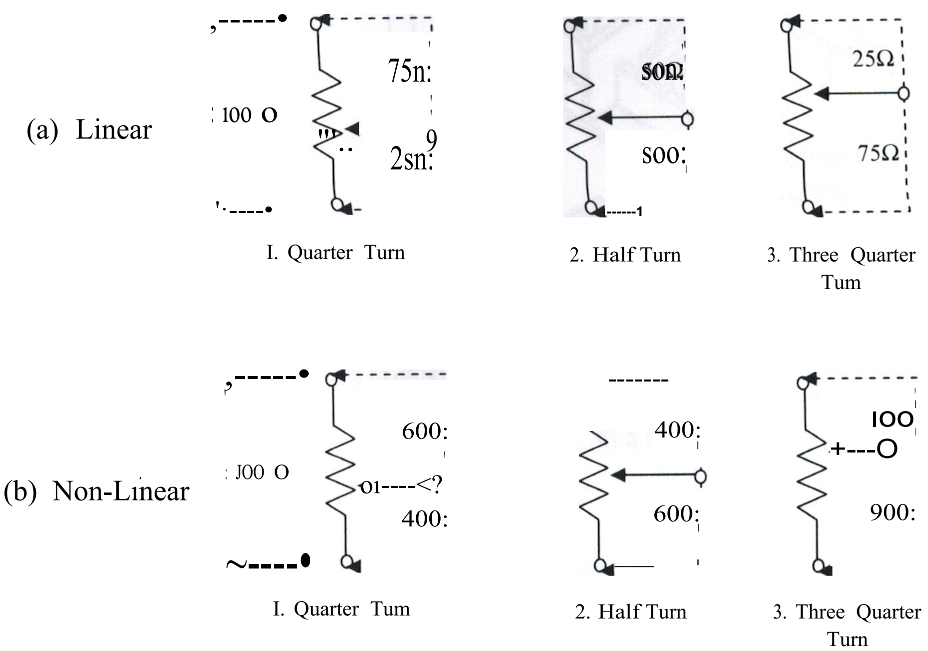
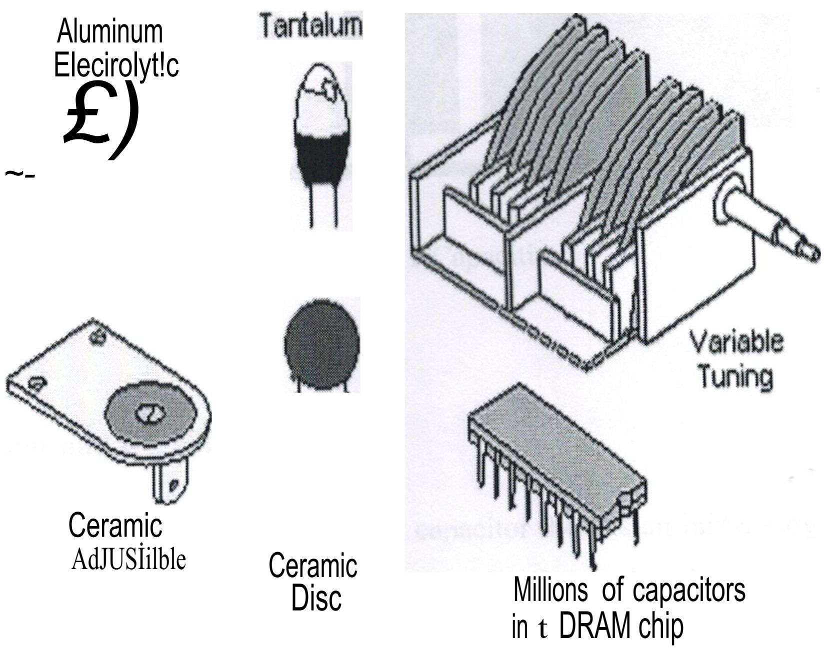


Figure 1.9 Examples of (a) Linear, (b) Non-Linear Potentiometer

1.3 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 uch a large amount of capacitance that it would be impractical to use in most situations. In figure 1.10 shown the types of capacitors [2].



. **Figure 1.10** Types of Capacitors.

1.3.1 Capacity

This analogy should help you better understand capacity. In the following diagram (Figure 1.11), 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.

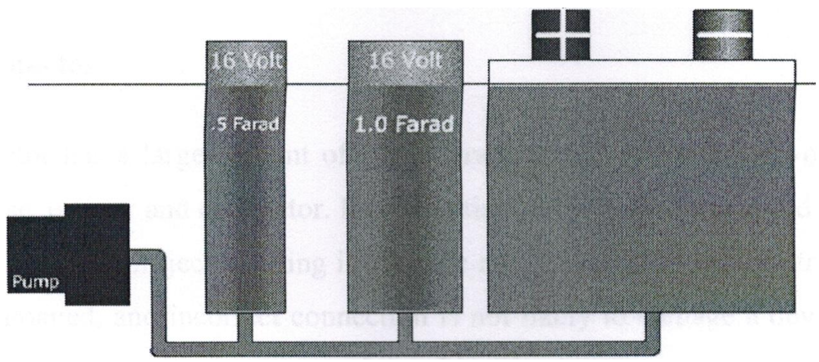


Figure 1.11 Capacities.

1.3.2 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 urrent flow stops. When the current stops flowing from the power supply to the apacitor, 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

·· e a battery. It only serves to fill in what would otherwise be very small dips in the supply voltage [2].

1.3.3 Capacitors and AC voltage

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

.4 Semiconductor

emiconductor 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 ·--ere 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 .:omponents in the circuit) only one type is used in this project.

1.4.1 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 1.12 there are two symbol of type of bipolar transistors.

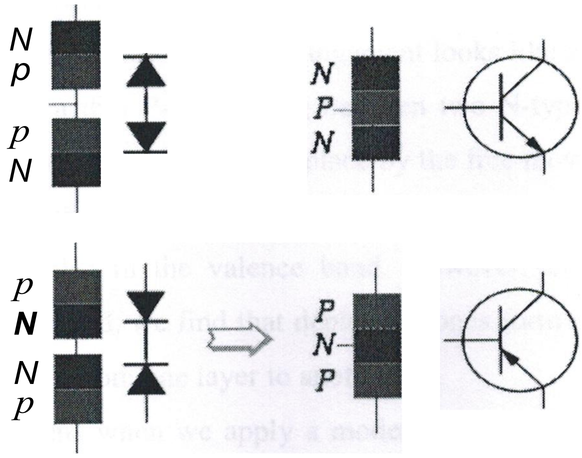


Figure 1.12 Symbol ofNPN and PNP transistors.

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 1.13 shows the energy levels in an NPN transistor.

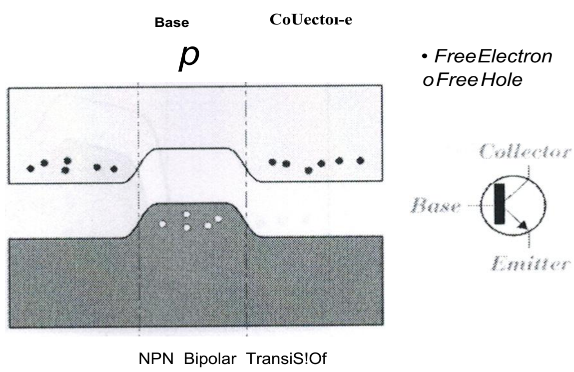


Figure 1.13 the Energy Levels in an NPN Transistor.

Figure 1.13 shows the energy levels in an NPN transistor when we aren't externally , , lying any voltages. We can see that the arrangement looks like a back-to-back pair of _; 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 -"' conduction band. In the P-type (filling) layer conduction can take place by the -.,,·ement of the free holes in the valence band. However, in the absence of any temally applied electric field, we find that depletion zones form at both PN-Junctions, o charge wants to move from one layer to another [3].

ider now what happens when we apply a moderate voltage between the Collector " Base parts of the transistor. The polarity of the applied voltage is chosen to increase "'force pulling the N-type electrons and P-type holes apart. (I.e. we make the Collector sitive with respect to the Base.) This widens the depletion zone between the Collector base and so no current will flow. In effect we have reverse-biased the Base-Collector e junction. The precise value of the Base-Collector voltage we choose doesn't really cıaner to what happens provided we don't make it too big and blow up the transistor! So the sake of example we can imagine applying a 10 Volt Base-Collector voltage. As cown in the figure 1.14 the applying collector-base voltage.

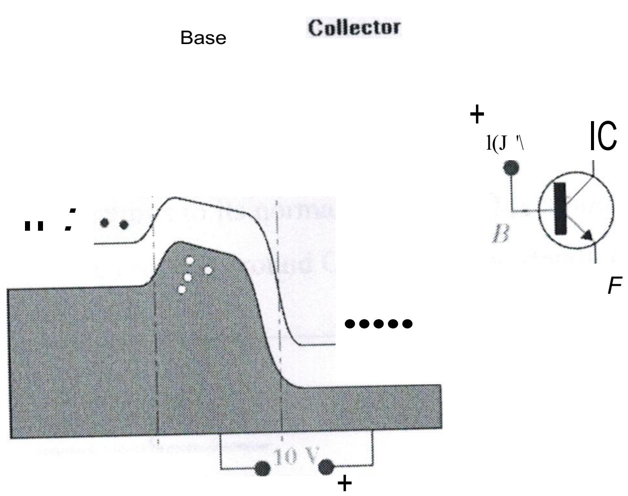
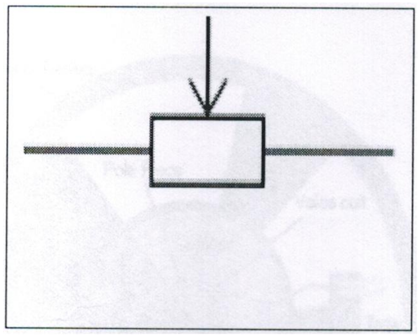


Figure 1.14 the Applying Collector-Base Voltage.

..5 Potentiometer

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



Figurel.15 Potentiometer Symbol

1.6 Switches

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.

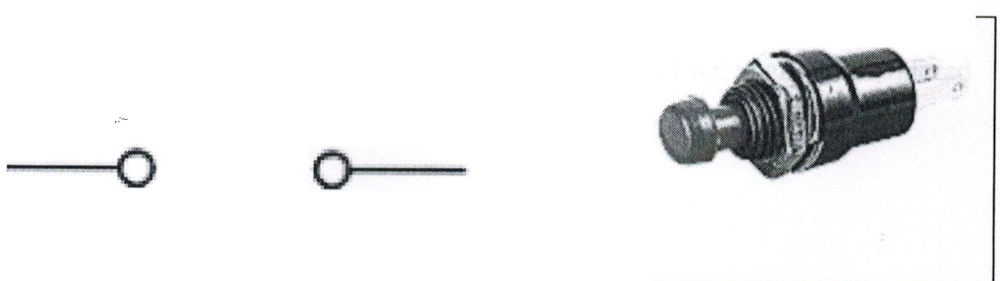


Figure 1.16 Push-to-Make Switches

1.7 Loudspeaker

A **loudspeaker, or speaker,** is an electromechanical transducer which converts an electrical signal into sound. The term loudspeaker is used to refer to both the device itself, and a complete system consisting of one or more loudspeaker **drivers** (as the individual units are often called) in an enclouser. The loudspeaker is the most variable element in an audio system, and is responsible for marked audible differences between ystems

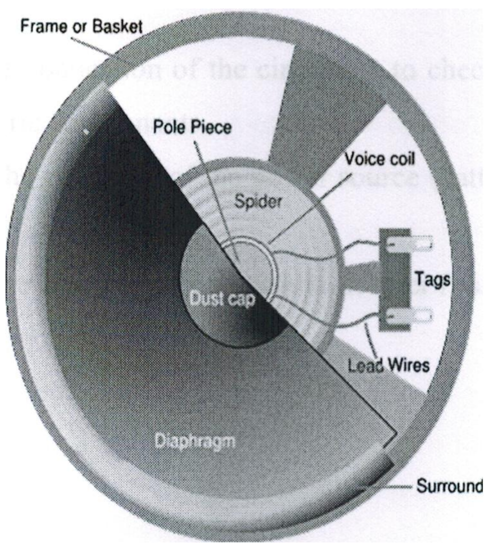


Figure 1.17 Close up of a loudspeaker driver

Cut-away view of a dynamic loudspeaker. The lead wires as shown are for illustration purposes. Commonly the voice coil wires are soldered to the lead wires and the soldered joints are glued to the diaphragm, close to the dust-cap periphery

.8 Safety Guidelines

1. Read the data sheet of any electrical instrument before using it in the circuit.
2. Be careful with chips pins when we plant them in the board not to break them.
3. Be careful while connecting the ground and voltage supply because mix them will cause the burning of the chips.
4. Be careful with the arrangement of the transistor pins (base, emitter, and collector) not to mix them, which lead to short cut and sometimes to be burned.
5. Be careful when shifting probes in a live/active circuit; be sure to shift using only one hand: It is best to keep the other hand off other surfaces and behind your back.
6. After finishes the connection of the circuit try to check that there is no short cut between the electric components
7. Be careful with the polarities of the power source (battery) when we connect it in any circuit.
8. Be careful with the power source to tum it off after finished.

1.8 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.

CHAPTER TWO

INFORMATION ABOUT ALARM SYSTEMS

2.1 Overview

This chapter will introduce general information about alarm systems and different _pes of alarm systems.

2.2 Alarm System Categories

The Alarm System is a detection signal system that is considered to be the .:ombination of interrelated signal initiating devices, signal indicating devices, control ~.:uipment, and interconnecting wiring installed for a particular application monitored Alarm System.

An alarm system which reports detected conditions to a monitoring facility monitoring acilities 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 arm system is called a Proprietary system. Protected Premises the physical site at which an alarm system is installed and operational [9].

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 svstem we will description as we see later.

2.3.1 Water Flood Alarm

Water leak detector. Unit shall have gold plated adjustable sensing probes to detect water from 0 to 1/8 inch *above* surface. *All* electronic circuitry *shall* be encapsulated in epoxy to protect from dirt, fungus and short term emersion in water. Unit shall provide DPDT (2 form C) relay contact outputs rated at l amp at 28vdc Max. for tie-in to existing alarm panels, building management systems or similar. Unit shall be powered with (2) 9v aline battery or separate power supply. Unit shall also be able to be powered with 12- AC or DC using separate voltage module. Unit shall be able to accept and monitor l r 2 lengths of water leak detection cable via locking plug-in connectors.

_.3.2 Fire Alarm

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

2.3.3 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.

2.3.4 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,

• drug storage area, or area containing confidential records. The intent is generally ·o 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 empt [9].

.3.5 Panic Alarm

stem that reports a more general type of perceived emergency, including the sence of one or more unruly or inebriated individuals, unwanted persons trying to gain :, observed intruders in a private yard or garden area, or a medical emergency. ovides police with little specific information, but is often the only way a user can call - assistance under abnormal conditions.

.6 Single Sensor Alarm

Those types from (2.3.7-2.3.8) are important in my project because it is including :ne information about it. A sensor detects the emergency condition and causes an alarm e transmitted to the monitoring facility or to be indicated audibly or visually. Some ors use single switches to trigger the alarm; other sensors require that two switches ctivate before the alarm is triggered. Some sensors use two or more detection technologies and require that two or more technologies sense the emergency condition fore the alarm is triggered. All of these are single sensors.

2.3.7 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 ergency response or dispatch personnel are not normally contacted when these alarm sterns detect a problem; protected property maintenance personnel tend to be notified . the monitoring facility.

__..8 **Sequential Alarm**

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

2.3.9 Industrial Process Alarm

A system that provides supervision for a wide variety of commercial and industrial _recesses, 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 is important about my project.

2.4 Event Types

We will present 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 triggrs 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 tube a dispatch able event, a request for response is made to the appropriate response agency or agencies.

2.4.2 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.

2.4.3 Transmission Test

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

2.4.4 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.

_.4.5 Reset

A return to normal operation for an alarm system that has been in a trouble condition, ut of service, or in an alarm condition. When a system has been "reset" it is back in full eration 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

_.4.6 Abort

A telephone 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 eing 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 ıo 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 een detected. Audible devices include electronic sounders, bells, horns, and sirens. isual 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 pecific 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.

2.7 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 ystem-designed feature that requires two or more sequential activations of the sensor efore 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 iquid 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 apacitance when a person touches or comes in close proximity to an object, such as a afe or file cabinet, insulated from electrical ground potential. Vibration Sensor: A ensor that detects vibrations generated during forced entry or an attempted forced entry.

Water Alert Sensor Cable. Unit shall have embedded gold plated nickel sensors every 3 feet. Cable shall be ultra flexible and contain an end-of-line test push button. The cable may not absorb, trap or wick moisture into the cable for detection, (resulting in long "dry-out" periods and required cleaning). Cable length is 12 feet, one or two cables of any standard length can connect to any Water Alert Detector

2.7.1 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.

2.8 Detects Water and Sounds Alarm

1. Helps prevent costly water damage which may not be covered by insurance
2. Warns of leaks and overflows in bath, kitchen, laundry, furnace, computer rooms or anywhere there is a potential for leaks
3. Low battery signal tells user when it's time to replace the battery

4. Circuit test bar ensures system is working
5. Alerts user within hearing range that water has reached desired level when used to monitor the filling of pools, tubs, sinks, aquariums and more
6. An ideal backup system for sump and bilge pumps in residential, commercial and marine applications
7. Sensor and alarm can be placed up to 6 feet apart

2.9 Summary

This chapter presented some information about alarm systems and other types of alarm systems and how we can use the alarm systems in general. Also we have seen the using of alarm systems specially the flood warning alamı.

CHAPTER3

WATER ACTIVATED ALARM

3.1 Overview

This chapter presents an explanation for our circuit diagram, its parts, aim of each art, 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.

1. An operational amplifier (usually abbreviated op-amp) is an integrated circuit (IC) which amplifies the signal across its input terminals.
2. Op-amps are widely used in the electronics industry, and are thus rather inexpensive.
3. Op-amps are analog, rather than digital devices, although they are used in many digital instruments.
4. 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.

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 voltages are required, typically +/- 15 V.

2. In real applications, any + and - voltage between about 10 to 20 V can be used, depending on the manufacturer's specifications.
3. The signal input terminals are on the left. There is a positive input terminal, V_p, and a negative input terminal, V_0. Note however, that the actual input voltages do not need to be positive and negative for inputs VP and V_n, respectively.
4. In fact, the VP input is usually referred to as the no inverting input and the V_n input as the inverting input, respectively.

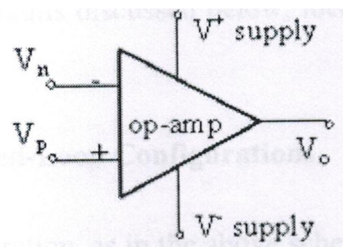


Figure 3.1 Op-Amps in Schematic Circuit Diagram

3.2.2 Ideal versus Actual Op-Amps

1. An ideal op-amp has infinite input impedance, so that it has no effect on the input voltage. This is called no input loading.
2. 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.
3. A direct result of the high input impedance is that we may assume negligible current flowing into (or out of) either op-anıp input, VP or V_0. This result helps us to analyze op-amp circuits, as discussed below.
4. 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.

6. 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.
7. An actual op-amp has a very high, though not infinite, gain. Gain g is typically in the 10^5 to 10^6 range.
8. 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, $Y_0 = (V, - Y_0)g$ i.e. the output voltage Y0 is a factor of g times the input voltage difference, $Y_P - Y_0$. This might be useful if the incoming signal is extremely small (microvolt) in need of high amplification.

In practice, however, circuits are built with a feedback loop (closed-loop configuration), which results in $V_n \approx V_P$ 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)

1. R1 100K (Brown, Black, Yellow, Gold)
2. R2 100K (Brown, Black, Yellow, Gold)
3. R3 33K (Orange, Orange, Orange, Gold)
4. R4 33K (Orange, Orange, Orange, Gold)
5. *R5* 2.7M (Red, Violet, Green, Silver)
6. R6 1K (Brown, Black, Red, Gold)
7. R7 10K (Brown, Grey, Orange, Gold)
8. R8 18K (Brown, Grey, Orange, Gold)

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

9. C1 100 µF Polyester (Brown, Black, Yellow, Black, Red)
10. C2 33 µF 10 V Tantalum
11. C3 10 µF Polyester (Brown, Black, Yellow, Black, Red)
12. C4 10 µF 25V Electrolytic

We have two Integrated circuits and two Transistors.

13. IC1 TL 081 CP
14. IC 2 LM 380N
15. Tr 1 BC 109 C
16. Tr 2 BC 179

The switch that will be used in the circuit is:

a. S1 (SPST) Miniature toggle type

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

c. LSl The value between (40 - 80 ohms)

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

e. The sensor is made using two non insulated wires placed on a plastic with the smallest possible gap between the two wires.

3.5 **ICI TL081CP**

General Description

The TL081 is a low cost high speed JFET input operational amplifier with an internally trimmed input offset voltage (BI-FET IITM technology). The device requires a low supply current and yet maintains a large gain bandwidth product and a fast slew rate. In addition, well matched high voltage JFET input devices provide very low input bias and offset currents. The TL081 is pin compatible with the standard LM741 and uses the same offset voltage adjustment circuitry. This feature allows designers to immediately upgrade the overall performance of existing LM741 designs. The TL081 may be used in applications such as high speed integrators, fast DIA converters, sample-and-hold circuits and many other circuits requiring low input offset voltage, low input bias current, high input impedance, high slew rate and wide bandwidth. The devices have 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 TL081C is the better choice.

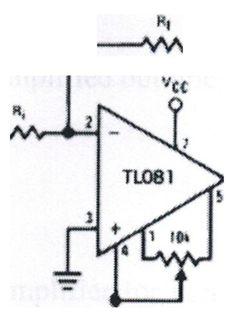


Figure 3.2 TL081CP Schematic circuit

Start-up Conditions

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

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

$$A_{c1B} = \frac{!}{\_} = \frac{Rl + R2 + R3}{R_2} = \frac{3R2 + R3}{R_2} = 3 + \frac{!l}{R_2} \quad (3.1)$$

3.6 **Trl BC109C**

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

In addition to seeing the ground through the bypass capacitor, the signal also sees ground through the de supply voltage source, Yee· It does so because there is zero signal voltage at the Yee terminal. Thus, the +Vee terminal effectively acts as ac ground. As a result R, and Rs, appear in parallel to the S1 (switch), because one end of Rs goes to actual ground and one end to Ra.

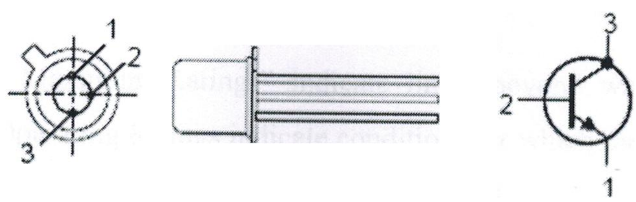


Figure 3.3 Simplified out line and symbol

3.7 **IC 2 LM 380N**

General Description

The LM380 is a power audio amplifier for consumer application. In order to hold system cost to a minimum, gain is internally fixed at 34 dB. A unique input stage allows inputs to be ground referenced. The output is automatically self centering to one half the supply voltages.

The output is short circuit proof with internal thermal limiting. The package outline is standard dual-in-line. A copper lead frame is used with the center three pins on either side comprising a heat sink. This makes the device easy to use in standard p-c layout.

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 LM384

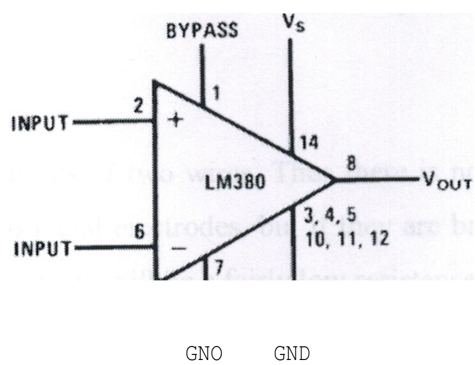


Figure 3.4 LM 380N in Schematic Circuit Diagram

Note 1: "Absolute Maximum Ratings" indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

Note 2: V S = 18V and T A= 25°C unless otherwise specified.

Note 3: Rejection ratio referred to the output with C BYPASS = 5 µF.

Note 4: With device Pins 3, 4, 5, 10, 11, 12 soldered into a 1/16" epoxy glass board with 2 ounce copper foil with a minimum surface of 6 square inches.

~ote 5: C BYPASS= 0.47 µfd on Pin 1.

Note 6: The maximum junction temperature of the LM380 is 150°C.

3.8 **BC179**

PNP Silicon Transistor

Silicon planar epitaxial transistors for use in AF small

Signal amplifier stages and direct coupled circuits

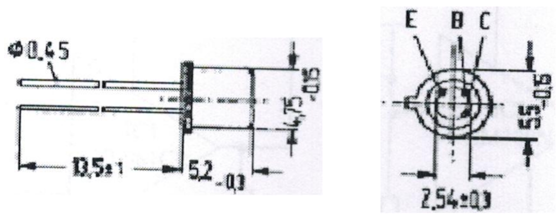


Figure 3.5 Transistor BCI 79 symbol

3.9 **Brief explanation**

The sensor simply consists of two wires. 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 ICJ 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 ICl which is used as a simple very low frequency oscillator having an operating frequency of only about 0.5 Hertz.

The output of ICl 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 saw tooth waveform which steadily rises as C2 charges, and falls as C2 discharges.

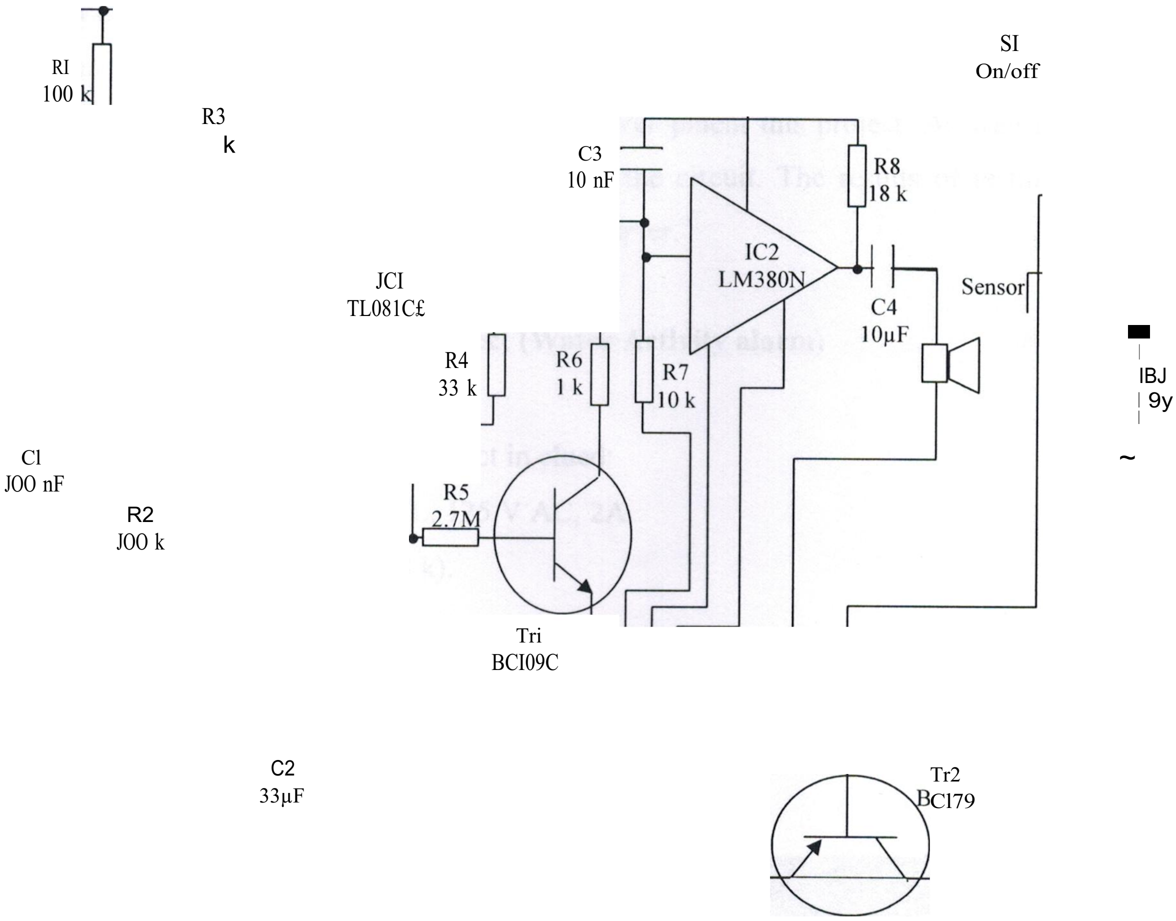


Figure 3.6 Circuit Diagram of Water-Activated Alarm

3.10 Summary

This chapter presented detailed technical information about the water-activated alarm. And include the components of this project. As well as the circuit diagrams .And brief explanation of the ships functions.

CHAPTER FOUR
MODIFICATIONS & RESULTS

4.1 Overview

This chapter will present modification of water- activity alarm. Also we will include the new components which we use in development this project. As well as we will show the output graphs of various parts of the circuit. The results of testing the completed project will also be described in this chapter.

4.2 Components of modification project (Water Activity alarm)

The modification on this original project in clued:

- Relay I: **5** V DC-CL, 125 V AC, 2A
- RI: from (33 -50 k).
- R2: 36 Ohms

And we also add a resistor in series to the speaker to increase its resistance from 4 Ohms to 40 Ohms as in the following figure

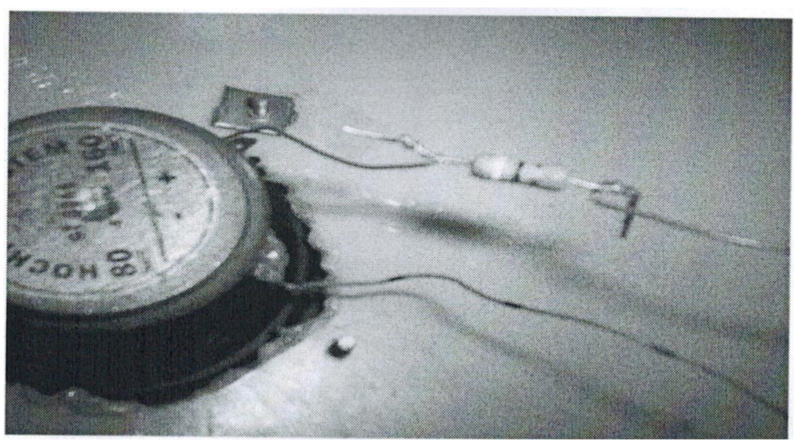


Figure 4.1 Connecting a resistance in series to speaker

Figure 4.2 The out form of Water Activity Alarm

As we seen in figure (4.2, 4.3), we took photo of last final form of water activity alarm device. This casing (cover) is chosen as it is suitable for the project.

Figure 4.3 The out form of Water Activity Alarm from another side

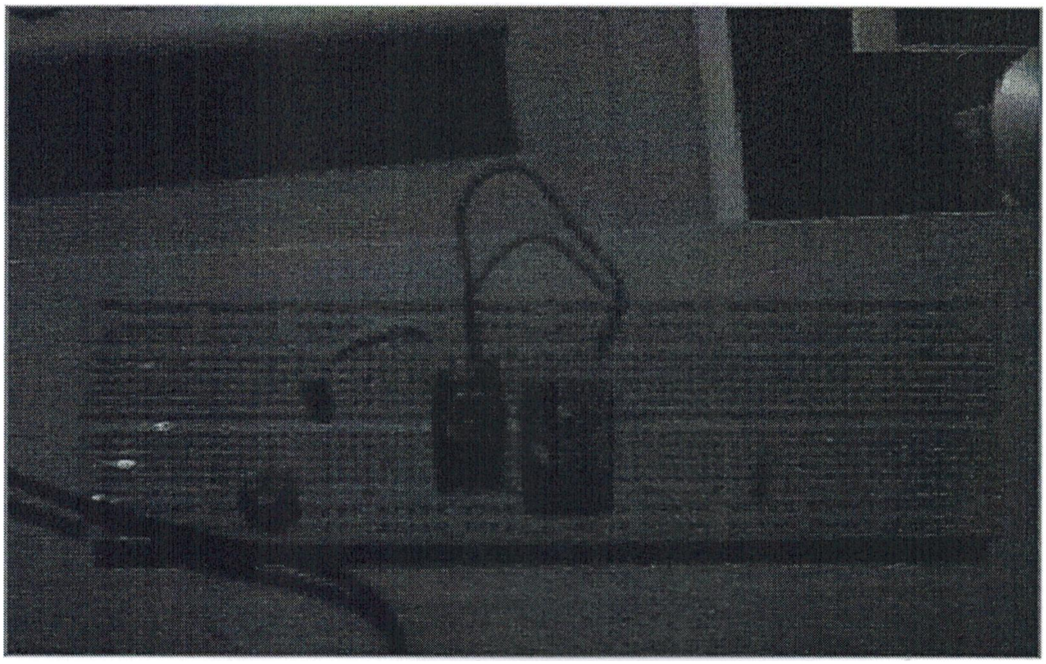


Figure 4.4 The Relays on testing board

4.3 Explaining the circuit

We know the original circuit (water activity alarm) it is working, when the device is detect any waters losses. Now we developed this circuit by adding some components such as relays.

In simply, the new circuit is working with original circuit, which given in output of second relay is 220 V AC/50 HZ, as we see later. In fact, the modification which we added on this circuit may be able to make a new circuit, by a way or another device might be successful in the future hopefully.

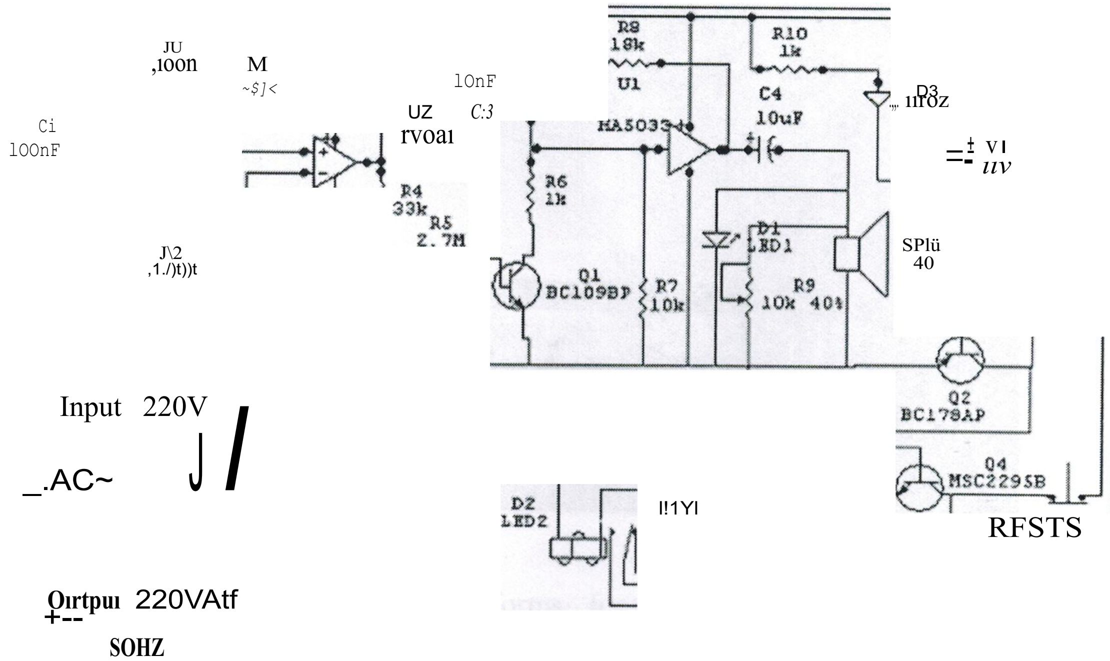


Figure 4.5 The Modification on Water Activity Alarm

Look to figure (4.5), as we see the figure (4.5) is illustrate explaining diagram of circuit, the signal which is coming from side of speaker(+) which is connected with TR MSC22295B, in base of it so the transistor will be working like switch. So the coil of relay 1 will be work than the contact of relay one is change from station one to another, in this case the another relay will be working, as we see above in figure (4.5).

Simply, the contacted of second relay is give in side 220 V AC/50, may can use the power supply to take from it 7 Ampere. This is value special on my device.

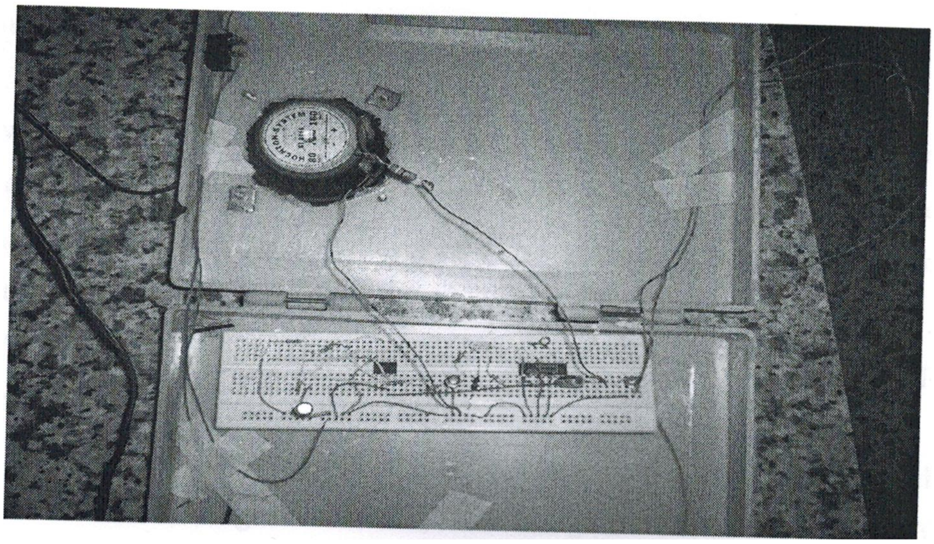


Figure 4.6 internal forms for water activity alarm

Figure 4.7 Photo illustrate testing circuit

4.4 Results

We will describe the results of our project as we see in photo. 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), just the

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 (BC178AB) where allowing to pass current from speaker, in this case the speaker will send tones as well as, another signal it give order to transistor (K.2G C3198 Y) allowing to pass current to feed coil of relay 1 , so the relay will be working and it will change contact from open to another case, where will allow current to pass from another relay, the yellow LED it is work and it will be on even make rest to the circuit .

Note, this circuit give us in its output power supply, may can use that as resource, the power which we can give from it around 7 A /220 V AC *.SOHZ.*

4.5 Summary

This chapter presented some modifications on the water- activity alarm. Also we included the new components which we used in development this project. As well as we illustrated and showed the output graphs of various parts of the circuit. Results were also presented, showing how the project was tested.

CONCLUSION

The water activated system is designed to operate in case if there is a flood of water and also of liquid in different places of liquid existence.

In which in case of flood inside or outside the house the system will give loud sound that there is something wrong in your tanks, pool or any liquid reserve after sensing of the water.

The water Activated alarm activated upon sensing liquids. And also we connect a pump to transfer the over-quantity of water or liquid to another tank.

The water Activated alarm has another function to use which we can connect it to another machine that have the ability to close the windows when it sense the rain.

We see that we can use the same circuit for different purpose as Fire Activated alarm by changing the senor with another one sensing the smoke and changing a pump with watering-can to boil over acrid.

These features allow the user to prevent any flood of water in his stock of water.

The best of my knowledge, we got experience to use another altemayive way to get the desired aim.