NEAR EAST UNIVERSITY

Faculty of Engineering

Department of Electrical and Electronic Engineering

BURGLAR ALARM SYSTEM

Graduation Project
EE-400

Student: Muayyad Kattanah (20020941)

Supervisor: Assoc. Prof. Dr. Kadri Buruncuk

Lefkosa - 2007

ACKNOWLEDGEMENTS

First of all I would to thank god for guiding me through my study.

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To my first and last lover Palestine my country; to whom spend his blood on the liberation road; to whom raising his gun against the occupation there.

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The first chapter will contains the schematic diagram of the common electrical components, and will summaries their functions briefly.

The second chapter will intreduce some of the important information of the maine electrical components. Third capter will go through the important parameters,and design of the burglar alarm system.

The sensor is easy to use and install ,the sent light is a PIR (passive infrared) movement,and its activated with an alarm that switches itself on as anything approach.

The important aim of burglar alarm is:

- Protect the houses, banks, cars and other places from stolen

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CHAPTER ONE

Introduction

It was a common device in the security system to use burglar alarm, which is a classical application for the digital logic design, and the uses of sensor in aims to:

1. Protect the houses, banks, cars and other places from stolen.
2. Protect the houses from fires while by using this system we can avoid the fire.
3. It has a wide applications in the control systems; thermal, mechanical, electro_ mechanical and electrical systems.

In our project we insert on the first aim by using sensor alarm/light, door, transformer and DC-motor, to retain the thief in the place is aimed to be stolen.

The sensor is easy to use and install ,the sent light is a PIR (passive infrared) movement,and its activated with an alarm that switches itself on as anything approach, and automatically goes off. It Scans up to 20 feet away. Its a daylight sensor,that eliminates unnecessary daylight operation making it perfect for outdoor use as well.

This project consists of three chapters, the first chapter will contains the schematic diagram of the common electrical components, and will summaries their functions briefly.

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CHAPTER TWO

Electrical Components

2.1 Capacitors

Capacitors store electric charge. They are used with resistors in timing circuits because it takes time for a capacitor to fill with charge

2.1.1 Function

They are used to filter circuits because capacitors easily pass AC (changing) signals but they block DC (constant) signals.

2.1.2 Capacitance

This is a measure of a capacitor's ability to store charge. A large capacitance means that more charge can be stored. Capacitance is measured in farads, symbol F. However 1F is very large, so prefixes are used to show the smaller values.

Three prefixes (multipliers) are used, μ (micro), n (nano) and p (pico):

- μ means 10^{-6} (millionth), so 1000μF = 1F
- n means 10^{-9} (thousand-millionth), so 1000nF = 1μF
- p means 10^{-12} (million-millionth), so 1000pF = 1nF

Capacitor values can be very difficult to find because there are many types of capacitor with different labelling systems!

2.1.3 Types of capacitor

There are many types of capacitor but they can be split into two groups, polarised and unpolarised. Each group has its own circuit symbol.

2.1.3.1 Polarised capacitors (large values, 1µF +)

2.1.3.1.1 Electrolytic Capacitors

Electrolytic capacitors are polarised and they must be connected the correct way round, at least one of their leads will be marked + or -. They are not damaged by heat when soldering.

There are two designs of electrolytic capacitors; axial where the leads are attached to each end, and radial where both leads are at the same end. Radial capacitors tend to be a little smaller and they stand upright on the circuit board.

It is easy to find the value of electrolytic capacitors because they are clearly printed with their capacitance and voltage rating. The voltage rating can be quite low (6V for example) and it should always be checked when selecting an electrolytic capacitor. It the project parts list does not specify a voltage, choose a capacitor with a rating which is greater than the project's power supply voltage. 25V is a sensible minimum for most battery circuits.

2.1.3.1.2Tantalum Bead Capacitors

Tantalum bead capacitors are polarised and have low voltage ratings like electrolytic capacitors. They are expensive but very small, so they are used where a large capacitance is needed in a small size.

Modern tantalum bead capacitors are printed with their capacitance and voltage in full. However older ones use a colour-code system which has two stripes (for the two digits) and a spot of colour for the number of zeros to give the value in μF. The standard colure code is used, but for the spot, grey is used to mean × 0.01 and white means × 0.1 so that values of less than 10μF can be shown. A third colour stripe near the leads shows the voltage (yellow 6.3V, black 10V, green 16V, blue 20V, grey 25V, white 30V, pink 35V).

2.1.3.2 Unpolarised capacitors (small values, up to 1μF)

Small value capacitors are unpolarised and may be connected either way round. They are not damaged by heat when soldering, except for one unusual type (polystyrene). They have high voltage ratings of at least 50V, usually 250V or so. It can be difficult to find the values of these small capacitors because there are many types of them and several different labelling systems!

Many small value capacitors have their value printed but without a multiplier, so you need to use experience to work out what the multiplier should be!

A number code is often used on small capacitors where printing is difficult:

- the 1st number is the 1st digit,
- the 2nd number is the 2nd digit,
- the 3rd number is the number of zeros to give the capacitance in pF.
- Ignore any letters - they just indicate tolerance and voltage rating.

2.2 Inductance

Figure 2.1: inductor.

An inductor is constructed by coiling a wire around some type of from. Current flowing through the coil creates a magnetic material such as iron or iron oxides. Frequently, the coil from is composed of magnetic material such as iron or iron oxides that increase the magnetic flux for a given current. (Iron cores are often composed of thin sheets called lamination. We discuss the reason for this construction technique).

When the current changes in value, the resulting magnetic flux changes, according to Faraday's law of electromagnetic induction, time-varying magnetic flux linking a coil induces voltage across the coil. For an ideal inductor, the voltage is proportional to the time rate of change of the current. Furthermore, the polarity of the voltage is such as to oppose the change in current. The constant of proportionality is called inductance, usually denoted by the letter *L*.

2.3 Diodes

The diode is basic but very important device that has two terminals, the anode and the cathode. The voltage v_D across the diode is referenced positive at the anode and negative at the cathode. Similarly, the diode current i_D is referenced positive from anode to cathode.

Notice in the characteristic that if the voltage v_D applied to the diode is positive, relatively large amounts of current flow for small voltages. This condition is called forward bias. Thus, current flows easily through the diode in the direction of the arrowhead of the circuit symbol.

On the other hand, for moderate negative values of v_D, the current i_D is very small in magnitude. This is called reverse-bias region, as shown on the diode characteristic. In many applications, the ability of the diode to conduct current easily in one direction, but not in the reverse direction, is very useful. For example, in an automobile, diodes allow current from the alternator to charge the battery when the engine is running. However, when the engine stops, the diodes prevent the battery from discharging through the alternator. In these applications, the diode is analog to one way valve in a fluid-flow system.

If sufficiently large reverse-bias voltage is applied to the diode, operation enters the reverse-breakdown region of the characteristic, and currents of large magnitude flow. Provided that the power dissipated in the diode does not raise its temperature too high, operation in reverse breakdown is not destructive to the device. In fact, we will see that diodes are sometimes deliberately operated in the reverse-breakdown region.

2.3.1 Connecting and soldering

Diodes must be connected the correct way round, the diagram may be labelled **a** or + for anode and **k** or - for cathode (yes, it really is k, not c, for cathode!). The cathode is marked by a line painted on the body. Diodes are labelled with their code in small print, you may need a magnifying glass to read this on small signal diodes!

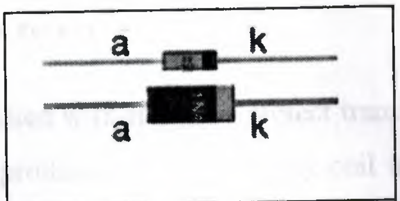


Figure 2.2: Diod.

Small signal diodes can be damaged by heat when soldering, but the risk is small unless you are using a germanium diode (codes beginning OA...) in which case you must use a heatsink. Rectifier diodes are quite robust and no special precautions are needed for soldering them

2.3.2 Diode types

2.3.2.1 Signal diodes (low current)

Signal diodes are used to process information (electrical signals) in circuits, so they are only required to pass small currents of up to 100mA.

General purpose signal diodes such as the 1N4148 are made from silicon and have a forward voltage drop of 0.7V.

Germanium diodes such as the OA90 have a lower forward voltage drop of 0.2V and this makes them suitable to use in radio circuits as detectors which extract the audio signal from the weak radio signal.

For general use, where the size of the forward voltage drop is less important, silicon diodes are better because they are less easily damaged by heat when soldering, they have a lower resistance when conducting, and they have very low leakage currents when a reverse voltage is applied.

2.3.2.2 Protection diodes for relays

Signal diodes are also used with relays to protect transistors and integrated circuits from the brief high voltage produced when the relay coil is switched off. The diagram shows how a protection diode is connected across the relay coil, note that the diode is connected 'backwards' so that it will normally NOT conduct. Conduction only occurs when the relay coil is switched off, at this moment current tries to continue flowing through the coil and it is harmlessly diverted through the diode. Without the diode no current could flow and the coil would produce a damaging high voltage 'spike' in its attempt to keep the current flowing.

2.3.2.3 Rectifier diodes (high current)

Rectifier diodes are used in power supplies to convert alternating current (AC) to direct current (DC), a process called rectification. They are also used elsewhere in circuits where a large current must pass through the diode

Table 2.1: maximum current and voltage

Diode	Maximum Current	Maximum Reverse Voltage
1N4001	1A	50V
1N4002	1A	100V
1N4007	1A	1000V
1N5401	3A	100V
1N5408	3A	1000V

All rectifier diodes are made from silicon and therefore have a forward voltage drop of 0.7V. The table shows maximum current and maximum reverse voltage for some popular rectifier diodes. The 1N4001 is suitable for most low voltage circuits with a current less than 1 A.

2.3.2.4 Zener Diodes

Zener diodes are used to maintain a fixed voltage. They are designed to 'breakdown' in a reliable and non-destructive way so that they can be used in reverse to maintain a fixed voltage across their terminals. The diagram shows how they are connected, with a resistor in series to limit the current.

Figure 2.3: Zener diode

Zener diodes can be distinguished from ordinary diodes by their code and breakdown voltage which are printed on them. Zener diode codes begin BZX... or BZY... Their breakdown voltage is printed with V in place of a decimal point, so 4V7 means 4.7V for example.

Zener diodes are rated by their breakdown voltage and maximum power. The minimum voltage available is 2.7V. Power ratings of 400mW and 1.3W are common.

2.4 Motors

We will see that there are many kinds of electrical motors. In this section, we give a brief overview of electrical motors, their specifications, and operating characteristics.

2.4.1 Basic Construction

An electrical motor consists of a stationary part, or stator, and a rotor, which is the rotating part connected to shaft that couples the machine to its mechanical load.

The shaft and rotor are supported by bearings so that they can rotate freely.

Depending on the type of machine, either the stator or the rotor (or both) contain Current-carrying conductors configured into coils. Slots are cut into the stator and rotor to contain the windings and their insulation. Currents in the windings set up magnetic fields and interact with fields to produce torque.

Usually, the stator and the rotor are made of iron to intensify the magnetic field.

As in transformers, if the magnetic field alternates in direction through the iron with time, the iron must be laminated to avoid large power losses due to eddy currents. (In certain parts of some machines, the field is steady and lamination is not necessary.).

2.4.1.1 AC Motors

Motors can be powered from either ac or dc sources. Ac power can be either single phase or three-phase. Ac motors include several types:

1. Induction motors, which are the most common types because they have relatively simple rugged construction and good operating characteristics.
2. Synchronous motors, which run at constant speed regardless of load torque (within the capability of the machine). Three-phase synchronous machines generate most of the electrical energy used in the world.
3. A variety of special-purpose types.

About two-thirds of the electrical energy generated in the United States is consumed by motors. Of this, well over half is used by induction motors. Thus, you are likely to encounter ac induction motors very frequently.

2.4.1.2 DC Motors

Dc motors are those that are powered from dc sources. One of the difficulties with dc motors is that nearly all electrical energy is distributed as ac. If only ac power is available and we need to use dc motor, a rectifier or some other converter must be used to convert ac to dc. This adds to expense of the system. Thus, ac machines are usually preferable if they meet the needs of the application.

Exceptions are automotive applications in which dc is readily available from the battery. Dc motors are employed for starting, windshield wipers, fans, and power windows.

2.4.1.2.1 The Physics of the DC Motor

The principles of operation of a direct current (DC) motor are presented based on fundamental concepts from electricity and magnetism contained in any basic physics course. The DC motor is used as a concrete example for reviewing the concepts of magnetic fields, magnetic force, Faraday's law, and induced electromotive forces (emf) that will be used throughout the remainder of the book for the modeling of electric machines.

2.4.1.2.2 Magnetic Force

Motors work on the basic principle that magnetic fields produce forces on wires carrying a current. In fact, this experimental phenomenon is what is used to define the magnetic field. If one places a current carrying wire between the poles of a magnet as in Figure 2.4, a force is exerted on the wire. Experimentally, the magnitude of this force is found to be proportional to both the amount of current in the wire and to the length of the wire that is between the poles of the magnet. That is, Fmagnetic is proportional to *£i.* The direction of the magnetic field B at any point is defined to be the direction that a small compass needle would point at that location. This direction is indicated by arrows in between the north and south poles in

Figure2.4.

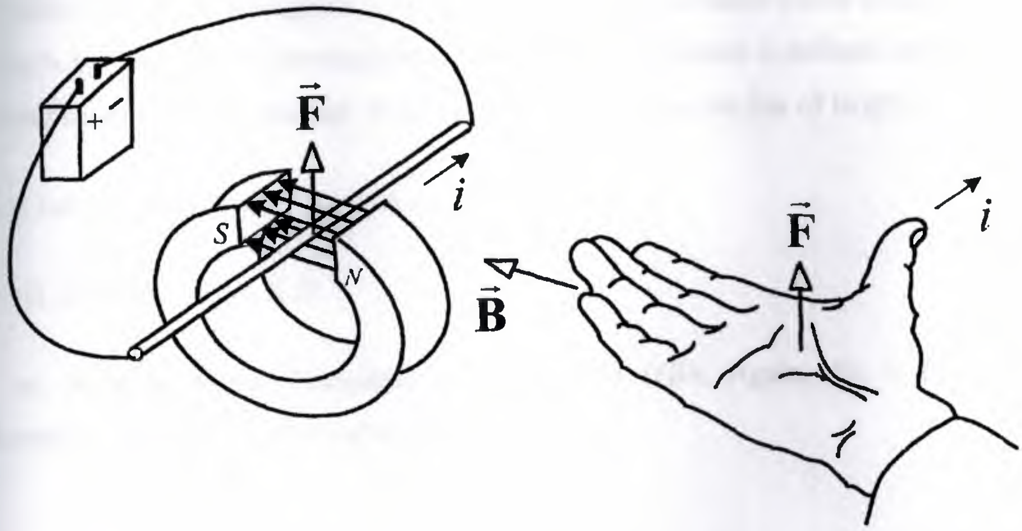


FIGURE 2.4. Magnetic force law. From *PSSC Physics,* 7th edition, by Haber-Schaim, Dodge, Gardner, and Shore, published by Kendall/Hunt, 1991.

With the direction of B perpendicular to the wire, the strength (magnitude) of the *magnetic induction field* B is defined to be *B &_* •* magnetic where -^magnetic is the magnetic force, *i* is the current, and *£* is the length of wire perpendicular to the magnetic field carrying the current. That is, *B* is the proportionality constant so that .^magnetic — *i£B.* As illustrated in Figure 1.1, the direction of the force can be determined using the right-hand rule.

Specifically, using your right hand, point your fingers in the direction of the magnetic field and point your thumb in the direction of the current.

Then the direction of the force is out of your palm.

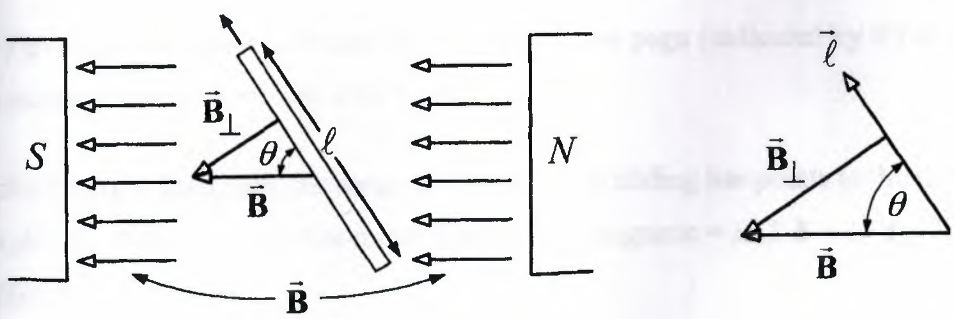
Further experiments show that if the wire is parallel to the B field rather

than perpendicular as in Figure 2.4, then no force is exerted on the wire. If the wire is at some angle *9* with respect to B as in Figure 2.5, then the force is proportional to the *component* of B perpendicular to the wire; that is, it is proportional to *B±* = J3sin(0). This is summarized in the *magnetic force law:* Let £ denote a vector whose magnitude is the length £ of the wire in the magnetic field and whose direction is defined as the positive direction of current in the bar; then the magnetic force on the bar of length

£ carrying the current *i* is given by

•t1 magnetic — 2-c X J3

or, in scalar terms, Fmagnetic = *i£Bsln(6)* = *i£B±.* Again, *B±* = *Bsin(6)* is the component of B perpendicular to the wire.



(a) (b)

FIGURE 2.5. Only the component *B±* of the magnetic field which is perpendicular to the wire produces a force on the current.

Example *A Linear DC Machine*

Consider the simple linear DC machine in Figure 2.6 where a sliding bar rests on a simple circuit consisting of two rails. An external magnetic field is going through the loop of the circuit up out of the page indicated by the 0 in the plane of the loop. Closing the switch results in a current flowing around the circuit and the external magnetic field produces a force on the bar which is free to move. The force on the bar is now computed.

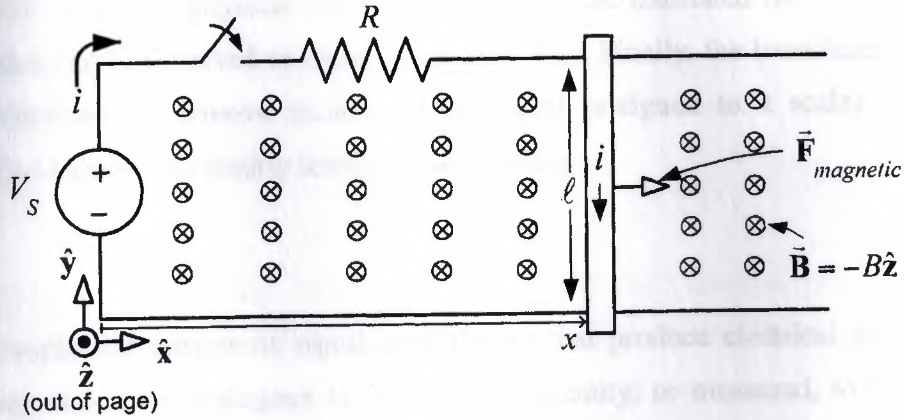


FIGURE 2.6. A linear DC motor.

The magnetic field is constant and points into the page (indicated by ®) so that written in vector notation, B = —*Bz* with *B* > 0.

By the right hand rule, the magnetic force on the sliding bar points to the right. Explicitly, with *£* — —*£y*, the force is given by Fmagnetic = *i£ X B* = *i(~£y)* X (-J3z) = *MBit.*

To find the equations of motion for the bar, let / be the coefficient of viscous (sliding) friction of the bar so that the friction force is given by *Ff* = —*fdx/dt.* Then, with *vfit* denoting the mass of the bar, Newton's Law Gives *i£B* - *fdx/dt* = *med2x/dt2.* Just after closing the switch at *t* — 0, but before the bar starts to move, the current is i(0+) = *Vs(0+)/R.* However, it turns out that as the bar moves the current does *not* stay at this value, but instead decreases due to electromagnetic induction. This will be explained later.

2.5 Sensors

Sensors consist of several components. First, there needs to be some interface (not direct contact necessarily) to the object so that the phenomenon being quantified can be measured. Next, the physical signal captured must be translated (or transuded) into a signal that can be observed or recorded in some way. Finally, the transducer signal must be conditioned (to remove noise) and calibrated (assigned to a scale) so the final quantified values have readily interpretable meaning.

We emphasize sensors or signal conditioners that produce electrical signal (usually voltages) which are analogous to his physical quantity, or measured, to be measured. Often, the voltage is proportional to the measured. Then, the sensor voltage is given by

$$V_{sensor} = K\,m$$

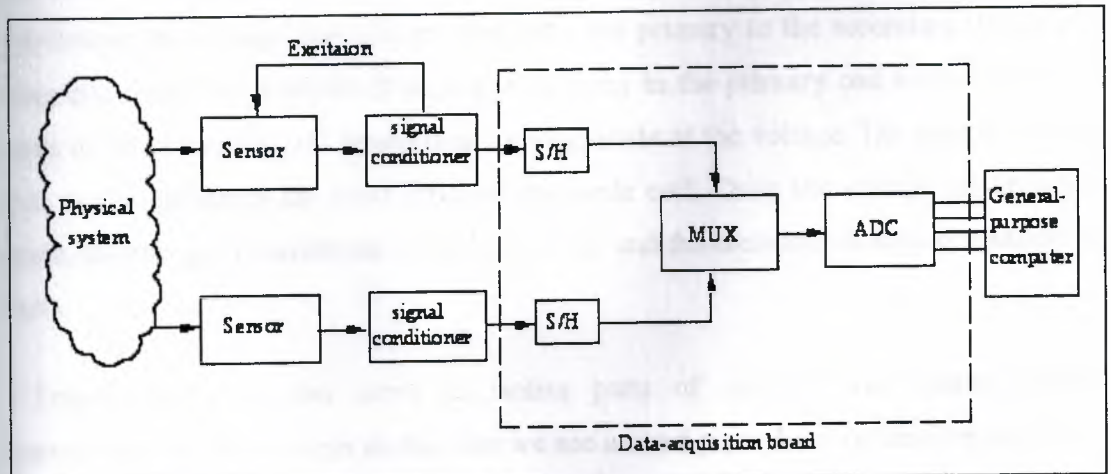


Figure 2.7: Sensor Function

In which v_{sensor} is the voltage produced by the sensor, K is the sensitivity constant and m is the measured. For the example, a load cell is a sensor consisting of four strain-gauge

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Capacitor values can be very difficult to find because there are many types of capacitor with different labelling systems!

2.1.3 Types of capacitor

There are many types of capacitor but they can be split into two groups, polarised and unpolarised. Each group has its own circuit symbol.

2.1.3.1 Polarised capacitors (large values, 1µF +)

2.1.3.1.1 Electrolytic Capacitors

Electrolytic capacitors are polarised and they must be connected the correct way round, at least one of their leads will be marked + or -. They are not damaged by heat when soldering.

There are two designs of electrolytic capacitors; axial where the leads are attached to each end, and radial where both leads are at the same end. Radial capacitors tend to be a little smaller and they stand upright on the circuit board.

It is easy to find the value of electrolytic capacitors because they are clearly printed with their capacitance and voltage rating. The voltage rating can be quite low (6V for example) and it should always be checked when selecting an electrolytic capacitor. It the project parts list does not specify a voltage, choose a capacitor with a rating which is greater than the project's power supply voltage. 25V is a sensible minimum for most battery circuits.

2.1.3.1.2Tantalum Bead Capacitors

Tantalum bead capacitors are polarised and have low voltage ratings like electrolytic capacitors. They are expensive but very small, so they are used where a large capacitance is needed in a small size.

Modern tantalum bead capacitors are printed with their capacitance and voltage in full. However older ones use a colour-code system which has two stripes (for the two digits) and a spot of colour for the number of zeros to give the value in μF. The standard colure code is used, but for the spot, grey is used to mean × 0.01 and white means × 0.1 so that values of less than 10μF can be shown. A third colour stripe near the leads shows the voltage (yellow 6.3V, black 10V, green 16V, blue 20V, grey 25V, white 30V, pink 35V).

2.1.3.2 Unpolarised capacitors (small values, up to 1μF)

Small value capacitors are unpolarised and may be connected either way round. They are not damaged by heat when soldering, except for one unusual type (polystyrene). They have high voltage ratings of at least 50V, usually 250V or so. It can be difficult to find the values of these small capacitors because there are many types of them and several different labelling systems!

Many small value capacitors have their value printed but without a multiplier, so you need to use experience to work out what the multiplier should be!

A number code is often used on small capacitors where printing is difficult:

- the 1st number is the 1st digit,
- the 2nd number is the 2nd digit,
- the 3rd number is the number of zeros to give the capacitance in pF.
- Ignore any letters - they just indicate tolerance and voltage rating.

2.2 Inductance

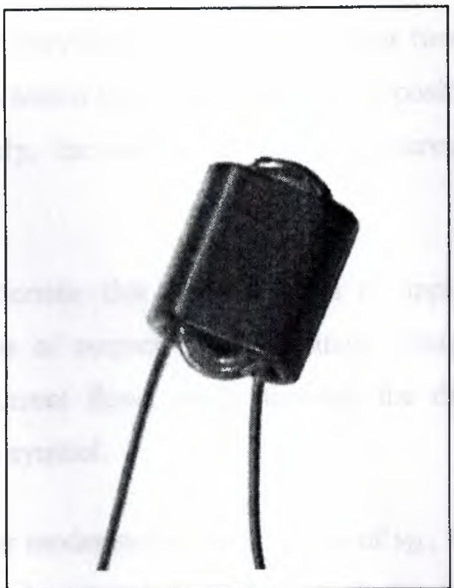


Figure 2.1: inductor.

An inductor is constructed by coiling a wire around some type of from. Current flowing through the coil creates a magnetic material such as iron or iron oxides. Frequently, the coil from is composed of magnetic material such as iron or iron oxides that increase the magnetic flux for a given current. (Iron cores are often composed of thin sheets called lamination. We discuss the reason for this construction technique).

When the current changes in value, the resulting magnetic flux changes, according to Faraday's law of electromagnetic induction, time-varying magnetic flux linking a coil induces voltage across the coil. For an ideal inductor, the voltage is proportional to the time rate of change of the current. Furthermore, the polarity of the voltage is such as to oppose the change in current. The constant of proportionality is called inductance, usually denoted by the letter *L*.

2.3 Diodes

The diode is basic but very important device that has two terminals, the anode and the cathode. The voltage v_D across the diode is referenced positive at the anode and negative at the cathode. Similarly, the diode current i_D is referenced positive from anode to cathode.

Notice in the characteristic that if the voltage v_D applied to the diode is positive, relatively large amounts of current flow for small voltages. This condition is called forward bias. Thus, current flows easily through the diode in the direction of the arrowhead of the circuit symbol.

On the other hand, for moderate negative values of v_D, the current i_D is very small in magnitude. This is called reverse-bias region, as shown on the diode characteristic. In many applications, the ability of the diode to conduct current easily in one direction, but not in the reverse direction, is very useful. For example, in an automobile, diodes allow current from the alternator to charge the battery when the engine is running. However, when the engine stops, the diodes prevent the battery from discharging through the alternator. In these applications, the diode is analog to one way valve in a fluid-flow system.

If sufficiently large reverse-bias voltage is applied to the diode, operation enters the reverse-breakdown region of the characteristic, and currents of large magnitude flow. Provided that the power dissipated in the diode does not raise its temperature too high, operation in reverse breakdown is not destructive to the device. In fact, we will see that diodes are sometimes deliberately operated in the reverse-breakdown region.

2.3.1 Connecting and soldering

Diodes must be connected the correct way round, the diagram may be labelled **a** or + for anode and **k** or - for cathode (yes, it really is k, not c, for cathode!). The cathode is marked by a line painted on the body. Diodes are labelled with their code in small print, you may need a magnifying glass to read this on small signal diodes!

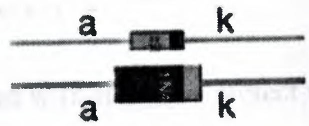


Figure 2.2: Diod.

Small signal diodes can be damaged by heat when soldering, but the risk is small unless you are using a germanium diode (codes beginning OA...) in which case you must use a heatsink. Rectifier diodes are quite robust and no special precautions are needed for soldering them

2.3.2 Diode types

2.3.2.1 Signal diodes (low current)

Signal diodes are used to process information (electrical signals) in circuits, so they are only required to pass small currents of up to 100mA.

General purpose signal diodes such as the 1N4148 are made from silicon and have a forward voltage drop of 0.7V.

Germanium diodes such as the OA90 have a lower forward voltage drop of 0.2V and this makes them suitable to use in radio circuits as detectors which extract the audio signal from the weak radio signal.

For general use, where the size of the forward voltage drop is less important, silicon diodes are better because they are less easily damaged by heat when soldering, they have a lower resistance when conducting, and they have very low leakage currents when a reverse voltage is applied.

2.3.2.2 Protection diodes for relays

Signal diodes are also used with relays to protect transistors and integrated circuits from the brief high voltage produced when the relay coil is switched off. The diagram shows how a protection diode is connected across the relay coil, note that the diode is connected 'backwards' so that it will normally NOT conduct. Conduction only occurs when the relay coil is switched off, at this moment current tries to continue flowing through the coil and it is harmlessly diverted through the diode. Without the diode no current could flow and the coil would produce a damaging high voltage 'spike' in its attempt to keep the current flowing.

2.3.2.3 Rectifier diodes (high current)

Rectifier diodes are used in power supplies to convert alternating current (AC) to direct current (DC), a process called rectification. They are also used elsewhere in circuits where a large current must pass through the diode

Table 2.1: maximum current and voltage

Diode	Maximum Current	Maximum Reverse Voltage
1N4001	1A	50V
1N4002	1A	100V
1N4007	1A	1000V
1N5401	3A	100V
1N5408	3A	1000V

All rectifier diodes are made from silicon and therefore have a forward voltage drop of 0.7V. The table shows maximum current and maximum reverse voltage for some popular rectifier diodes. The 1N4001 is suitable for most low voltage circuits with a current less than 1 A.

2.3.2.4 Zener Diodes

Zener diodes are used to maintain a fixed voltage. They are designed to 'breakdown' in a reliable and non-destructive way so that they can be used in reverse to maintain a fixed voltage across their terminals. The diagram shows how they are connected, with a resistor in series to limit the current.

Figure 2.3: Zener diode

Zener diodes can be distinguished from ordinary diodes by their code and breakdown voltage which are printed on them. Zener diode codes begin BZX... or BZY... Their breakdown voltage is printed with V in place of a decimal point, so 4V7 means 4.7V for example.

Zener diodes are rated by their breakdown voltage and maximum power. The minimum voltage available is 2.7V. Power ratings of 400mW and 1.3W are common.

2.4 Motors

We will see that there are many kinds of electrical motors. In this section, we give a brief overview of electrical motors, their specifications, and operating characteristics.

2.4.1 Basic Construction

An electrical motor consists of a stationary part, or stator, and a rotor, which is the rotating part connected to shaft that couples the machine to its mechanical load.

The shaft and rotor are supported by bearings so that they can rotate freely.

Depending on the type of machine, either the stator or the rotor (or both) contain Current-carrying conductors configured into coils. Slots are cut into the stator and rotor to contain the windings and their insulation. Currents in the windings set up magnetic fields and interact with fields to produce torque.

Usually, the stator and the rotor are made of iron to intensify the magnetic field.

As in transformers, if the magnetic field alternates in direction through the iron with time, the iron must be laminated to avoid large power losses due to eddy currents. (In certain parts of some machines, the field is steady and lamination is not necessary.).

2.4.1.1 AC Motors

Motors can be powered from either ac or dc sources. Ac power can be either single phase or three-phase. Ac motors include several types:

1. Induction motors, which are the most common types because they have relatively simple rugged construction and good operating characteristics.
2. Synchronous motors, which run at constant speed regardless of load torque (within the capability of the machine). Three-phase synchronous machines generate most of the electrical energy used in the world.
3. A variety of special-purpose types.

About two-thirds of the electrical energy generated in the United States is consumed by motors. Of this, well over half is used by induction motors. Thus, you are likely to encounter ac induction motors very frequently.

2.4.1.2 DC Motors

Dc motors are those that are powered from dc sources. One of the difficulties with dc motors is that nearly all electrical energy is distributed as ac. If only ac power is available and we need to use dc motor, a rectifier or some other converter must be used to convert ac to dc. This adds to expense of the system. Thus, ac machines are usually preferable if they meet the needs of the application.

Exceptions are automotive applications in which dc is readily available from the battery. Dc motors are employed for starting, windshield wipers, fans, and power windows.

2.4.1.2.1 The Physics of the DC Motor

The principles of operation of a direct current (DC) motor are presented based on fundamental concepts from electricity and magnetism contained in any basic physics course. The DC motor is used as a concrete example for reviewing the concepts of magnetic fields, magnetic force, Faraday's law, and induced electromotive forces (emf) that will be used throughout the remainder of the book for the modeling of electric machines.

2.4.1.2.2 Magnetic Force

Motors work on the basic principle that magnetic fields produce forces on wires carrying a current. In fact, this experimental phenomenon is what is used to define the magnetic field. If one places a current carrying wire between the poles of a magnet as in Figure 2.4, a force is exerted on the wire. Experimentally, the magnitude of this force is found to be proportional to both the amount of current in the wire and to the length of the wire that is between the poles of the magnet. That is, Fmagnetic is proportional to *£i.* The direction of the magnetic field B at any point is defined to be the direction that a small compass needle would point at that location. This direction is indicated by arrows in between the north and south poles in

Figure2.4.

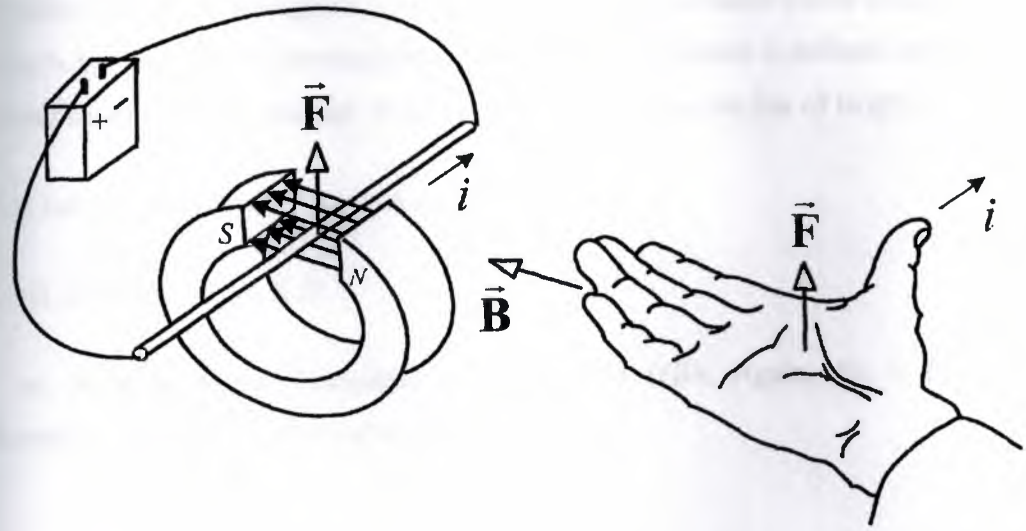


FIGURE 2.4. Magnetic force law. From *PSSC Physics,* 7th edition, by Haber-Schaim, Dodge, Gardner, and Shore, published by Kendall/Hunt, 1991.

With the direction of B perpendicular to the wire, the strength (magnitude) of the *magnetic induction field* B is defined to be *B &_* •* magnetic where -^magnetic is the magnetic force, *i* is the current, and *£* is the length of wire perpendicular to the magnetic field carrying the current. That is, *B* is the proportionality constant so that .^magnetic — *i£B.* As illustrated in Figure 1.1, the direction of the force can be determined using the right-hand rule.

Specifically, using your right hand, point your fingers in the direction of the magnetic field and point your thumb in the direction of the current.

Then the direction of the force is out of your palm.

Further experiments show that if the wire is parallel to the B field rather

than perpendicular as in Figure 2.4, then no force is exerted on the wire. If the wire is at some angle *9* with respect to B as in Figure 2.5, then the force is proportional to the *component* of B perpendicular to the wire; that is, it is proportional to *B±* = J3sin(0). This is summarized in the *magnetic force law:* Let *£* denote a vector whose magnitude is the length *£* of the wire in the magnetic field and whose direction is defined as the positive direction of current in the bar; then the magnetic force on the bar of length

£ carrying the current *i* is given by

•t1 magnetic — 2-c X J3

or, in scalar terms, Fmagnetic = *i£Bsln(6)* = *i£B±.* Again, *B±* = *Bsin(6)* is the component of B perpendicular to the wire.

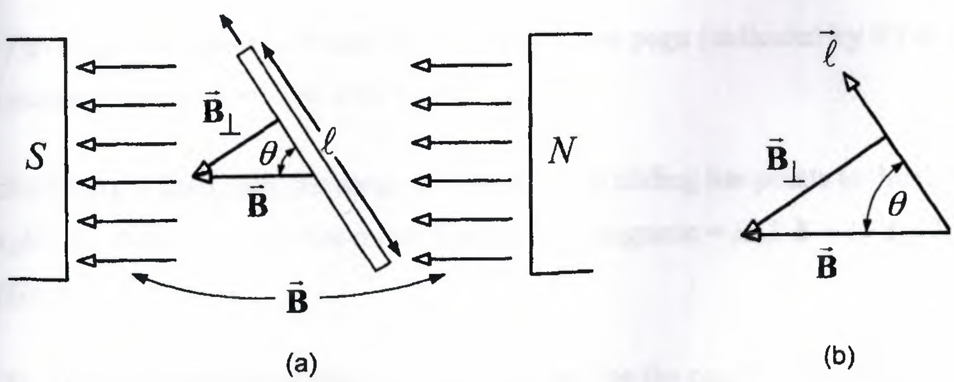


FIGURE 2.5. Only the component *B±* of the magnetic field which is perpendicular to the wire produces a force on the current.

Example *A Linear DC Machine*

Consider the simple linear DC machine in Figure 2.6 where a sliding bar rests on a simple circuit consisting of two rails. An external magnetic field is going through the loop of the circuit up out of the page indicated by the 0 in the plane of the loop. Closing the switch results in a current flowing around the circuit and the external magnetic field produces a force on the bar which is free to move. The force on the bar is now computed.

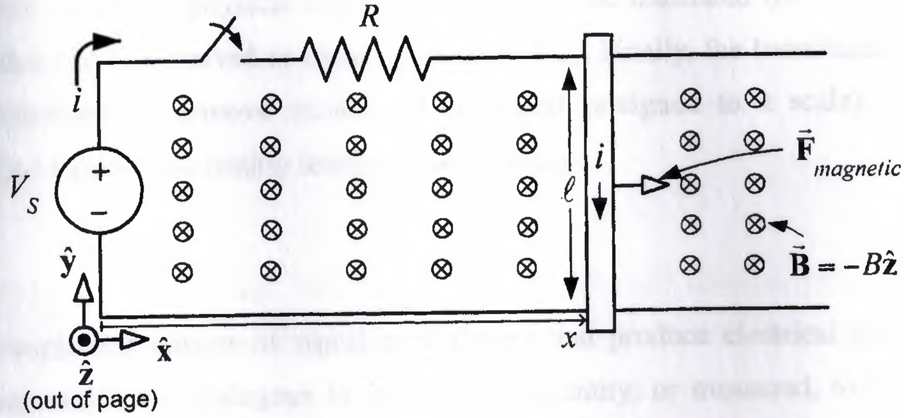


FIGURE 2.6. A linear DC motor.

The magnetic field is constant and points into the page (indicated by ®) so that written in vector notation, B = —*Bz* with *B* > 0.

By the right hand rule, the magnetic force on the sliding bar points to the right. Explicitly, with *£* ——*£y,* the force is given by Fmagnetic = *i£ X B* = *i(~£y)* X (-J3z) = *MBit.*

To find the equations of motion for the bar, let / be the coefficient of viscous (sliding) friction of the bar so that the friction force is given by *Ff* = —*fdx/dt.* Then, with *vfit* denoting the mass of the bar, Newton's Law Gives *i£B - fdx/dt* = *med2x/dt2.* Just after closing the switch at *t* — 0, but before the bar starts to move, the current is i(0+) = *Vs(0+)/R.* However, it turns out that as the bar moves the current does *not* stay at this value, but instead decreases due to electromagnetic induction. This will be explained later.

2.5 Sensors

Sensors consist of several components. First, there needs to be some interface (not direct contact necessarily) to the object so that the phenomenon being quantified can be measured. Next, the physical signal captured must be translated (or transuded) into a signal that can be observed or recorded in some way. Finally, the transducer signal must be conditioned (to remove noise) and calibrated (assigned to a scale) so the final quantified values have readily interpretable meaning.

We emphasize sensors or signal conditioners that produce electrical signal (usually voltages) which are analogous to his physical quantity, or measured, to be measured. Often, the voltage is proportional to the measured. Then, the sensor voltage is given by

$$V_{sensor} = K\,m$$

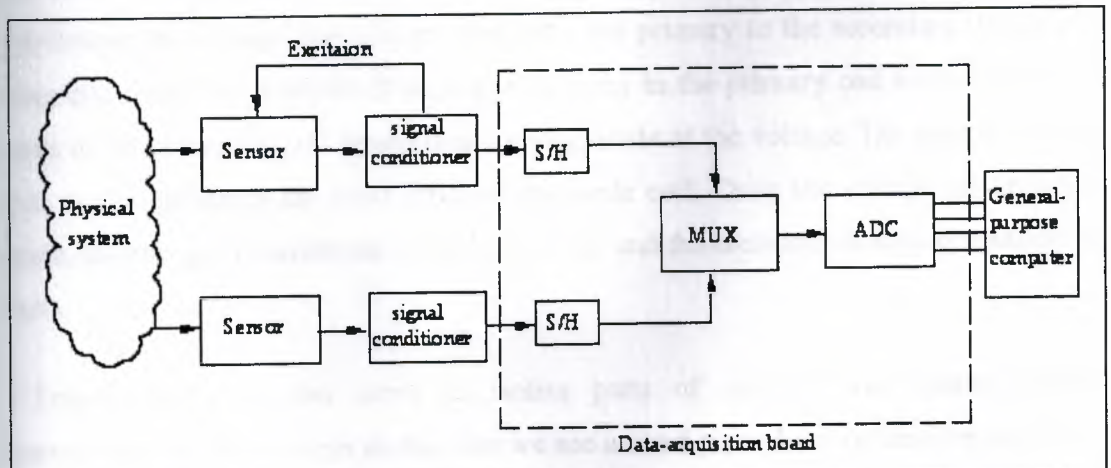


Figure 2.7: Sensor Function

In which v_{sensor} is the voltage produced by the sensor, K is the sensitivity constant and m is the measured. For the example, a load cell is a sensor consisting of four strain-gauge elements connected in a Wheatstone bridge and bonded to a load-bearing element. As force is applied to the load cell, a proportional voltage appears across two terminals of the bridge. Excitation in the form of a constant voltage is applied to other two terminals of the bridge. For a given excitation voltage, the sensitivity constant has units of V/N or V/1bf.

2.6 Transformer

In AC electrical systems, electric transformers convert voltage from one value to another. Transformers are comprised of two sets of coils or windings linked by a magnetic field. The coils are primary and secondary and function as conductors. When the primary coil receives AC voltage, this produces a varying magnetic field of voltage surrounding the conductor. The primary coil is responding to the fluctuating current of AC voltage. The magnetic field activates the secondary conductor coil. This results in the transformer changing the voltage and transferring electrical energy, ideally with the least amount of energy loss. The number of windings on each coil is important as this determines the voltage that is conveyed from the primary to the secondary through the magnetic field. The number of windings or turns in the primary coil to the number of turns in the secondary coil determines the magnitude of the voltage. The core is typically iron as this produces the most efficient magnetic coil. Once the voltage conversion is made, the energy is transferred to the load center and the electrical process continuesfrom there.

Transformers can also serve to isolate parts of circuits from others. Electric transformers can be as large as the ones we see around powerlines or small enough to be tucked away in household appliances. Transformers can also serve to convert as power adapters in situations where there is a voltage difference between an electronic component or appliance and an electrical power supply. There is a need in AC electrical systems to continuously increase or lower the voltage levels for efficiency and safety.

Transformers provide for this need marvelously since their operation is based on the fluctuating current of AC voltage.

The incoming transformer voltage is an important factor. The three common frequencies available are 50 Hz, 60Hz and 400 Hz. European power is typically 50 Hz while North American power is usually 60hz. The 400 Hz is reserved for high-powered applications such as aerospace technologies. It is also important to consider the secondary power specifications when evaluating transformers. Other specifications to keep in mind when selecting a transformer like the maximum ratings of the following, secondary current and voltage rating, power and output rating. Power transformers have various configurations according to phase and connections. The most common phases are single-phase and three-phase. Both the size and expense of a transformer increases in proportion to the number of primary windings.

Figure 2.8 : Transformers.

Transformers find many applications in electric power distribution. In transporting power over long distance (from hydroelectric power-generating station to a distance city, for example), it is desirable to use relatively large voltages, typically hundreds of kilovolts. Recall that the power delivered by an ac source is given by

$$P = V_{\mathrm{rms}} I_{\mathrm{rms}} \cos(\theta)$$

For a fixed power factor ($\cos\theta$), many combinations of voltage and current can be used transferring a given amount of power. The wires that carry the current have nonzero resistances. Thus, some power is lost in the transmission lines, given by

$$P_{loss} = R_{\mathrm{line}} I^2_{rms}$$

In which R_{line} is the resistance of the transmission line. By designing the power distribution system with large value and small current value, the line loss can be made to be a small fraction of the power transported. Thus larger voltage yields higher efficiency in power distribution.

2.7 Batteries

A battery is a device in which chemical energy is directly converted to electrical energy. It consists of one or more voltaic cells, each of which is composed of two half cells connected in series by the conductive electrolyte. In the figure to the right, the battery consists of one or more voltaic cells in series. (The conventional symbol does not necessarily represent the true number of voltaic cells.) Each cell has a positive terminal, shown by a long horizontal line, and a negative terminal, shown by the shorter horizontal line. These do not touch each other but are immersed in a solid or liquid electrolyte.

The electrolyte is a conductor which connects the half-cells together. It also contains ions which can react with chemicals of the electrodes. Chemical energy is converted into electrical energy by chemical reactions that transfer charge between the electrode and the electrolyte at their interface. Such reactions are called *faradaic*, and are responsible for current flow through the cell. Ordinary, non-charge-transferring (*non-faradaic*) reactions also occur at the electrode-electrolyte interfaces. Non-faradaic reactions are one reason that voltaic cells (particularly the lead-acid cell of ordinary car batteries) "run down" when sitting unused.

Around 1800, Alessandro Volta studied the effect of different electrodes on the net electromotive force (emf) of many different types of voltaic cells. (Emf is equivalent to what was called the internal voltage source in the previous section.) He showed that the net emf (E) is the difference of the emfs E1 and E2 associated with the electrolyte-electrode interfaces within the two half-cells. Hence identical electrodes yield E=0 (zero emf). Volta did not appreciate that the emf was due to chemical reactions. He thought that his cells were an inexhaustible source of energy, and that the associated chemical effects (e.g., corrosion) were a mere nuisance -- rather than, as Michael Faraday showed around 1830, an unavoidable by-product of their operation.

Voltaic cells, and batteries of voltaic cells, are rated in volts, the SI unit of electromotive force. The voltage across the terminals of a battery is known as its *terminal voltage*. The terminal voltage of a battery that is neither charging nor discharging (the open-circuit voltage) equals its emf. The terminal voltage of a battery that is discharging is less than the emf, and that of a battery that is charging is greater than the emf.

Alkaline and carbon-zinc cells are rated at about 1.5 volts, because of the nature of the chemical reactions inside. Because of the high electrochemical potentials of lithium compounds, Li cells can provide as much as 3 or more volts. However, lithium compounds can also be hazardous.

Figure 2.9: Small Batteries.

The conventional model for a voltaic cell, as drawn above, has the internal resistance drawn outside the cell. This is a correct Thevenin equivalent for circuit applications, but it oversimplifies the chemistry and physics. In a more accurate (and more complex) model, a voltaic cell can be thought of as two electrical pumps, one at each terminal (the faradic reactions at the corresponding electrode-electrolyte interfaces), separated by an internal resistance largely due to the electrolyte. Even this is an oversimplification, since it cannot explain why the behavior of a voltaic cell depends strongly on its rate of discharge. For example, it is well known that a cell that is discharged rapidly (but incompletely) will recover spontaneously after a waiting time, but a cell that is discharged slowly (but completely) will not recover spontaneously.

The simplest characterization of a battery would give its emf (voltage), its internal resistance, and its capacity. In principle, the energy stored by a battery equals the product of its emf and its capacity.

2.8 Switches

The switch is an electrical device that is used for switching s circuit or a device (ON,OFF). Switch contacts are rated with a maximum voltage and current, and there may be different ratings for AC and DC. The AC values are higher because the current falls to zero many times each second and an arc is less likely to form across the switch contacts.

Figure 2.10: Switch.

For low voltage electronics projects the voltage rating will not matter, but you may need to check the current rating. The maximum current is less for inductive loads (coils and motors) because they cause more sparking at the contacts when switched off.

There are three important features to consider when selecting a switch:

1. Contacts (e.g. single pole, double throw)
2. Ratings (maximum voltage and current)
3. Method of Operation (toggle, slide, key etc.)

2.9 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical. The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification. Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The supplier's catalogue should show you the relay's connections. The coil will be obvious and it may be connected either way round. Relay coils produce brief high voltage 'spikes' when they are switched off and this can destroy transistors and ICs in the circuit. To prevent damage you must connect a protection diode across the relay coil. The relay's switch connections are usually labeled COM, NC and NO:

COM = Common, always connect to this; it is the moving part of the switch.

NC = Normally Closed, COM is connected to this when the relay coil is off.

NO = Normally Open, COM is connected to this when the relay coil is on.

Connect to COM and NO if you want the switched circuit to be on when the relay coil is on. Connect to COM and NC if you want the switched circuit to be on when the relay coil is off.

Disadvantages of relays:

- Relays are bulkier than transistors for switching small currents.
- Relays cannot switch rapidly (except reed relays), transistors can switch many times per second.
- Relays use more power due to the current flowing through their coil.
- Relays require more current than many chips can provide, so a low power transistor may be needed to switch the current for the relay's coil. [3]

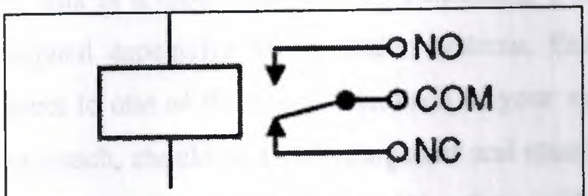


Figure 2.11: Circuit symbol for a relay.

2.11 Wire

Different types of wire for different jobs. If you try to put any old wire that you have hanging around the shop underground, you may get lucky and your irrigation system will work. Chances are, though, that you will be plagued by short circuits, bad grounding, corrosion or simply a non-functioning system. We outline the most common wire types for landscape irrigation or lighting use below. Remember, when undertaking electrical work of any kind make sure you use common safety sense and don't dive into that 220 volt electrical panel unless you have enough experience not to get electrocuted.

2.11.1 Residential & Small Commercial Typical Wire and Usage

2.11.1.1 Multi-Conductor Sprinkler Wire

For smaller systems, this is a direct-burial cable containing a number of individual copper core wires designed especially for sprinkler systems. Each one of the small colored wires will connect to one of the wires from each of your valves. The other wire on your valves, one from each, should be twisted together and attached to the white wire inside the cable. This is your common ground, and the valves will not operate properly unless this connection is a good one. Attach the other end of the wires to the controller terminals. Remember, this type of wire is for small jobs only - not golf!

2.11.1.2 Low Voltage Lighting Wire

Small outdoor lighting systems for Res. /Comm. use are typically low-voltage and require a two-wire underground cable. The most common mistake is under-sizing. Pay close attention to voltage drop. Any two conductor copper core direct burial wire will work, but lighting manufacturers prefer stranded copper, #12, #10 or #8.

2.11.1.3 120 Volt Wire

If you need to run a 120 volt lead from your power source to a controller or other device, make sure that it is a three conductor copper core wire. One wire is "hot" (black), one is neutral (white) and the remainder is the ground wire. The ground will be either green jacketed or bare copper, and once again is absolutely necessary for proper operation. Only direct-burial U.L. listed wire should be used in trenches. When the wire goes above ground, conduit is necessary. Using conduit for direct-burial wire is an unnecessary waste.

2.11.2 Wire for Larger Systems & Golf Courses

2.11.2.1 Solid Copper Core Wire

This is the common wire used for commercial sites, golf course sprinklers, etc. The most common size is #14 or #12 AWG, red jacketed for signal wire and white for the common ground. It's a bigger wire than sprinkler cable (above); therefore it's more rugged and has less voltage loss. Homeowners can use this wire as well, and may have to if there is a long distance (500' or more) from the valves to the controller. It comes in large rolls and can be used for all kinds of different electrical work. In summary, this is a good all-around wire to have around any shop.

2.11.2.2 120 or 220 Volt Wire for Large Systems

When your power wire routings start getting into the thousands of feet, you have to carefully calculate the power usage of the system, voltage loss and wire sizing. At this level you are still using direct burial power cable, but the sizing can vary greatly depending on how many power legs you have, whether the system is 120 or 220 volt, and how many devices are connected. We recommend that you hire an engineer or consultant to help you with this so that you don't waste money on oversized wire or risk a system that doesn't work properly because of under sizing.

2.11.2.3 Communication Cable

Each manufacturer of advanced field controllers for large sites/golf courses will have a specification for a particular kind of communication cable. The cable sends command signals between satellites and the central computer controller. Usually this is a heavy-duty pair, in some cases armored with metal to prevent rodent damage.

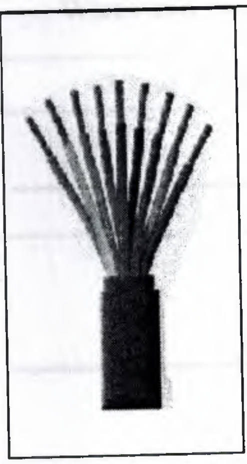
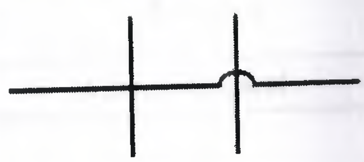


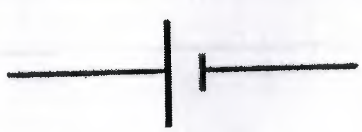
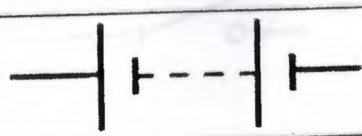
Figure 2.12: Wire

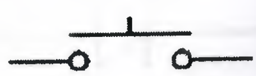
2.12 Schematic Symbol

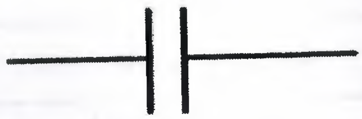
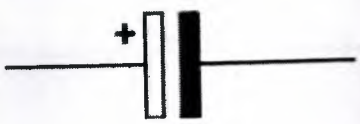
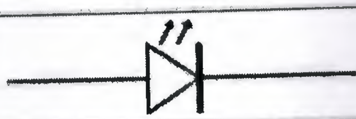
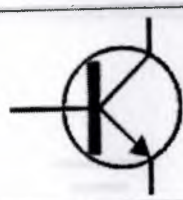
Understanding the schematic symbols of electrical components is very important in drawing, or understanding any circuit.

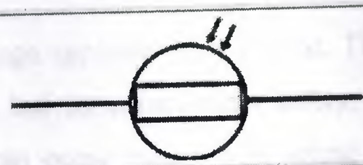
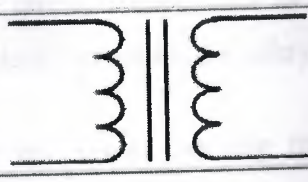
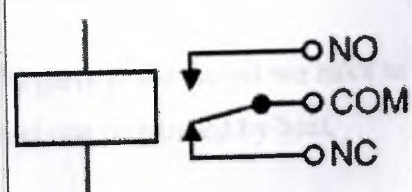
And the following table shows the exact symbol of this chapter common components and the right way to draw the electrical wires in any circuit:

Wires and connections		
Component	**Circuit Symbol**	**Function of Component**
Wire		To pass current very easily from one part of a circuit to another.
Wires joined		This symbol is used in circuit diagrams where wires cross to show that they are connected (joined). The 'blob' is often omitted at T-junctions, but it is vital to include it at crossings.
Wires not joined		In complex circuit diagrams it is often necessary to draw wires crossing even though they are not connected

Power Supplies		
Component	**Circuit Symbol**	**Function of Component**
Cell		Supplies electrical energy. Single cells are often wrongly called a battery, but strictly a battery is two or more cells joined together.
Battery		Supplies electrical energy. A battery is more than one cell.

DC supply		Supplies electrical energy.
AC supply		Supplies electrical energy.
Lamps		
Component	**Circuit Symbol**	**Function of Component**
Lamp (lighting)		A transducer which converts electrical energy to light. This symbol is used for a lamp providing illumination, for example a car headlamp or torch bulb.
Lamp (indicator)		A transducer which converts electrical energy to light. This symbol is used for a lamp which is an indicator, for example a warning light on a car dashboard.
Motor		A transducer which converts electrical energy to kinetic energy (motion).
Switches		
Component	**Circuit Symbol**	**Function of Component**
Push Switch (push-to-make)		A push switch allows current to flow only when the button is pressed. This is the switch used to operate a doorbell.
Push-to-Break Switch		This type of push switch is normally closed (on), it is open (off) only when the button is pressed.
On-Off Switch (SPST)		SPST = Single Pole, Single Throw. An on-off switch allows current to flow only when it is in the closed (on) position.

Capacitors		
Component	**Circuit Symbol**	**Function of Component**
Capacitor		A capacitor stores electric charge. A capacitor is used with a resistor in a timing circuit. It can also be used as a filter, to block DC signals but pass AC signals.
Capacitor, polarised		A capacitor stores electric charge. This type must be connected the correct way round. A capacitor is used with a resistor in a timing circuit. It can also be used as a filter, to block DC signals but pass AC signals.
Diodes		
Component	**Circuit Symbol**	**Function of Component**
Diode		A device which only allows current to flow in one direction.
LED Light Emitting Diode		A transducer which converts electrical energy to light.
Zener Diode		A special diode which is used to maintain a fixed voltage across its terminals.
Transistors		
Component	**Circuit Symbol**	**Function of Component**
Transistor NPN		A transistor amplifies current. It can be used with other components to make an amplifier or switching circuit.

Transistor PNP		A transistor amplifies current. It can be used with other components to make an amplifier or switching circuit.
	Other Symbols	
Component	**Circuit Symbol**	**Function of Component**
LDR Light Dependent Resistor		A transducer which converts brightness (light) to resistance (an electrical property).
Inductor (Coil, Solenoid)		A coil of wire which creates a magnetic field when current passes through it. It may have an iron core inside the coil. It can be used as a transducer converting electrical energy to mechanical energy by pulling on something.
Transformer		Two coils of wire linked by an iron core. Transformers are used to step up (increase) and step down (decrease) AC
Relay		An electrically operated switch, for example a 9V battery circuit connected to the coil can switch a 230V AC mains circuit. NO = Normally Open, COM = Common, NC = Normally Closed.
Earth (Ground)		A connection to earth. For many electronic circuits this is the 0V (zero volts) of the power supply, but for mains electricity and some radio circuits it really means the earth. It is also known as ground.

CHAPTER THREE

BURGLAR ALARM

3.1 Safety guidelines

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

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

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

- While the circuit is on, avoid touching the sensitive components like the transistor, and diodes and 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.

3.2 Why We Need a Security System

Most homeowners only think about installing a home security system after they themselves or a neighbor has been a victim of a burglary. Installing a home security system is one of the most effective deterrents available. Many burglars are opportunity offenders, which means they are not going to go out of their way if you have taken steps to make breaking into your home difficult for them. Most likely, a burglar won't find your home an "easy target" if you have a home security system. Also, you can save anywhere from 5% to 20% off your home owners insurance if you have a home alarm security system

If you think you could never be a victim of home burglary because things like that don't happen in your neighborhood. think again! Home burglary can happen in any neighborhood. Statistics show homes without security systems are about 3 times more likely to be broken into than homes with security systems. Many home owners don't realize how vulnerable they are in their own home until it's too late. The key to home preventing home burglary is knowledge. By having a home security system installed in your home you are less likely to be the victim of burglary or theft.

3.3 Infrared Motion Sensor

3.3.1 Installation and settings

Shut of the power, connect the power and load wire to the bottom led, Put the sensor on the bottom led, and twist the screw tightly then electrifying to test it.

The sensor can be adjusted to turned off after particular time, from 5 to 480 seconds, and also the light sensitivity can be adjusted according to the are its going to operate in.

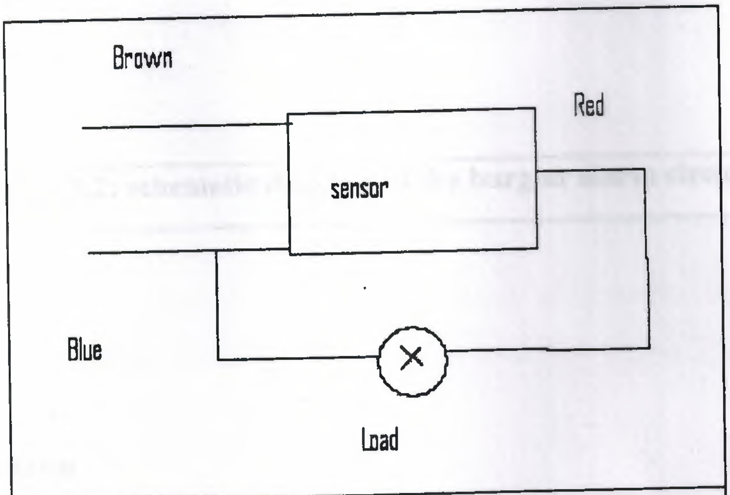


Figure 3.1:Sensor Connect-wire.

3.3.2 Operating the Sensor

The height of the sensor can be selected between 0.5 to 3.5 meter, and the position has to be set according to the detection rang cover. Its important to keep it away from heat motion. Its important to know that the working time is very long, it is nearly 30 seconds

3.4 Schematic Diagram Of the Burglar Alarm Circuit

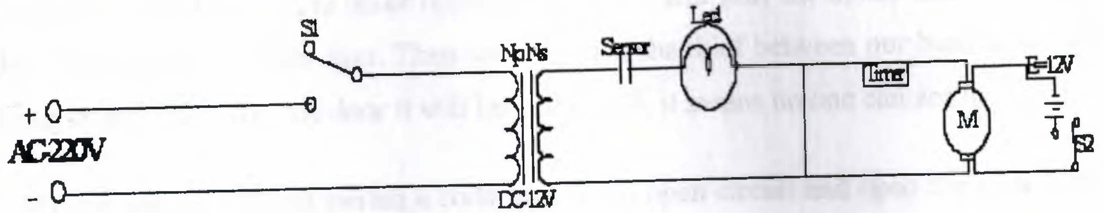


figure 3.2: schematic diagram of the burglar alarm circuit

3.5 Circuit alarm

we use in the circuit AC 220V by switch and I connect it with a transformer with a sensor alarm/light and light series, and the motor parallel, with a motor there is timer use fro the door.

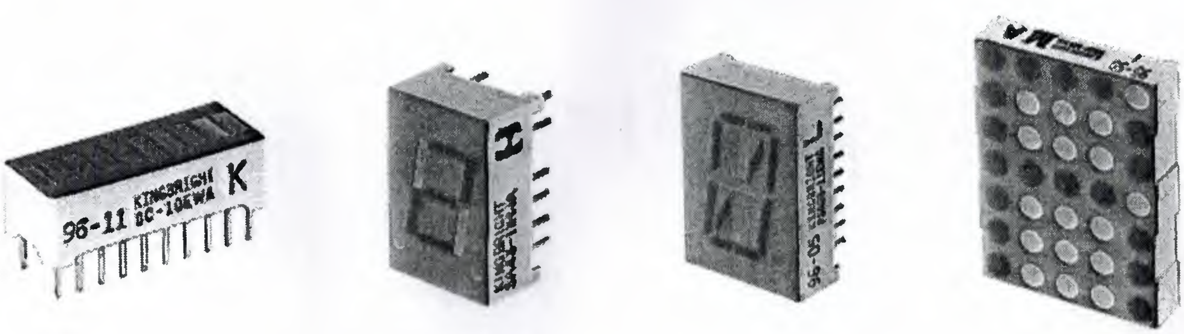
When starts the switch this system beginning to start but waiting the other switch (sensor), the sensor will send signals to find if any one in the place where the sensor put, when the thief enter that place, he will cut this signals and the sensor will give the circuit second connecting after the switch before. After that, the light will turn on in the police station and in that time the motor will turn on too, to start the door closing behind the thief to let him inside so we can catch him when the police will come and the timer was connecting at the motor to make open circuit after the door will reach the floor and stop the motor.

When the police come or the owner he has the switch to open the door by change the connection with a motor, and that connect (+) and (-) from the battery or any generator to (-) and (+) with a motor, to make opposite operation and start the motor turn on, and the door will open with timer also. Then we will have the thief between our hand and every thing safety. Of course the door it will be in the wall, it means no one can see it.

We can put on the first switch a code number to open circuit and open the door better than use switch to make all of these specially for use this system to important places like banks …. Etc.

3.6 LED Displays

LED displays are packages of many LEDs arranged in a pattern, the most familiar pattern being the 7-segment displays for showing numbers (digits 0-9). The pictures below illustrate some of the popular designs:



Bargraph 7-segment Starburst Dot matrix

Figure 3.3: types of LED displays

3.6.1 Pin connections of LED displays

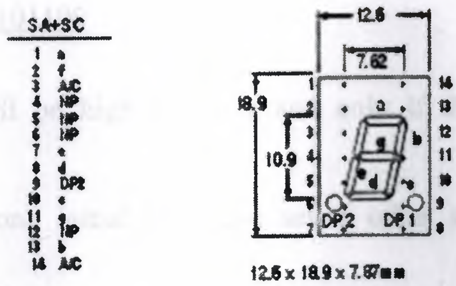


Figure 3.4: Pin connections diagram

There are many types of LED display and a supplier's catalogue should be consulted for the pin connections. The diagram on the right shows an example from the Rapid Electronics catalogue. Like many 7-segment displays, this example is available in two versions: Common Anode (SA) with all the LED anodes connected together and Common Cathode (SC) with all the cathodes connected together. Letters a-g refer to the 7 segments, A/C is the common anode or cathode as appropriate (on 2 pins). Note that some pins are not present (NP) but their position is still numbered.

3.6.2 System of security coding

* Let's choose the sequence to be 0101100

This means that if we have the following bit stream 110101100110101100111000101100

- The output will be high (F=1) if and only if the system detects the sequence 0101100
- So, we have one initial state and seven other states: A(initial state), B,C,D,E,F,G,H.
- The state diagram will be as shown in the next figure:

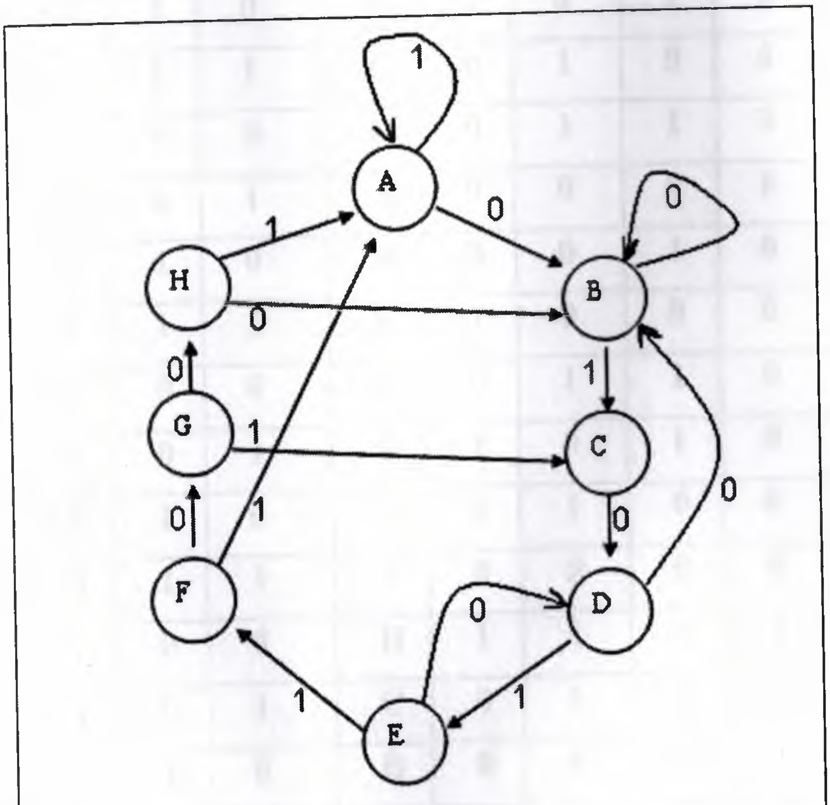


Figure 3.5: Markov diagram

- The simplest way in design such circuit is the design via D FFs,
- Since we have 8 states = 23 states
- Then we need only three 3 D-FFs (x,y,z)
- The state table is as shown in the following table :

Current state				**input**	**Next state**				**output**
	x	**y**	**z**	**W**		**X**	**y**	**z**	**F**
A	0	0	0	0	B	0	0	1	0
	0	0	0	1	A	0	0	0	0
B	0	0	1	0	B	0	0	1	0
	0	0	1	1	C	0	1	0	0
C	0	1	0	0	D	0	1	1	0
	0	1	0	1	A	0	0	0	0
D	0	1	1	0	B	0	0	1	0
	0	1	1	1	E	1	0	0	0
E	1	0	0	0	D	0	1	1	0
	1	0	0	1	F	1	0	1	0
F	1	0	1	0	G	1	1	0	0
	1	0	1	1	A	0	0	0	0
G	1	1	0	0	H	1	1	1	1
	1	1	0	1	C	0	1	0	0
H	1	1	1	0	B	0	0	1	0
	1	1	1	1	A	0	0	0	0

$D_x(t+1) = xyz'w' + xy'z'w + xy'zw' + xy'zw$

0	1	3	2
4	5	7 **1**	6
12 **1**	13	15	14
8	9 **1**	11	10 **1**

$D_y(t+1) = x'y'zw + yz'w' + xz'w' + xyz' + xy'w'$

0	1	3 **1**	2
4 **1**	5	7	6
12 **1**	13 **1**	15	14
8 **1**	9	11	10 **1**

$D_z(t+1) = w'(z'+x'+y)+ xy'z'$

0 **1**	1	3	2 **1**
4 **1**	5	7	6 **1**
12 **1**	13	15 **1**	14 **1**
8 **1**	9 **1**	11	10

Now, you can draw the circuit using three Flip-Flops (D-type), a common clock, and input x.

The output F is the output of AND gate which inputs are the outputs of the FFs.

D_x ,D_y and D_z are the inputs of FFs, have the formulas shown above using Karnaugh maps. They are functions of the input and the current state.

CONCLUSION

The firs chapter introduced the schematic symbols of the most common electrical components that are used in Hardware project. And it will introduce briefly the function of each component.

The second chapter intreduced some of the important information of the maine electrical components. Third capter will go through the important parameters,and design of the burglar alarm system.

Most homeowners only think about installing a home security system after they themselves or a neighbor has been a victim of a burglary. Installing a home security system is one of the most effective deterrents available. Many burglars are opportunity offenders, which mean they are not going to go out of their way if you have taken steps to make breaking into your home difficult for them. Most likely, a burglar won't find your home an "easy target" if you have a home security system. Also, you can save anywhere from 5% to 20% off your home owners insurance if you have a home alarm security system

If you think you could never be a victim of home burglary because things like that don't happen in your neighborhood. . . think again! Home burglary can happen in any neighborhood. Statistics show homes without security systems are about 3 times more likely to be broken into than homes with security systems. Many home owners don't realize how vulnerable they are in the their own home until it's too late. The key to home preventing home burglary is knowledge. By having an home security system installed in your home you are less likely to be the victim of burglary or theft.

- Ideal for uses, homes, banks, cars and other places.
- When movement is detected, the Sensor Light will activate a gentle soft illumination and automatically switch off in 15 seconds.
- The sensor alarm has a daylight sensor; it will only operate in the dark and can scan a 6 meter (19') range at 180°.
- Switch to turn on continuously, or turn off completely.

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