

**DESIGN AND CONSTRUCTION OF AN SMS BASED BURGLAR  
MONITORING SYSTEM**

**BY**

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**(EE/07/0046)**

**A PROJECT REPORT SUBMITTED TO THE DEPARTMENT  
OF ELECTRICAL AND ELECTRONICS ENGINEERING,  
SCHOOL OF ENGINEERING AND ENGINEERING  
TECHNOLOGY, MODIBBO ADAMA UNIVERSITY OF  
TECHNOLOGY, YOLA. IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF  
BACHELOR OF ENGINEERING.**

**ELECTRICAL AND ELECTRONICS DEPARTMENT, SCHOOL  
OF ENGINEERING AND ENGINEERING TECHNOLOGY**

**DECEMBER, 2012**

**DECLARATION**

I **Bobmanuel Christian Samuel** hereby declare that this project was written by me and it is a record of my own research work. It has not been presented before in any previous application for a Bachelor's degree in Electrical and Electronics Engineering Modibbo Adama University of Technology, Yola. References made to published literature have been duly acknowledged.

.....

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The above declaration is confirmed

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Date: .....

**Engr. A. S. Kadalla**  
(Supervisor)

## CERTIFICATION

This project entitled “**Design and Construction of an SMS Based Burglar Monitoring System**” by **Bobmanuel Christian Samuel (EE/07/0046)** meets the regulations governing the award of the bachelor’s degree of Moddibo Adama University of Technology, Yola and is approved for its contribution to knowledge and literary presentation.

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Date: .....

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(External Examiner)

## **DEDICATION**

This project work is dedicated to GOD Almighty and my beloved Grandmother **Ma'am**  
**Veronica George Lawson Jack.**

## **ACKNOWLEDGEMENTS**

Glory is to God for a divine inspiration to complete this task. I lack the appropriate words to express my gratitude to my beloved Grandmother Ma'am Veronica George Lawson Jack for her care, prayer and financial support. Mother I can't thank you enough.

I would like to acknowledge and extend my heartfelt gratitude to the following persons who have made the completion of this project possible:

Our HOD (Engr. I.M Visa), for his vital encouragement and support.

My Supervisor Engr. A.S Kadalla who has been instrumental and contributive to the realization of this project.

To all Staff and Students of the Department. Most especially to Inyongikarenfum, Elizabeth, Ruth, Kitan, Pastor Chris Enemaku and Francis Agoli.

And finally to God, who made all things possible.

## **ABSTRACT**

Home security has been a major issue where crime is increasing and everybody wants to take proper measures to prevent intrusion. In addition there was a need to automate home so that user can take advantage of the technological advancement. This project is aimed at developing the security of the household against intruders. In the case of household intrusion while you are out of your home the device sends an SMS to the emergency number provided to it.

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# CHAPTER ONE: INTRODUCTION

## 1.0 BACKGROUND

In a situation where there is high level of stealing, there is need for better security system. It is much safer to have a system that monitors and communicates to the device owner without putting human life at risk in the name of “Watchman”. This project tends to utilize the availability of GSM network, mobile phone and electronics circuit to achieve an automated system which is programmed to work as a thinking device to accomplish this purpose.

Homes without security systems are more likely to be targeted by a burglar and most of residential burglaries occur during the daylight. Under smart and intelligent home environment, numerous sensors, motion detectors, smoke detectors, water leakage detectors etc., and communication devices can be utilized for connection throughout the house, capable of monitoring and detecting the physical events. The output from these sensors can be used to alert the owner of any unauthorized intrusion or control home appliances such as lightings. Thus, maintaining seamless connectivity between devices and the main controller is very crucial. A lost connectivity can jeopardize the security of the home. It is also an important factor to ensure that, the devices being used operate in very-low power consumption so that they would last longer.

By simply sending an SMS to the mobile phone attached to the circuit, puts the system to either “active or inactive” state, and on any attempt of theft the system sends a text message to the device owner to take quick action either by calling the police to arrest the situation. This will solve the problem of the way by which homes are broken into.

## **1.1 PROBLEM STATEMENT**

Security is an important aspect of all our lives. A secure environment tends to give individuals rest of mind. However, with a global recession occurring, people have resorted to less honorable means to make ends meet. Theft rates (in a typical Nigerian University) have increased causing disharmony in the areas where such events occur. This sometimes leads to unpleasant occurrences such as fights and sometimes injuries. These injuries are either sustained when the culprit is caught and a mob action is decided upon. The aim of the proposed design is to reduce such occurrences by alerting the appropriate quarters while an unauthorized entrance into a house occurs. The relevance of this paper cannot be overemphasized.

## **1.2 OBJECTIVES**

The main objective of this project is to monitor home in real time against intrusion in the absence of home owner using mobile phone. The objectives can be summaries as below:

1. The system can be used for security in assisting smart house to reduce the intrusion problem and in areas of high residential burglary.
2. The user can get alerts anywhere through the GSM technology thus making the system location independent.

3. The system contains low cost components easily available which cuts down the overall system cost.
4. Through an SMS alert, it brings the home owner a step ahead of the technology.

### **1.3 SIGNIFICANCE OF THE STUDY**

This project is of great important, not only to home security but also applies to other things that requires security attention and protection – such as banks, cars, monitoring of base station systems (BSS), fish ponds, and whatever that require human immediate attention. Implementing this project to the specified areas, putting human life at risk all the name of watchman will be drastically reduced. One of such benefit is that this system can communicate to the home owner in real time if there is high level of residential burglary in the area for necessary actions to be taken.

### **1.4 SCOPE OF THE STUDY**

The scope of this project is Design and Construction of An SMS Based Burglar Monitoring System for the household that uses GSM network to monitor and safe guard the household. The system will communicate to the house owner through sending text message upon any theft attempt.

The system will monitor only windows and doors in the household. One major limitation with this project is that the device will only send message to the house owner if there is GSM network coverage in the area of theft attempt.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.0 REVIEW OF SECURITY SYSTEMS**

The burglar monitoring security system in the modern world has an interesting history. The innovation and modification of thousands of system invented gave a result to recent home security systems. The English inventor Mr. Tildesley credited with inventing the first home alarm system. He was the first claimed to come out with the idea of burglar alarm systems, with the linked of bells with the door lock, he made the system to ring if someone came and touched or even try to open the locks.

Innovation is yet to come after that when it came in the form of addition of electricity and use of magnet. The burglar alarm by using the electricity wires and magnets came from the Boston inventor, Mr. Augustus Pope. Using at doors, the contact got closed and an electrical circuit formed to ring the bell if any intrusion happen.

After that Mr. Edwin Holmes start the business with using the Pope's invention in New York, but the residents still not yet to accept the electrical alarm model. After the use of electricity for the street lights in 1880, it turned the peoples to accept the era of alarm system with electrical models. It is more than just electrical models that the American Telephone and Telegraph Company (ATTC) bought the Holmes Burglar business in 1905 with linking it to emergency call systems for inviting police and fire fighting personnel.

In 1980s the use of home burglar alarm system was widespread, less expensive and more versatile and by the middle of 1990s the system has become a standard feature. A few years after that, the wireless system came in combined with the alarm systems. In the most advanced technology, the use of motion detectors, surveillance equipment and electronic tracking devices are being used.

Home security and home alarm systems have become synonymous in the security context. The home alarm systems have the wide and the essential use of burglar alarm technology or burglar alarm itself for home security. With the construction of houses in the outer areas of the city and away from the city limit the security concept has got up with the people. The direct linking of the modern systems with the local police stations has given people more confidence and has assured immediate help from the law enforcers.

This advantage of wireless systems is taken by a DAITEM company, one of the companies that is leading European wireless alarm system manufacturer. The 21 years of experience to the security market and founded since 1977, DAITEM is specialized in the design of wireless alarm systems. Made a history of being the first fully wireless, autonomous and modular security system.

## **2.1 THE ATMEL AT89S52 MICROCONTROLLER**

The AT89S52 is a low-power, high performance CMOS 8-bit microcomputer with 8Kbytes of memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry standard 80S51 and 80S52

instruction set and pin out. The on-chip flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with flash on a monolithic chip, the Atmel AT89S52 is a powerful microcomputer that provides a highly flexible and cost-effective solution to many embedded control applications.

The word micro suggests that the device is very small and controller suggests that the device can be used to control objects, processes and events. You can find micro controller in all kinds of gadgets today. Any device that measures, controls, stores, calculates, or displays information is a candidate of micro controller. The 8952 belong to the family of chip available in NMOS and CMOS versions. The AT89S52 provides the following standard features: 8K bytes of flash, 256 bytes of RAM, 32 I/O lines, three 16-bit timer/counters, a six vector two-level interrupt architecture, a full-duplex serial port, on-chip oscillator and clock circuitry. In addition, the 8952 are designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The idle mode stops the CPU while allowing the RAM, timer/counters, serial ports and interrupt system to continue functioning.

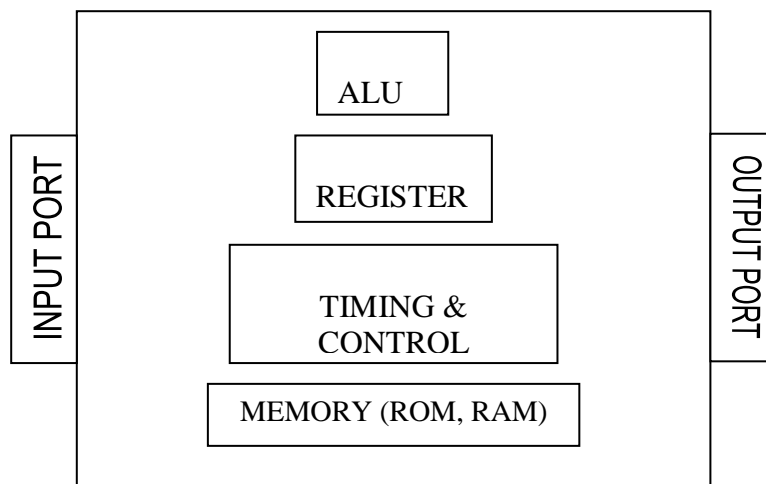
## **2.2 ELEMENTS OF THE ATMEL AT89S52 MICROCONTROLLER**

**The CPU (Central Processing Unit)** - Executes program instructions. Types of instructions include arithmetic, logic, and data transfer. An external crystal provides a timing reference for clocking the CPU.

**ROM (Read Only Memory)** - This is the read only memory that is programmed into the chip during the manufacturing process. It holds the main program in its different locations.

**RAM (Random Access Memory)** - This is where the device stores information for temporary use. The CPU can write to RAM as well as read from it. Any information stored in the RAM is lost when power is removed from the chip. The 8952 have 128 bytes of RAM.

**I/O (Input/output) Ports-** This ports enable the 8952 to read and write external memory and other components, the 8952 have four 8-bit I/O ports (port 0-3), which are effectively used. It does not have any external memory to write or read from since pin 31 is connected high.



**Figure 2.1:** The Internal Block Structure of the AT89S52 Microcontroller IC.

## **2.3 OPERATION OF THE AT89S52 MICROCONTROLLER**

AT89S52 is a single-chip computer, it has internal 8Kbytes ROM and 128 bytes RAM in-built to hold codes at unique location hence its ROM is used for permanent storage of programs, while the RAM is a volatile storage device which loses information it is holding once power is removed from the system. For the 89S52 to access internal memory pin 31 is connected high. The 89S52 accesses code memory when it executes an assembly language, pure hex file program or subroutine. Code memory is intended for programs that have been previously programmed into ROM hence code and data memory can be combined in a single area, making WR control (write operation) and PSEN and RD (read operation) are logically ANDed to create a read signal that is active when PSEN is high. Resetting the chip causes it to begin the program execution from the beginning i.e. at 0000H in code memory. Finally, the chip has two pins for connecting to a +5 volts power supply ( $V_{CC}$ ) and ground ( $V_{SS}$ ).

## **2.4 AT COMMAND SETS**

The AT command set is the fundamental interface with the mobile phone. An AT command is simply a string of characters preceded by the AT prefix that is sent to the phone. The commands typically instruct the phone to perform some action or set some characteristic within the phone. The phone has two states: command state and on-line state. In command state, the mobile phone will accept and respond to AT commands. In

the on-line state, the modem will transmit data, but ignore AT commands. Typically the modem is in the on-line state after dialing.

AT commands has the following format:

- The command is prefixed with AT (Attention)
- The command is terminated by a carriage return <CR> (except the A/ command and escape sequence).
- The commands can be entered in upper case or lower case.
- The AT prefix can be in upper case or lower case, but both the A and the T must be the same case.
- Characters that precede the AT prefix are ignored.
- Multiple commands can be strung together on a single line and spaces may be included between commands but are not necessary.

The command line interpretation begins upon receipt of the carriage return. These commands are used for request information about the current configuration or operational status of the mobile phone/modem and test availability and request the range of valid parameters, when applicable, for an AT command.

General Syntax of AT-Commands:

**Basic**            AT<command> [=] [<parameter>]

**Extended**        AT+<command>= [<parameter>]

AT\*<command>= [<parameter>]

**Read command** AT+<command>?

AT\*<command>?

AT<command>?

**Test command** AT+<command>=?

AT\*<command>=?

**Response command** AT+<command> : <parameter >

AT\*<command> : <parameter>

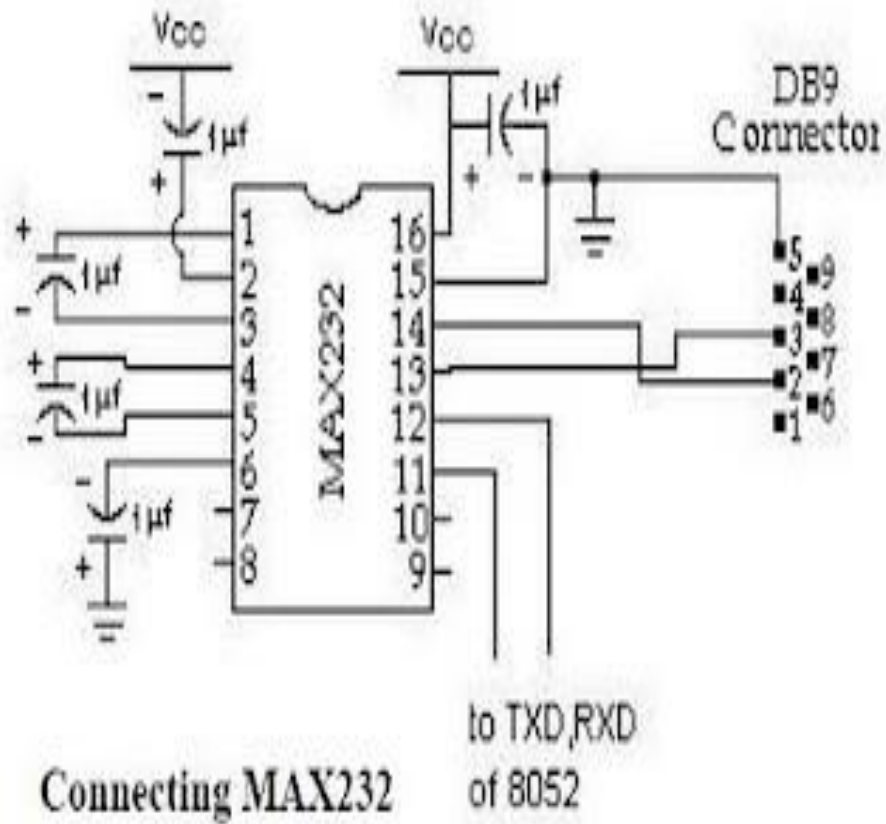
Some Important AT commands used to Test and Design are:

1. **ATD** To dial a voice call from the modem.
2. **AT+IPR** To set the baud rate for the modem (here for our application the baud rate is set as 9600).
3. **ATA** To answer an incoming call.
4. **AT+CHUP** To hang up the initiated call.
5. **AT+CFUN** To set the phone functionality. Set to 0 to deactivate the modem.
6. **AT+CLIP** To identify caller number this command is set to 1

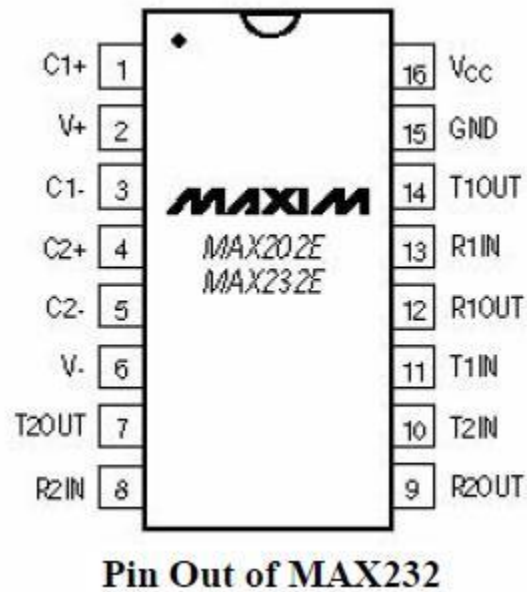
7. **AT+CLIR** For calling line Identification Restriction.
8. **AT+CNUM** To identify the subscriber number.
9. **AT+CMGR** To read the message at particular location .The location number is given  
  
as index .
10. **AT+CMGD** To delete the received message
11. **AT+CMGS** To send the message.
12. **AT+CMGF** To change the message format to PDU or Text mode.
13. **AT+CMGL** To see all the list of messages.
14. **ATE** To enable and disable command echo.

## **2.5 THE MAX 232**

MAX232 is used to interface the microcontroller to standard RS-232 port of personal computer. It is a signal level converter necessary for conversion between TTL and RS-232 standards.



**Figure 2.2:** MAX232 pin configuration



**Figure 2.3:** Block diagram and pin names of MAX232

The MAX232 requires 5 external 10uF capacitors. These are used by the internal charge pump to create +10 volts and -10 volts. The MAX232 includes 2 receivers and 2 transmitters so two serial ports can be used with a single chip. We will only use one transmitter for this project. The only connection that must be made to the 8052 is one jumper from pin 3 of the 8052 to pin 11 of the MAX232.

The circuit diagram shown above in figure 2.4 illustrates the connection of RS232 with microcontroller and serial port DB9 connector. Data is transmitted and received on pins 2 and 3 respectively. Data Set Ready (DSR) is an indication from the Data Set (i.e., the modem or DSU/CSU) that it is on. Similarly, DTR indicates to the Data Set that the DTE is on. Data Carrier Detect (DCD) indicates that a good carrier is being received from the remote modem.

Pins 4 RTS (Request To Send - from the transmitting computer) and 5 CTS (Clear To Send - from the Data set) are used to control. In most Asynchronous situations, RTS and CTS are constantly on throughout the communication session. However where the DTE is connected to a multipoint line, RTS is used to turn carrier on the modem on and off. On a multipoint line, it's imperative that only one station is transmitting at a time (because they share the return phone pair). When a station wants to transmit, it raises RTS. The modem turns on carrier, typically waits a few milliseconds for carrier to stabilize, and then raises CTS. The DTE transmits when it sees CTS up. When the station has finished its transmission, it drops RTS and the modem drops CTS and carrier together.

Clock signals (pins 15, 17, & 24) are only used for synchronous communications. The modem or DSU extracts the clock from the data stream and provides a steady clock signal to the DTE. The transmit and receive clock signals do not have the same baud rate. Transmit and receive leads (2 or 3) can be reversed depending on the use of the equipment - DCE Data Communications Equipment or a DTE Data Terminal Equipment.

CTS Clear To Send

DCD Data Carrier Detected (Tone from a modem)

DCE Data Communications Equipment e.g. modem

DSR Data Set Ready

DSRS Data Signal Rate Selector (Not commonly used)

DTE Data Terminal Equipment e.g. computer, printer

DTR Data Terminal Ready

FG Frame Ground (screen or chassis)

NC No Connection

RCk Receiver (external) Clock input

RI Ring Indicator (ringing tone detected)

RTS Request To Send

RxD Received Data

SG Signal Ground

SCTS Secondary Clear To Send

SDCD Secondary Data Carrier Detected (Tone from a modem)

SRTS Secondary Request To Send

SRxD Secondary Received Data

STxD Secondary Transmitted Data

TxD Transmitted Data

## 2.6 THE INFRARED MODULE

The infrared receiver (TSOP31556) component used on this module detects 40KHz carrier signals coming from an infrared transmitter (TSAL6200) generated from the microcontroller directly. The TSOP1740 – series are miniaturized receivers for infrared remote control systems.

PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor.

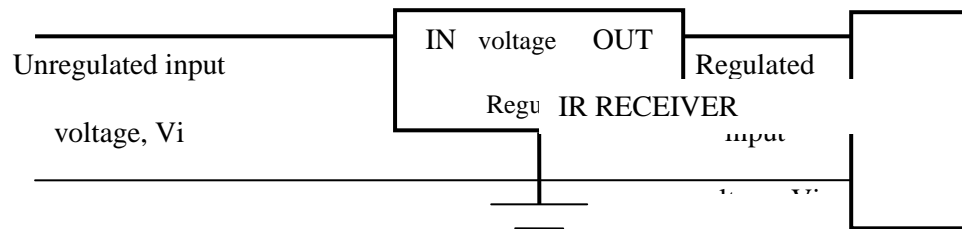
The TSAL6200 and TSOP1740 are the standard IR remote control transmitter and receiver series, supporting all major transmission codes. The circuit of the TSOP1740 is designed in a



way that unexpected output pulses due to noise or disturbance signals are avoided. A band-passfilter, an integrator stage and an automatic gain control are used to suppress such disturbances. The distinguishing mark between data signal and disturbance signal are carrier frequency, burst length and duty cycle. The pin 1 is the ground, pin 2 is the voltage source and pin 3 is the output.

## 2.7 THE 3-TERMINAL VOLTAGE REGULATOR (LM317)

This is normally the best choice for non-critical application. It has only three connections (input, output, and ground) and it is factory-built to provide a fixed output.



**Figure 2.5:** Connection arrangement of the LM317 IC regulator.

The generation of this type is the LM317 regulator series, which provide fixed regulated voltage from 5 to 24 Volts.

In this project, the single IC voltage regulator used is the LM317 which provides a  $V_{cc}$  of +5V. The power supply is tapped from the 12V step-down transformer and then regulated with LM317 to have +5volt ( $V_{cc}$ ) which was used to supply all the required  $V_{cc}$  of +5V for the Microcontroller chip. The output voltage is +5V, and maximum output current is 500mA to 1A.

# CHAPTER THREE: DESIGN AND CONSTRUCTION

## PROCEDURE

### 3.0 SYSTEM DESCRIPTION

This chapter deals with the detailed and orderly presentation of calculations involved in the design. The block diagram is presented here to serve as a guide to components selection and calculation.

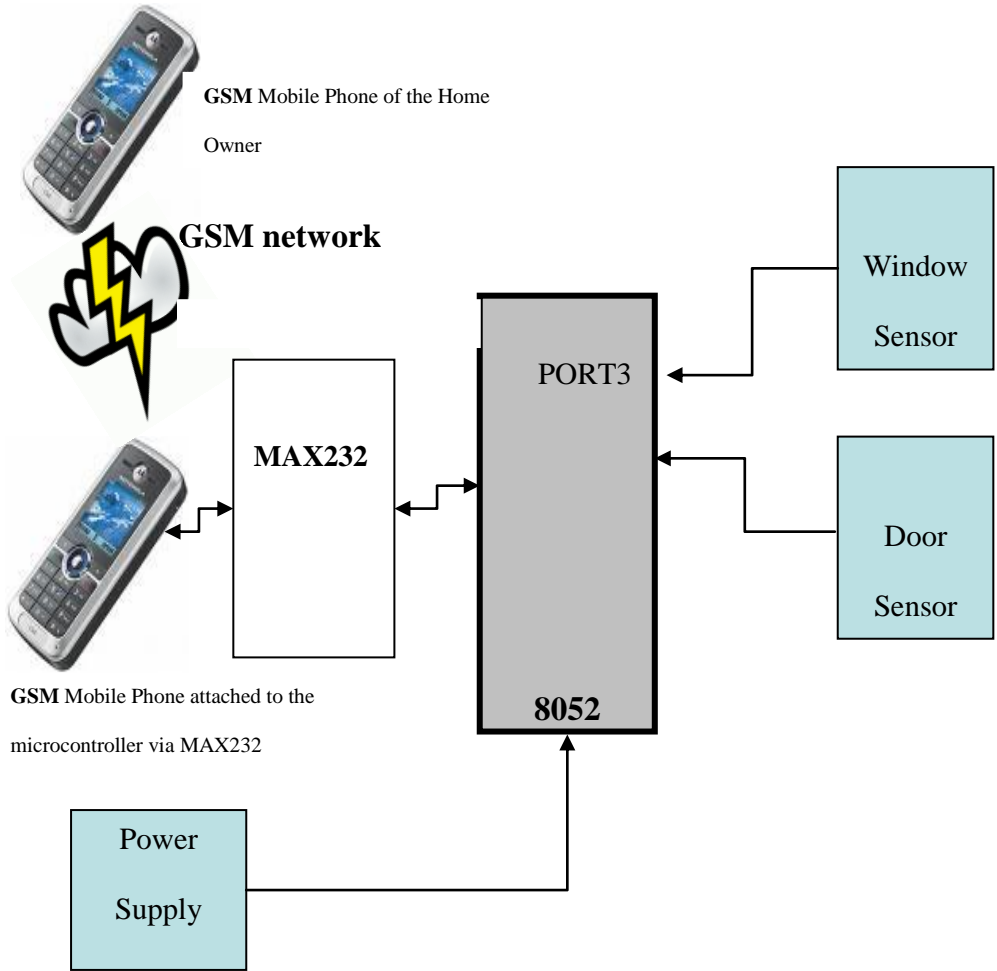


Figure 3.1: Block diagram of an SMS based burglar security system.

### 3.1 POWER SUPPLY DESIGN

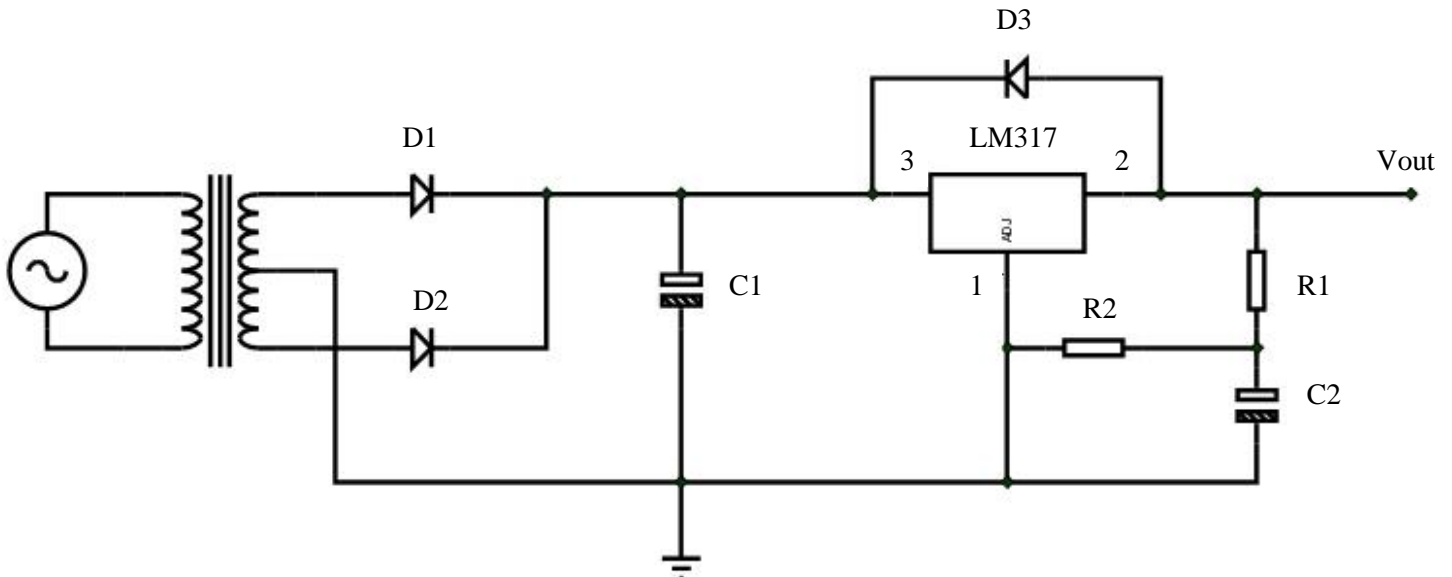


Figure 3.2 power supply unit

The system requires a 5V 1A d.c for proper operation. This is achieved by using regulated power supply circuit as shown in the figure 3.2 above. A linear voltage regulator (LM317) is used to achieve the needed voltage regulation. The value of  $C_1$  is recommended to improve the transient response.

$$V_{in} = V_{out} + 5 \dots \dots \dots 3.1$$

From the datasheet of LM317

$$V_{in} = 5 + 5 = 10V$$

The R.M.S voltage of transformer,  $V_r$  is given as

$$V_r = \frac{V_{in}}{\sqrt{2}} \dots \dots \dots 3.2$$

$$= 7.07 \text{ Volt}$$

7.07Volt is not available, therefore 12Volt is selected. Hence  $V_r = 12\text{Volt}$

Let voltage across capacitor,  $C_1$  be  $V_c$

$$V_c = V_r \times \sqrt{2} \dots\dots\dots 3.3$$

$$= 12 \times \sqrt{2} = 16.97 \text{ Volt}$$

Hence the working voltage of the capacitor,  $V_{wc}$

$$V_{wc} = 2 \times V_c \dots\dots\dots 3.4$$

$$= 2 \times 16.97 = 34 \text{ Volt}$$

In the absent of 34 Volt, 35 Volt is selected as adequate voltage. Therefore  $V_{wc} = 35 \text{ Volt}$

The capacitance of the capacitor is calculated as follows:

$$I = \frac{dQ}{dt} \dots\dots\dots 3.6$$

But  $Q = C \times V \dots\dots\dots 3.7$

Hence  $I = C \times \frac{dV}{dt}$

Therefore  $C = I \times \frac{dt}{dv} \dots\dots\dots 3.8$

Also  $dt = \frac{T}{2}$ ,  $T = \frac{1}{f} \dots\dots\dots 3.9$

$$C = \frac{I \times T}{2 \times dv} \dots\dots\dots 3.10$$

From equation 3.10

$$C = \frac{I}{2 \times f \times dv} \dots\dots\dots 3.11$$

Where  $dv =$  ripple voltage

$f =$  frequency of the mains = 50Hz

$I =$  load current = 1A

Taking 10% of the ripple voltage, yields

$$dv = \frac{10}{100} \times V_c = \frac{10V_c}{100}$$

Where  $V_c = 16 \text{ Volt}$

$$\text{Hence } C_1 = \frac{100}{2 \times 10 \times 50 \times 16} = 0.00626\text{F}$$

$$= 6250\mu\text{F}$$

In the absent of 6250μF, 6800μF is selected as adequate capacitance of capacitor C<sub>1</sub>.

Also, from datasheet of LM317

$$V_{\text{out}} = \frac{V_{\text{ref}}}{R_1} \times (R_1 + R_2) \dots \dots \dots 3.12$$

From datasheet V<sub>ref</sub> = 1.25 Volt and V<sub>out</sub> from calculation is 5 Volt

$$1 + \frac{R_2}{R_1} = \frac{5}{1.25} = 4$$

$$\frac{R_2}{R_1} = 4 - 1 = 3$$

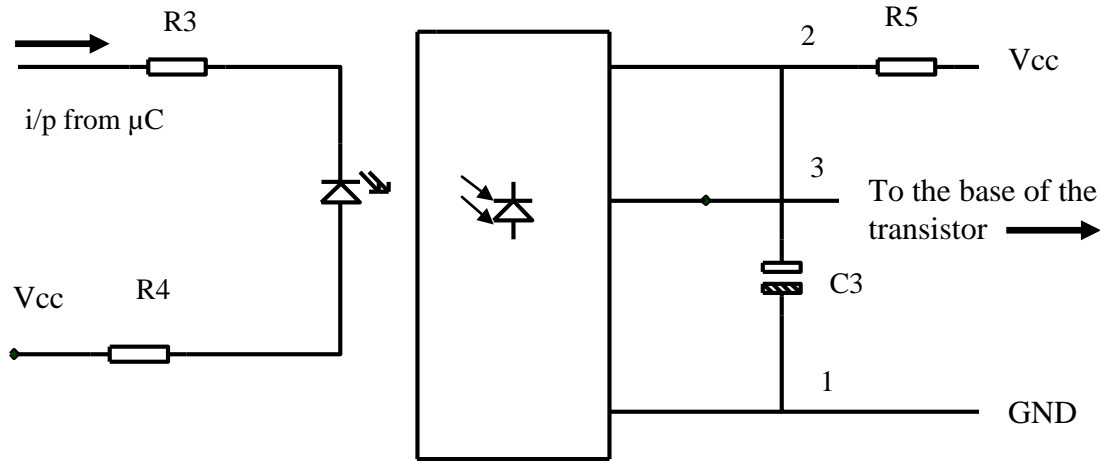
$$R_2 = 3 \times R_1 \dots \dots \dots 3.13$$

R<sub>1</sub> = 1KΩ (recommended in LM317 datasheet)

Therefore R<sub>2</sub> = 3KΩ

### 3.2 THE SENSORS

The sensors used are TSOP31556 and TSAL6200 for the receivers and transmitters. Both TSOP31556 and TSAL6200 are chosen because they are optimized to better suppress spurious pulses from energy saving fluorescent lamps and immune to dimmed LCD backlighting.



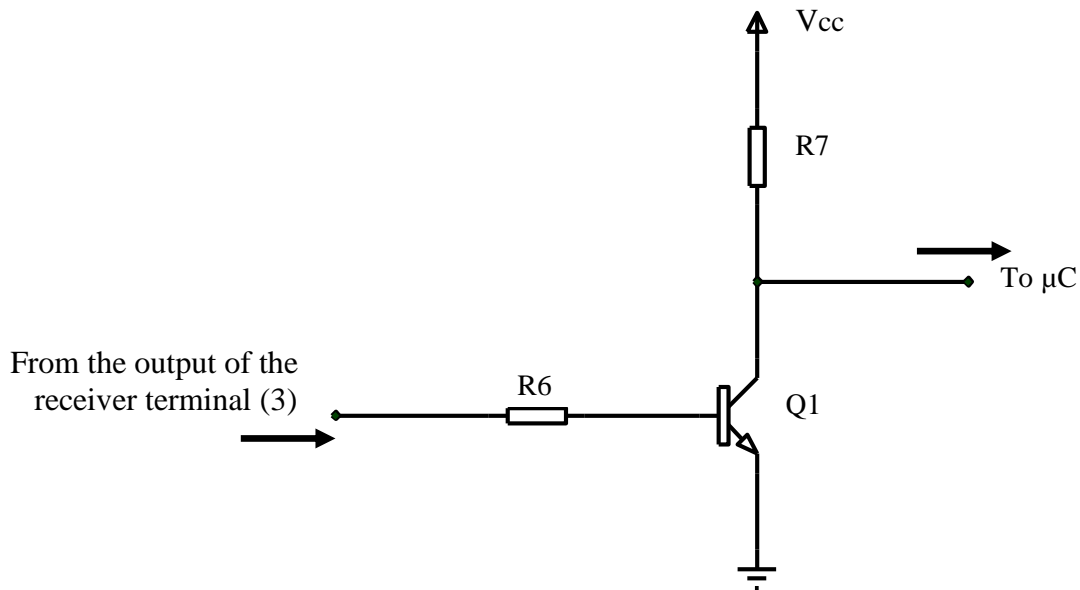
**Figure 3.3:** banks of sensors

These are sensors in the form of switches already attached to the household doors and windows. The outputs from these sensors are fed to microcontroller port three (i.e P3.2 and P3.3) which now serves as the input as shown in figure 3.3 above.

The output from the microcontroller through port one (P1.0) is fed to the infrared transmitter through R12 transmitting at a carrier frequency of 40KHz. The infrared receiver receives this frequency and sends to the microcontroller through port three (P3.2 & P3.3) through a transistor which act as a switch.

### 3.3 TRANSISTORS AS A SWITCH

A transistor is a semiconductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals.



**Figure 3.4:** transistor as a switch

In a grounded-emitter transistor circuit, such as the circuit shown above in figure 3.4, as the base voltage rises, the emitter and collector currents rise exponentially. The collector voltage drops because of the collector load resistance. The transistor provides current gain, allowing a relatively large current in the collector to be switched by a much smaller current into the base terminal. The ratio of these currents varies depending on the type of transistor.

Calculation for R6 and R7 are shown below

$$V_{R6} = V_{CC} + V_{BE} \dots \dots \dots 3.14$$

But  $V_{CC}$  is 5V from power supply and  $V_{BE}$  is the emitter-base voltage which is 0.7V.

$$\text{Therefore, } V_{R6} = 5 - 0.7 = 4.3V \dots \dots \dots 3.15$$

Also,  $I_c(\text{sat}) = 50\text{mA}$  from datasheet of 2N3904 transistor

Hence,  $I_B(\text{sat}) = \frac{I_C(\text{sat})}{10} \dots\dots\dots 3.16$

$$I_B(\text{sat}) = \frac{50}{10} = 5\text{mA}$$

Now,  $V_{R6} = I_B(\text{sat}) \times R_6 \dots\dots\dots 3.17$

$$R_6 = \frac{V_{R6}}{I_B(\text{sat})} = \frac{4.3\text{V}}{5\text{mA}} = 860\Omega \times 10 = 8.6\text{K}\Omega$$

In the absent of 8.6KΩ, 10KΩ is selected as adequate resistance of R<sub>6</sub>.

The value of R<sub>7</sub> is also calculated as follows

$$V_{R7} = V_{CC} - V_{CE}(\text{sat}) \dots\dots\dots 3.18$$

From datasheet of 2N3904, V<sub>CE</sub>(sat) is equal to 0.2V

$$V_{R7} = 5 - 0.2 = 4.8\text{V} \dots\dots\dots 3.19$$

Also,  $V_{R7} = I_C \times R_7 \dots\dots\dots 3.20$

$$R_7 = \frac{V_{R7}}{I_C(\text{sat})} = \frac{4.8\text{V}}{50\text{mA}} = 96\Omega \times 10 = 960\Omega$$

In absent of 960Ω, 1KΩ is selected as adequate resistance of R<sub>7</sub>.

The value of the capacitor C<sub>3</sub> which is equal to 1μF and the resistance value of R<sub>3</sub> and R<sub>4</sub> which are 68Ω and 1KΩ respectively are recommended from the datasheet of the infrared module for proper operations.

From datasheet recommendation of AT89S52:

$$C5 = C6 = 33\text{pF}$$

$$C4 = 10\mu\text{F}$$

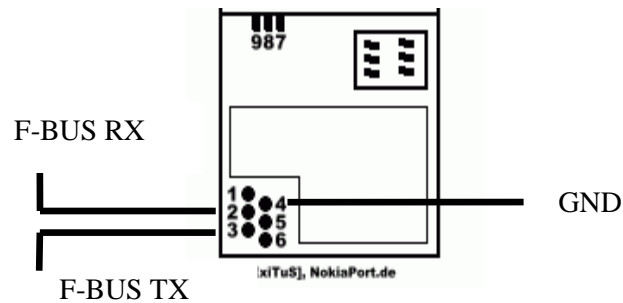
$$C7 = C8 = C9 = C10 = 1\mu\text{F}$$

$$R10 = 10\text{K}\Omega$$

$$R12 = 1\text{K}\Omega$$

### 3.4 THE MOBILE PHONE (NOKIA 1110i)

Most Nokia phones have F-Bus and M-Bus connections like the Nokia1110i and can be used to connect a phone to a PC or in this case a microcontroller (AT89S52). The connection can be used for controlling just about all functions of the phone, as well as uploading new firmware etc. This bus allows us to send and receive SMS messages. For this project the F-BUS protocol and commands are used. The F-Bus is bi-directional serial type bus running at 115,200bps, 8 data bits.



**Figure 3.5:** pinout description of Nokia 1110i

**Table 3.1** pinout/pin configuration of Nokia 1110i

PINOUTS/PIN	DESCRIPTION
1	DAI CLK
2	F-BUS RX
3	F-BUS TX
4	GND
5	M-BUS
6	V <sub>PP</sub>

### **3.5 THE CRYSTAL OSCILLATOR**

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. The frequency of the oscillator used is 11.0592MHz and it is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for the microcontroller AT89S52, digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers.



**Figure 3.6:** crystal oscillator

### **3.6 THE SOFTWARE USED**

The software used in compiling the programme is Reads51 and written in Assembly Language. Reads51 is an Integrated Development Environment (IDE) that currently supports Rigel's 8051 family of embedded control boards, including Rigel's new line of single-chip board. The IDE includes an assembler, C compiler, editor, linker/locator, debugger, and chip simulator. Graphically, the IDE consists of a main menu, customizable toolbars, and various windows. All windows, except the editor window are

dockable. Dockable windows may be attached to any side of the IDE, or left floating anywhere on the desktop.

**The main programme:**

```
#include <sfr52.inc>
```

```
ORG 0000H
AJMP VERONICA
ORG 0003H
AJMP INTRUDER_DOOR
ORG 0013H
AJMP INTRUDER_WINDOW
```

VERONICA:

```
; Configure Timer 2 in Auto-Reload Mode.
; Timer Clk = (11.00592 * 1)/12 = 0.91716MHz
```

```
MOV P2,#00H
Mov IE,#95H ;ENABLE SERIAL INTERUPT
Mov T2CON,#00H
Mov T2MOD,#02H
Mov TL2, #BBh ; Lower Byte
Mov TH2, #FFh ; Upper Byte
Mov RCAP2L, #BBh ; Lower Byte
Mov RCAP2H, #FFh ; Upper Byte
Setb TR2 ; Run Timer
```

```
;Configure Timer1 in Auto-Reload Mode
```

```
Mov SCON, #50h ; Sets Baud Rate in Mode
Mov PCON, #80h ; Sets SMOD
Mov TL1, #FAh
Mov TH1, #FAh
Setb TR1 ; Start Timer1
```

WAIT\_4\_INTERRUPT:

```
AJMP WAIT_4_INTERRUPT
```

```
.*****
;
INTRUDER_DOOR:
```

```

,*****
ACALL SERIAL_INIT
ACALL SEND_PDU_MODE
MOV SBUF,#07H
M1:JNB TI,M1
CLR TI
MOV SBUF,#91H
M2:JNB TI,M2
CLR TI
MOV SBUF,#32H
M3:JNB TI,M3
CLR TI
MOV SBUF,#84H
M4:JNB TI,M4
CLR TI
MOV SBUF,#30H
M5:JNB TI,M5
CLR TI
MOV SBUF,#00H
M6:JNB TI,M6
CLR TI
MOV SBUF,#00H
M7:JNB TI,M7
CLR TI
MOV SBUF,#00H
M8:JNB TI,M8
CLR TI
MOV SBUF,#04H
M9:JNB TI,M9
CLR TI
MOV SBUF,#0BH
M10:JNB TI,M10
CLR TI
MOV SBUF,#C8H
M11:JNB TI,M11
CLR TI
MOV SBUF,#70H
M12:JNB TI,M12
CLR TI
MOV SBUF,#30H
M13:JNB TI,M13
CLR TI
MOV SBUF,#87H
M14:JNB TI,M14
CLR TI
MOV SBUF,#43H

```

```
M15:JNB TI,M15
    CLR TI
    MOV SBUF,#25H
M16:JNB TI,M16
    CLR TI
    MOV SBUF,#F7H
M17:JNB TI,M17
    CLR TI
    MOV SBUF,#00H
M18:JNB TI,M18
    CLR TI
    MOV SBUF,#00H
M19:JNB TI,M19
    CLR TI
    MOV SBUF,#21H
M20:JNB TI,M20
    CLR TI
    MOV SBUF,#90H
M21:JNB TI,M21
    CLR TI
    MOV SBUF,#31H
M22:JNB TI,M22
    CLR TI
    MOV SBUF,#21H
M23:JNB TI,M23
    CLR TI
    MOV SBUF,#53H
M24:JNB TI,M24
    CLR TI
    MOV SBUF,#85H
M25:JNB TI,M25
    CLR TI
    MOV SBUF,#10H
M26:JNB TI,M26
    CLR TI
    MOV SBUF,#05H
M27:JNB TI,M27
    CLR TI
    MOV SBUF,#C8H
M28:JNB TI,M28
    CLR TI
    MOV SBUF,#22H
M29:JNB TI,M29
    CLR TI
    MOV SBUF,#93H
M30:JNB TI,M30
```

```

CLR TI
MOV SBUF,#F9H
M31:JNB TI,M31
CLR TI
MOV SBUF,#24H
M32:JNB TI,M32
CLR TI
MOV SBUF,#02H
M33:JNB TI,M33
CLR TI
RETI

```

```

,*****
,
INTRUDER_WINDOW:
,*****
,

```

```

ACALL SERIAL_INIT
ACALL SEND_PDU_MODE
MOV SBUF,#07H
N1:JNB TI,N1
CLR TI
MOV SBUF,#91H
N2:JNB TI,N2
CLR TI
MOV SBUF,#32H
N3:JNB TI,N3
CLR TI
MOV SBUF,#84H
N4:JNB TI,N4
CLR TI
MOV SBUF,#30H
N5:JNB TI,N5
CLR TI
MOV SBUF,#00H
N6:JNB TI,N6
CLR TI
MOV SBUF,#00H
N7:JNB TI,N7
CLR TI
MOV SBUF,#00H
N8:JNB TI,N8
CLR TI
MOV SBUF,#04H
N9:JNB TI,N9
CLR TI
MOV SBUF,#0BH
N10:JNB TI,N10

```

```
CLR TI
MOV SBUF,#C8H
N11:JNB TI,N11
CLR TI
MOV SBUF,#70H
N12:JNB TI,N12
CLR TI
MOV SBUF,#30H
N13:JNB TI,N13
CLR TI
MOV SBUF,#87H
N14:JNB TI,N14
CLR TI
MOV SBUF,#43H
N15:JNB TI,N15
CLR TI
MOV SBUF,#25H
N16:JNB TI,N16
CLR TI
MOV SBUF,#F7H
N17:JNB TI,N17
CLR TI
MOV SBUF,#00H
N18:JNB TI,N18
CLR TI
MOV SBUF,#00H
N19:JNB TI,N19
CLR TI
MOV SBUF,#21H
N20:JNB TI,N20
CLR TI
MOV SBUF,#90H
N21:JNB TI,N21
CLR TI
MOV SBUF,#31H
N22:JNB TI,N22
CLR TI
MOV SBUF,#21H
N23:JNB TI,N23
CLR TI
MOV SBUF,#53H
N24:JNB TI,N24
CLR TI
MOV SBUF,#85H
N25:JNB TI,N25
CLR TI
```

```

MOV SBUF,#10H
N26:JNB TI,N26
CLR TI
MOV SBUF,#05H
N27:JNB TI,N27
CLR TI
MOV SBUF,#C8H
N28:JNB TI,N28
CLR TI
MOV SBUF,#22H
N29:JNB TI,N29
CLR TI
MOV SBUF,#93H
N30:JNB TI,N30
CLR TI
MOV SBUF,#F9H
N31:JNB TI,N31
CLR TI
MOV SBUF,#BCH
N32:JNB TI,N32
CLR TI
MOV SBUF,#02H
N33:JNB TI,N33
CLR TI
RETI
,*****
SERIAL_INIT:
,*****
MOV SBUF,#'A'
A1: JNB TI,A1
CLR TI
MOV SBUF,#'T'
T: JNB TI,T
CLR TI
MOV SBUF,#'+'
PLUS: JNB TI,PLUS
CLR TI
MOV SBUF,#'C'
C1: JNB TI,C1
CLR TI
MOV SBUF,#'M'
M: JNB TI,M
CLR TI
MOV SBUF,#'G'
G: JNB TI,G
CLR TI

```

```

MOV SBUF,#'F'
F: JNB TI,F
CLR TI
MOV SBUF,#'='
EQUAL: JNB TI,EQUAL
CLR TI
MOV SBUF,#'0'
ZERO: JNB TI,ZERO
CLR TI
RET

```

```

,*****
,
SEND_PDU_MODE
,*****

```

```

MOV SBUF,#'A'
A11: JNB TI,A11
CLR TI
MOV SBUF,#'T'
T1: JNB TI,T1
CLR TI
MOV SBUF,#'+'
PLUS1: JNB TI,PLUS1
CLR TI
MOV SBUF,#'C'
C11: JNB TI,C11
CLR TI
MOV SBUF,#'M'
MM: JNB TI,MM
CLR TI
MOV SBUF,#'G'
G1: JNB TI,G1
CLR TI
MOV SBUF,#'S'
S1: JNB TI,S1
CLR TI
MOV SBUF,#'='
EQUAL1: JNB TI,EQUAL1
CLR TI
MOV SBUF,#'33'
ZERO1: JNB TI,ZERO1
CLR TI
RET

```

```

END

```

### 3.7 THE COMPLETE CIRCUIT DIAGRAM

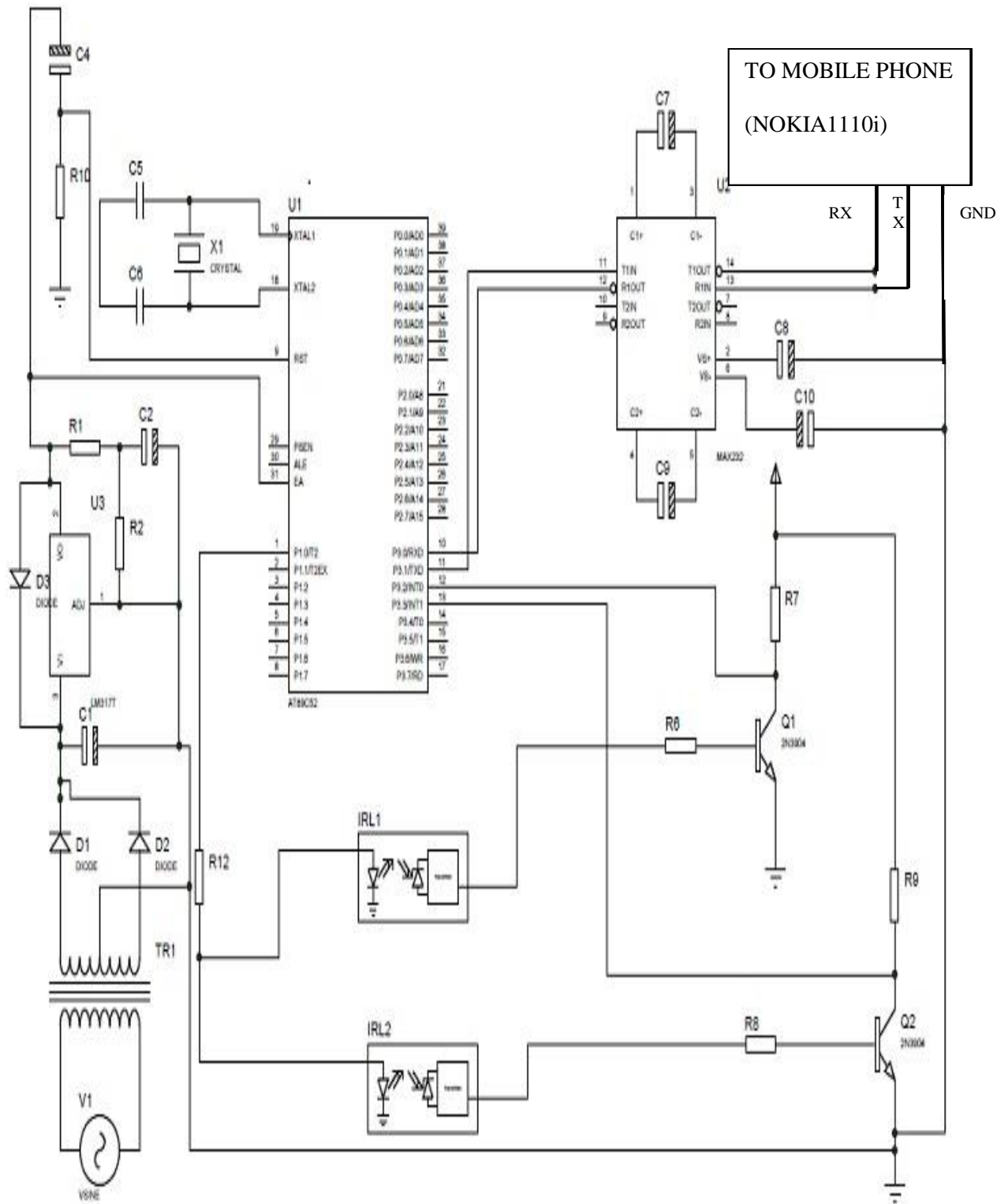
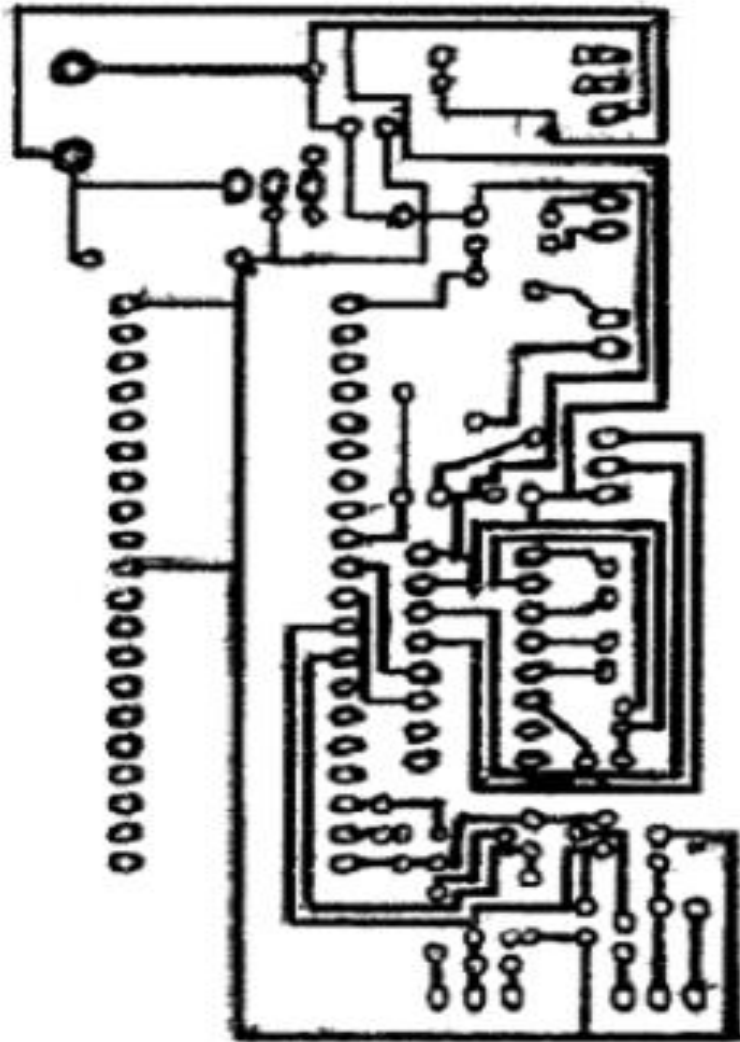


Figure 3.8: Complete circuit diagram

### 3.8 THE PRINTED CIRCUIT BOARD LAYOUT



**Figure 3.9:** the printed circuit board

### 3.9 CONSTRUCTION

The system was first built on bread board. This was done to ascertain its workability and to logically arrange the entire circuit according to the design specification. The construction followed a sequence ranging from the power supply to the final output. The

sensors from the doors and windows also served as inputs to microcontroller as well. The output of the microcontroller was used (through programming) to control sending of text messages, In this project we interfaced 8052 microcontroller with Nokia 1110i GSM mobile phone to decode the received message and do the required action. The protocol used for the communication between the two is AT command.

The entire system has two inputs which are: - the input from the MAX232 interfaced via the COM port of the microcontroller and the sensors attached to the doors and windows.

The entire system has one power source – regulated AC power supply source. The integrated circuits (IC's) used was fixed on IC socket so as to ensure easy replacement. The individual components were held firm on the Printed Circuit Board (PCB) with the aid of soldering lead and iron.

### **3.10 THE CASING**

The whole system is cased in an adaptable box. Which was designed before the construction was carried out. It has a dimension of  $6 \times 10.5 \text{ cm}$  and a height of  $7.5 \text{ cm}$ .

The case also provided a space for ventilation.



**Plate 3.1:** Casting of the SMS based burglar monitoring system

# **CHAPTER FOUR: PERFORMANCE AND COST EVALUATION**

## **4.0 INTRODUCTION**

This chapter is based on testing, performance evaluation and assembling of components on Vero board in relation to the designed circuit. An individual component was tested and each of the subunits was built on a bread board and monitored before transferring it to the Printed Circuit Board (PCB). Proteus was also used for simulating the design before building to bread board and finally to Printed Circuit Board (PCB).

## **4.1 PERFORMANCE EVALUATION**

After the construction of the entire system, the program was written and burned into the microcontroller chip. It was tested working as it performed the objective of the design. Satisfaction was gotten from the moment the system was activated and a door opened, the system automatically sent a text message to a programmed recipient mobile phone number. The mission of the design was accomplished.

## **4.2 TESTING**

Various test was carried out before, during and after the construction has been completed. The multi-meter was extensively used for carrying out most of these tests. Each subunit was tested and confirmed efficient.

## **4.3 CONTINUITY TEST**

The multi-meter was used to check open circuit in the circuit, as part of this test; short circuit test was also conducted. Partial contact was thoroughly checked and corrected.

#### 4.4 COMPONENT STATUS TEST

The theoretical specification of components and their appropriate characteristics was tested and was observed efficient. Data sheet's was also used as a component guide to ascertain its specifications.

#### 4.5 COST EVALUATION

**Table 4.1:** Costing and evaluation of materials used

<b>S/N</b>	<b>DESCRIPTION</b>	<b>QUANTITY</b>	<b>UNIT PRICE (N)</b>	<b>AMOUNT</b>
<b>1</b>	<b>AT89S52<math>\mu</math>C</b>	<b>1</b>	<b>500</b>	<b>500</b>
	<b>44 PIN IC SOCKET</b>	<b>1</b>	<b>50</b>	<b>50</b>
<b>2</b>	<b>MAX 232</b>	<b>1</b>	<b>200</b>	<b>200</b>
	<b>16 PIN IC SOCKET</b>	<b>1</b>	<b>50</b>	<b>50</b>
<b>3</b>	<b>NOKIA PHONE (NOKIA 1110i)</b>	<b>1</b>	<b>5000</b>	<b>5000</b>
<b>4</b>	<b>CAPACITORS(33pF)</b>	<b>2</b>	<b>10</b>	<b>20</b>
	<b>(1<math>\mu</math>F)</b>	<b>7</b>	<b>10</b>	<b>70</b>
	<b>(10<math>\mu</math>F)</b>	<b>1</b>	<b>10</b>	<b>10</b>
	<b>(6800<math>\mu</math>F)</b>	<b>1</b>	<b>100</b>	<b>100</b>

	<b>(470<math>\mu</math>F)</b>	<b>1</b>	<b>50</b>	<b>50</b>
<b>5</b>	<b>LM317</b>	<b>1</b>	<b>50</b>	<b>50</b>
<b>6</b>	<b>TRANSISTOR</b>	<b>2</b>	<b>50</b>	<b>100</b>
<b>7</b>	<b>RESISTORS (1K)</b>	<b>4</b>	<b>10</b>	<b>40</b>
	<b>(3K)</b>	<b>1</b>	<b>10</b>	<b>10</b>
	<b>(10K)</b>	<b>2</b>	<b>10</b>	<b>20</b>
	<b>(820<math>\Omega</math>)</b>	<b>3</b>	<b>10</b>	<b>30</b>
	<b>(68<math>\Omega</math>)</b>	<b>2</b>	<b>10</b>	<b>20</b>
<b>8</b>	<b>CRYSTAL OSCILLATOR (11.0592MHz)</b>	<b>1</b>	<b>50</b>	<b>50</b>
<b>9</b>	<b>DIODE(1N4004)</b>	<b>3</b>	<b>10</b>	<b>30</b>
<b>10</b>	<b>IR RECEIVER (TSOLP35100)</b>	<b>2</b>	<b>50</b>	<b>100</b>
<b>11</b>	<b>IR TRANSMITTER (TSALP6200)</b>	<b>2</b>	<b>50</b>	<b>100</b>
<b>12</b>	<b>TRANSFORMER</b>	<b>1</b>	<b>500</b>	<b>500</b>

	<b>(CENTER TAPPED)</b>			
<b>13</b>	<b>CASING</b>	<b>1</b>	<b>450</b>	<b>450</b>
<b>14</b>	<b>GLUE</b>	<b>2</b>	<b>50</b>	<b>50</b>
<b>TOTAL</b>				<b>7550</b>

## **CHAPTER FIVE: CONCLUSIONS**

### **5.0 SUMMARY**

The entire system has two inputs, which are: - the input from the sensors and the input from the MAX232 (the level converter) interfaced via the COM port of the microcontroller. With these a system that sends text message to home owner is designed and implemented.

### **5.1 CONCLUSIONS**

It is always better to start every design with a good proposal, which will stand as a reference point to the work as it proceeds. The result of any design gives joy if aims and objectives are gotten. Since the project performed its proposal, it indeed satisfactory. Now from the input to the output of each stage was a success. The major input is like an interrupt and upon reception by microcontroller it goes through the iteration of sending text message to the emergency number. The design is thus a success.

### **5.2 RECOMMENDATIONS**

The circuit was found working in accordance with the design. However, the limitation of this project is on the side of network providers and the battery level of the mobile phone interfaced with the microcontroller through the MAX232. This is because from the design of the system no provision is made for the charging of the mobile phone battery. Another limitation is in the area recharging the SIM card of the mobile phone that communicates with the home user. Furthermore, the sensors (i.e. both the transmitter and

receiver) should be arranged point-to-point. Any deviation will cause the carrier frequency from the transmitter not to be accessible by the receiver hence no interrupt will be observed by the system. Again, the cable used to interface the mobile phone and the MAX232 should be the RJ45 cable and RS232 which convert analogue signal into digital signal. It is recommended that more of the areas be network covered and the home user should ensure that the battery of the mobile phone interfaced with the system be charged and the SIM card also should be recharged. This is because the design makes use of GSM network to operate.

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