DESIGN AND CONSTRUCTION OF A CAR DEMOBILIZER WITH PERSONAL IDENTIFICATION NUMBER

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DECLARATION

This is to declare that this project was carried out by LAWAL ABDULAZEEZ BOLAJI of the department of Electrical and Computer Engineering of the school of engineering and engineering technology of the Federal University of Technology, Minna under the supervision of Engr. (Mrs) Caroline Alenoghena for the award of Bachelor of Engineering (B.Eng).

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.....	.....
SIGNATURE AND DATE	SIGNATURE AND DATE

DEDICATION

From the depth of my heart and total reverence I dedicate this project of mine to Almighty Allah, Sheik Muhammed-il-awal; Alhaji Ladi Lawal, Alhaja Munirat Lawal and Alhaja Amudalat Ayinde.

ACKNOWLEDGMENT

It is said, "GRATITUDE is a memory of heart". I am therefore grateful to Almighty Allah for the successful completion of my course in Electrical and Computer Engineering. From the depth of my heart, I will like to express my sincere gratitude to my parents, Alhaji Ladi Lawal and Alhaja Munirat Lawal, and Alhaja Amudat Ayinde for their moral and financial support throughout my stay in the university. I also wish to express my deep appreciation and gratitude to my special one Miss Saudat Sanni for giving me the love and support during the last lap of my academic career.

I am greatly indebted to my able wonderful and supportive supervisor Engr. (Mrs) C. Alenoghena who through her advice gave this project a meaningful direction, my thanks also goes to the H.O.D. Engr. M. D. Abdullhai and lecturers for their contribution towards the laying of fundamental knowledge which was put together to achieve the aim of this work piece.

Finally, special thanks also goes to my friends and colleagues, Kunle Abioye, Sheriff Lawal, Murtala Oduloye, Issac David, Saint Obaje and others for their support and encouragement given to me during the course of my study.

ABSTRACT

Criminology studies providing statistical data on societal crime show that the phenomenon has been increasing geometrically. Burglary and theft cases remain relevant despite the pragmatic effort to curb it. This optical state of insecurity couple with the inadequacies of security measure attracted me to design and construct a car demobilizer with personal identification number. The design, therefore, presents an extraordinary protective and perceived normal function to the car owner and also for the purpose of checkmating car burglary or theft. The security device was built around a programmed microcontroller, LCD, integrated circuit, diode, keypad, so as to generate our desired aim. The output of the whole security device is to provide a real – time security for cars. The uniqueness of this particular project design is that, personal identification number (PIN code) must be entered and the LCD (screen) will display all the operation of the device.

CHAPTER ONE

1.0 INTRODUCTION

The level of insecurity and the prevailing nature of car theft itself seems uncontrollable, and have generated notable endless anxiety in people. This in built fear is due to huge financial and material losses often incurred by victims and some times people paying the supreme price with their dear lives.

In Africa, crime has been on a steady increase throughout the continent, particularly in urban settlement and cities where the population is dense and hence there is competition and other serious challenges for survival.
As house, business and lives can be secured, so should properties such as cars be secured. The security of the car should not stop having document of insurance other mean of preventing and protecting car theft should be employed.

Most of this strategic effort does not effectively checkmate the adaptive skill tendencies and capabilities for the intruder. As a result of these inadequacies of manual and mechanical measures adopted by the man in crime prevention. As an electrical engineer this motivated me in using the knowledge of electronics to combat this problem. A better solution towards these problem is to use a CAR DEMOBILIZER WITH PERSONAL IDENTIFICATION NUMBER (PIN). The advantages of the car demobilizer with personal identification number is the PIN added to it, should in case the car is snatched at gun point, once the car is off the intruder cannot move the car anymore because the security system is activated, this demobilize the car

with the aid of liquid crystal display, the operation of the security system can be displayed and viewed. The inclusion of the personal identification number is to serve as password for only the owner of the car and can be changed at anytime by the owner and the owner having the initial default PIN.

This project titled "DEISGN AND CONSTRUCTION OF A CAR DEMOBILIZER WITH PERSONAL IDENTIFICATION NUMBER" was built around a microcontroller, relay, integrated circuits, LCD, Keypad, Diodes etc so as to generate our desired aim. The relay is used to upgrade the ignition system, then the 5V regulator is to convert or reduce the 12V battery supply to the required 5V needed for the system operation. All these electronics devices were built around a microcontroller which controls all the activities of the system. Without the authority of the owner releasing the Pin the car will never start. Any attempt therefore to start the car by the intruder cannot yield fruitful result.

This design therefore presents an extra ordinary protective advantage In addition to the perceived normal function of the car owner.

Power supply to the system is derived from the car's electrical system that is to say the device should be capable of operating with a 5 volts D.C supply, and 5V regulator changing the 12V car battery to the desired voltage (5V). Non-volatile memory is to keep the PIN once the security is compromised. The other PIN is used to enter the initialization mode. With the aid of crystal display, the system clock is defined. The diode is to protect the reversal action either by entering the wrong PIN or abnormal operation. This device is portable and can be installed in a hidden place in the car.

Chapter one of this project reports gives introduction to general principle and importance of the project, its advantages, objectives and challenges of the project.

Chapter two explained the literature review, chapter three of this project deals with design analysis and principles of operation, chapter four is the construction, testing and packaging of the project, chapter five contains the discussion of results, conclusion and recommendations.

1.1 MOTIVATION

Most people suffer from different types of car theft incidents, although not known to some. This challenge motivated me to take up a better solution to solve the aforementioned problems.

Although security system for cars has for a long time been in existence, this one I'm sure will help to clear the problem of car theft in our society.

Therefore the design and construction of this project work is in such a way that it will be of great interest to any one that needs and values his/her property.

CHAPTER TWO

2.0 LITERATURE REVIEW

Car security device may have not been thought necessary. Gone are the days when there is no car but when they were eventually made there was no much need for security system. But the event of 1896 and some other critical car theft yielded provision for car security. Cars became natural target for thieves being valuable, reasonably easy to resell and processing a built-in gate way system. It was learnt that car gets broken in every twenty seconds in the United States.

Africa and infact Nigeria and its states have not been left out of these cases of car theft. Since all these insecurity act as stated, that is stealing of automobiles. Both the manufacturer and the user are faced with the challenges of making it secured against thieves and unauthorized persons. The first measure used by the manufacturers is the use of ignition key and car lock. Since only the car user or authorized person have access to the key, it makes it secures against any intruder. As time has provided this method does not ensure adequate security of the car in the car since wire can be bridged to start the car in the absence of the car key and most car lock can be picked or broken by the intruder.

Various methods have been used by car users which include disconnection of battery, chaining of the stirring wheel etc. all this methods as well as the previous one does not ensure adequate security of the car. Men of the underworld have designed means of beating all security measures and make way with vehicle. Another disadvantages of this method is that it does not

provide any security. If the car is snatched at gun point due to the advent of technologies today there are various manufacturers these security system make use of various principles and method. Although all these methods provide better security for the car. It does not guarantee hundred percent security. Intruders in most cases were able to discover limitations and short come of all these security gadgets and are still able to make away with cars.

When microprocessor integrated circuits and other electronics components were invented. It was considered a small fast, reliable and effective revolution, it quickly replaced the vaccum tube. Desirable electrical constructions become realizable. Most designs that had to be constructed in enormous surfaces could have been done on surface as small as a breadboard. This invention, among other development, also had a significant impact on construction of car security system. As technology improved better security system will be designed. The one that will provide better security to life and property of car users.

2.1 TYPES OF CAR DEMOBILIZERS

I. Car demobilizer with alarm
II. Car demobilizer with hijack alarm
III. Automatic car theft alarm

2.2 HISTORICAL BACKGROUND

There are lots of security measures for cars, they are as follows;

I. The use of ignition key and car lock:- This method secures the car against any intruder but this method doesn't ensure adequate security for the car since wire can be bridged to start the car in the absence of the car key. The lock can also be picked or broken by the intruder. In this case, only the car user or authorized person has access to the car key.

II. Disconnection of battery:- This is also a good security measure for car but constant disconnection of battery may cause damage to the car engine system so therefore it is not advisable.

III. Chaining of the steering wheel:- this method is the act of locking the steering wheel with chain and padlock, but lock can be broken by the intruder.

IV. Pedal lock:- sometimes pedal lock is prefer as car security measure because of the location of the pedal in the car, it is a bit hard for the intruder to break through but once the intruder can pick and break into the car, the pedal lock can also be broken.

Various methods have been used, all these methods as well as the previous ones doesn't ensure adequate security of the car. The design and construction of car demobilizer with personal identification number is an improved car security device which involve the use of PIN CODE, the car can only be used with the authority of the owner.

CHAPTER THREE

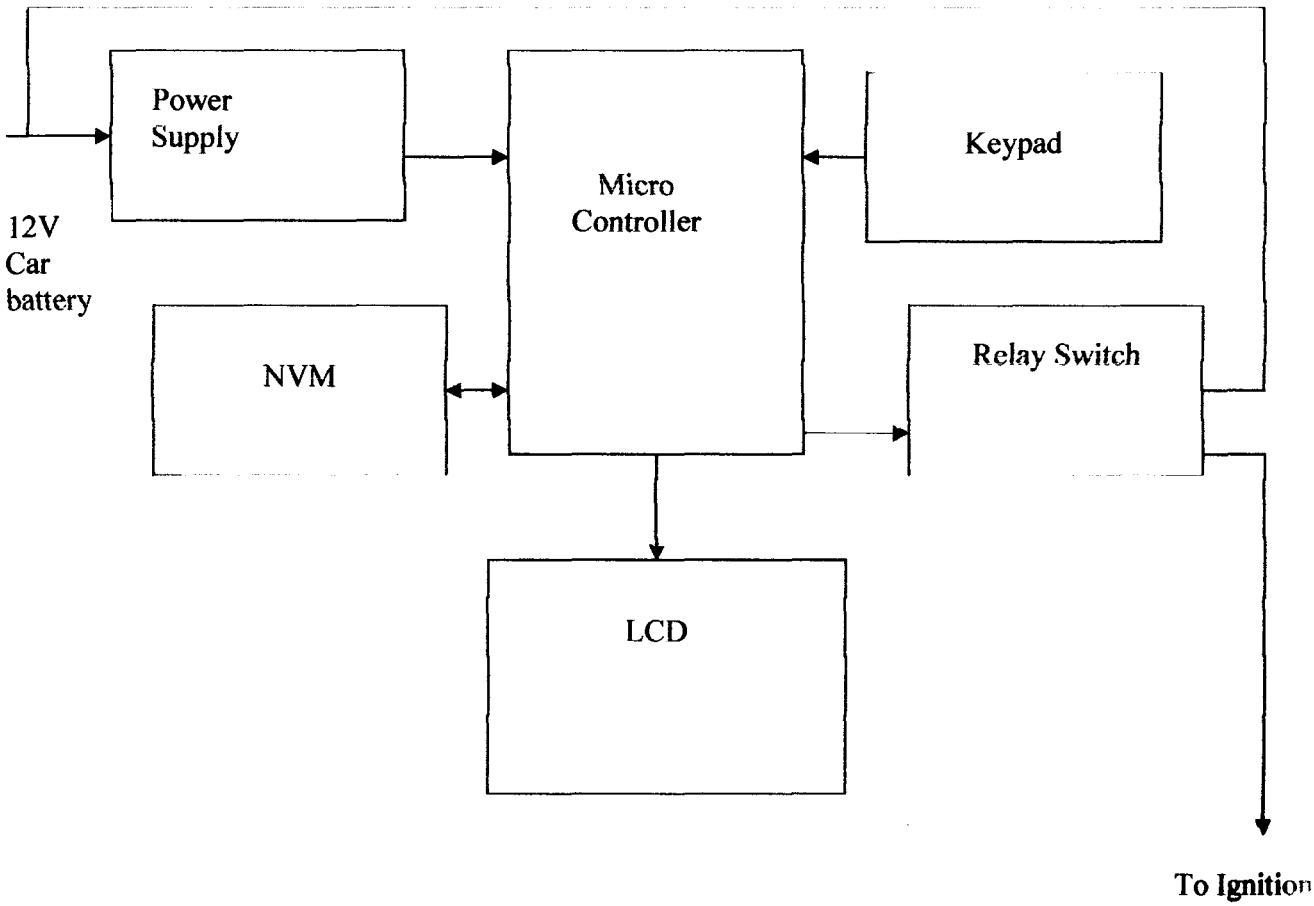


Fig 3.0 BLOCK DIAGRAM FOR CAR DEMOBILIZER

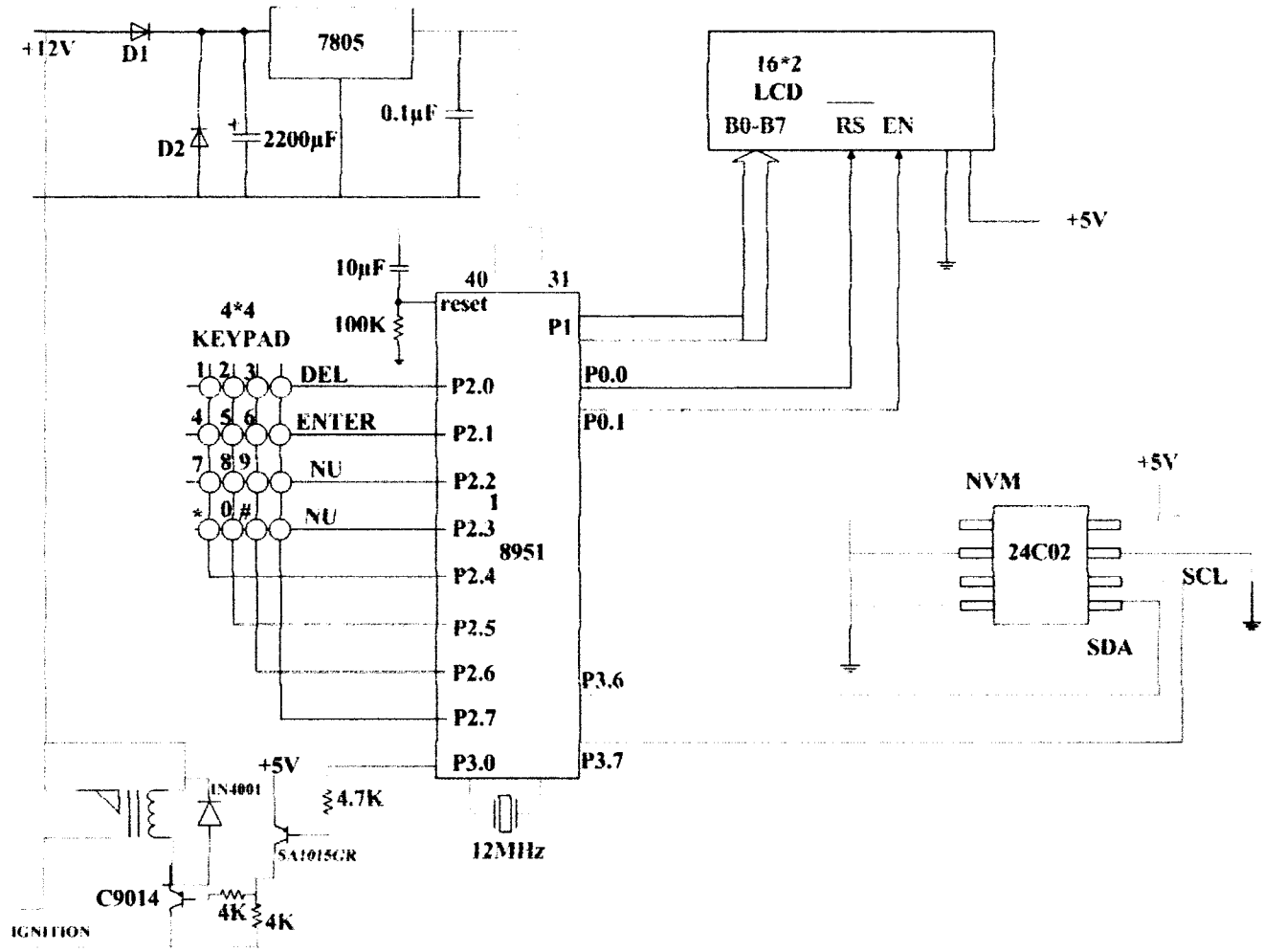


Fig 3.1 **CIRCUIT DIAGRAM FOR CAR DEMOBILIZER**

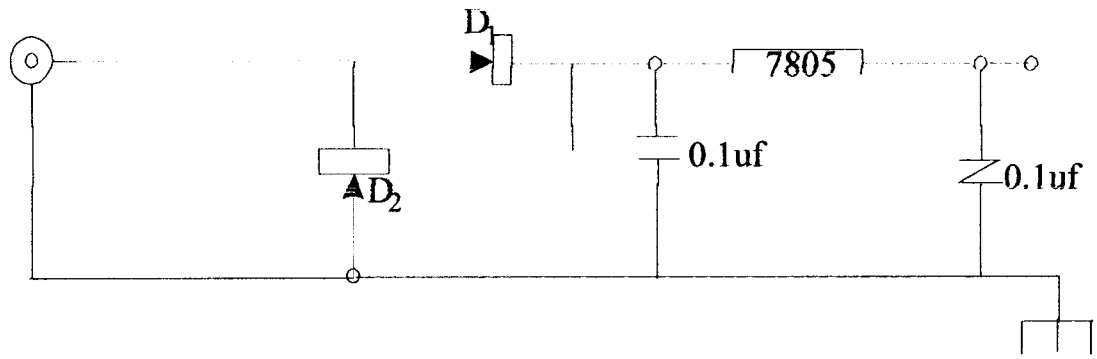
The car security system employed a microcontroller, non-volatile memory, a 4 x 4 keypad and 16 x 2 LCD.

The microcontroller scan the keypad, addresses the LCD, Non-volatile memory and activates a relay when the correct pin is entered via the keypad.

3.1 POWER CONTROL UNIT

Since the unit was designed for automatic application, a 12V DC battery power source was used as the primary power supply. This was resulted down to +5V using a 7805 5Volts 1-amp regulator according to the connection shown below.

3.2 System power supply



D1 and D2 provide reversed protection the input voltage was stabilized by a 2200uf capacitor and regulated down to +5 using a 7805 regulator. The 5 volt output was fed into the system for power.

3.3 THE MICROCONTROLLER

The microcontroller was powered from the 5-volt supply D1 power to p1 the device was held reset for a time given

$T = RC$

$R = 100K\Omega$; $C = 1uf$

The microcontroller performs amongst other things:

1. Scans the keypad
2. Access the non-volatile memory
3. Address the display
4. Energizes the relay when the correct pin is entered.

3.4 THE KEYPAD

A 4x4 matrix keypad was used for data entering into the controller.

The keypad was converted to port 1 (p1) of the controller.

The keypad is scanned when PIN input is requested. The activated key is closed in software and written to the LCD display.

The displaced pin is replaced by a '*' character for security.

3.5 LCD

A 4x12 alphameric liquid crystal display was used for the interactivity with the user. The LCD was address over po of the controller.

3.6 NON VOLATILE MEMORY

A 24CO2 12c electrically erusable programmable read only memory (EEPROM) was used for storing the user PIN code for data retention. 10bytes were used for storing the PIN codes and two extra bytes for device signature. The microcontroller addresses the non-volatile memory over bits on P3.

3.7 RELAY SWITCH

A 12V 30A relay was interposed between the ignition switch and the remaining part of the electrical system. The relay was activated by low level logic on P3.7 when the correct PIN code has been entered into the system the relay complete the electrical circuit and supplies power to the ignition system.

3.8 SYSTEM OPERATION

At power on, i.e when the ignition switch closes, 12V DC flows into the positive supply lead of the control unit. The system initializes itself and start executing the on-chip program code. The initialization routines set up the LCD for data display, after which the user name and matric number are displayed via the LCD, the user is prompted for the PIN code. The system waits until the PIN code is entered. If the request for PIN code insertion exceeds about 8sec, the system times out. After three consecutive timeout, the system lockout. If the wrong PIN is keyed in three times at a point the

controller locks the non-volatile memory and notifies the user. Once the non-volatile memory is locked, the non-volatile memory has to be reinitialized to clear the lock flag before it can be used again.

3.9 PROGRAM FOR THE MICROCONTROLLER

```
INCLUDE 89c51.mc

lcd_rs BIT p0.0
lcd_port EQU p1
lcd_en BIT p0.1
STACK EQU 60h
dATA_rEAD  DATA 33
DAta_2_write DATA 32
clock BIT p3.4
data_in BIT p3.6
data_out BIT p3.5
cmd DATA 29
address DATA 28
card_Data_buffer DATA 8
keypad_data_buffer DATA 18
prog_mode_header_byte EQU 10
prog_mode_exit_byte EQU 11
error BIT 80
time_out_error BIT 83
chk_pgm_mode BIT 85
chk_password_mode BIT 86
password_valid BIT 87
key_code DATA 34
temp DATA 35
default_Flag BIT 88
format_valid BIT 89
```

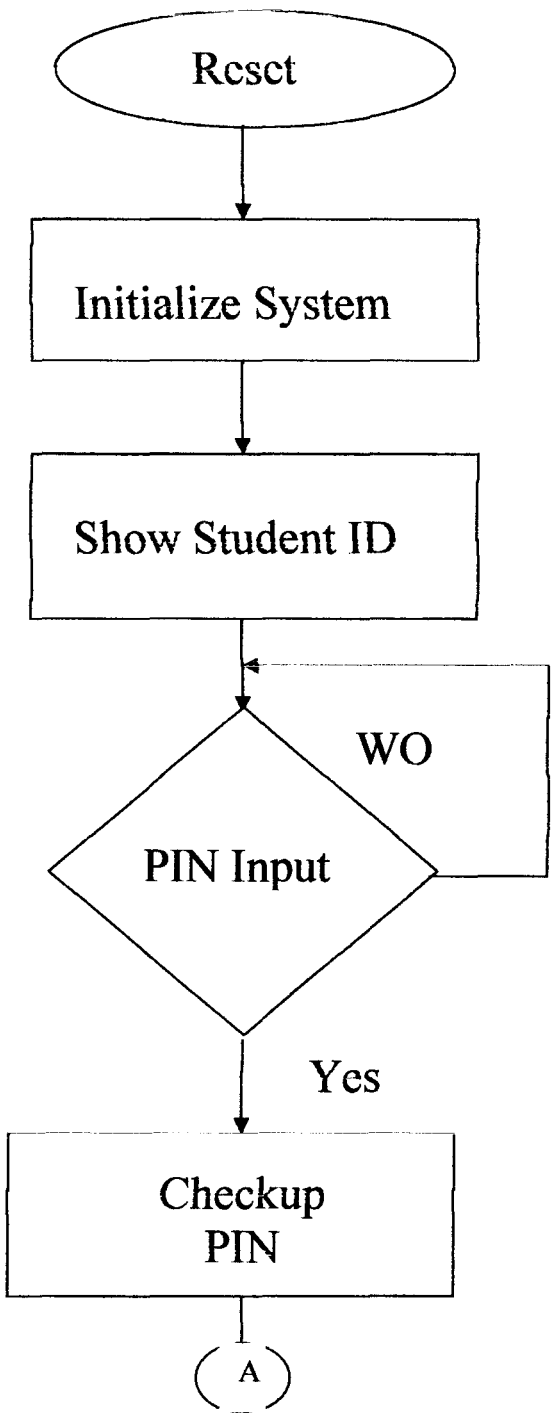
```
flags DATA 28h
key_in BIT p3.2
motor_en BIT p3.0
row_1 BIT p2.3
row_2 BIT p2.2
row_3 BIT p2.1
row_4 BIT p2.0
col_1 BIT p2.7
col_2 BIT p2.6
col_3 BIT p2.5
col_4 BIT p2.4
last_Address EQU 128
slave_address EQU 0a0h
read_flag EQU 01h
write_flag EQU 00h
key EQU 4fh
format_key EQU 55h
password_retry DATA 38
card_io_Error BIT 92
mode_Sw BIT p3.6
FORMAT_FLAG EQU 55H
delete_flag EQU 15
enter_flag EQU 14
lock_on BIT 94
                org 0000h

START:          MOV sp, #stack
```

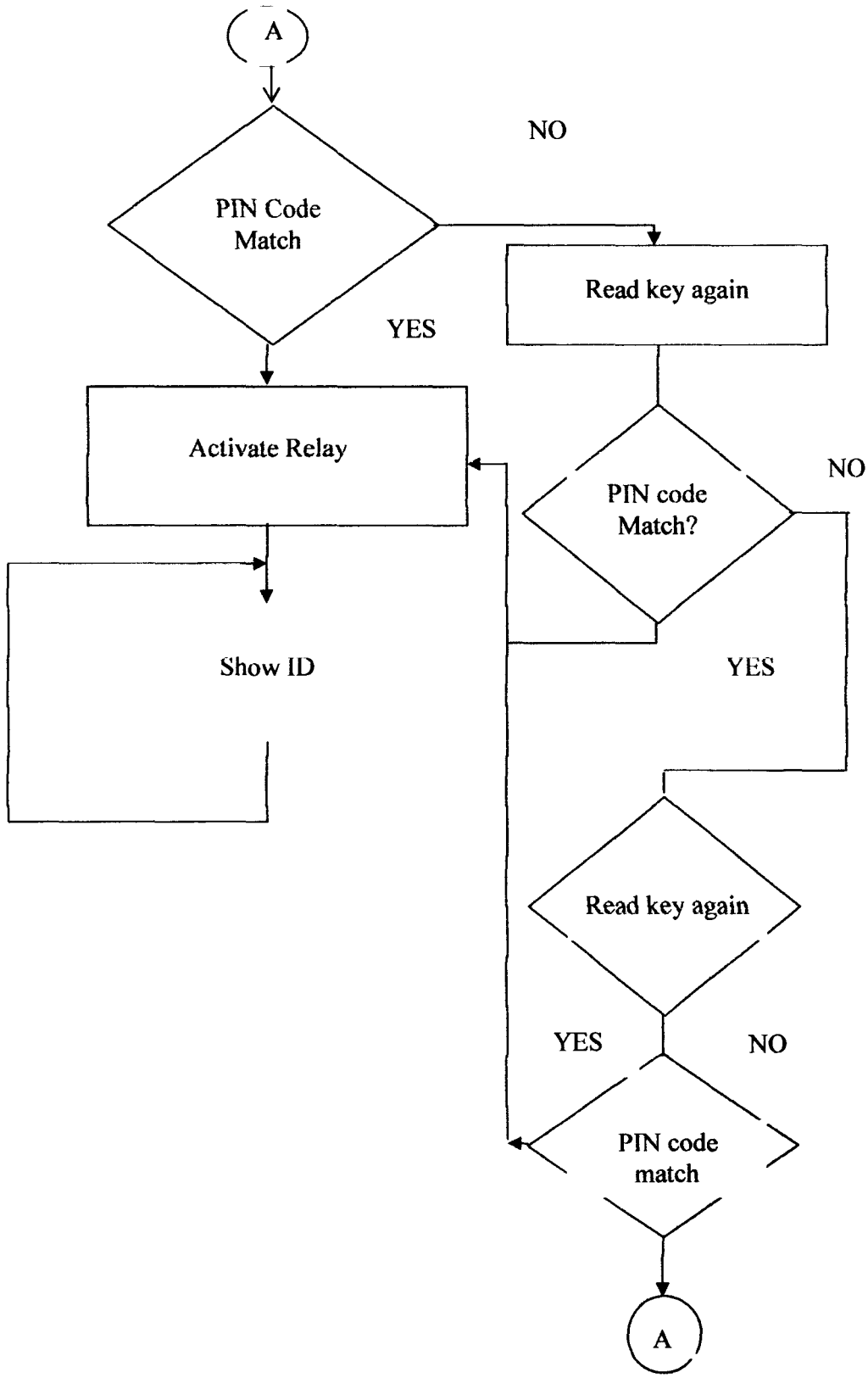
```
                MOV p2,#00001111b

read_keypad:    MOV R0,#keypad_Data_buffer


go_get_key:     ACALL read_key_code
                MOV temp, A
chk_delete:     XRL A, #delete_Flag
                JZ delete_pressed
                MOV A, temp
                XRL A,#enter_flag
                JZ enter_pressed
                MOV A, temp
                MOV @R0, A
                INC R0
                MOV A, #"*"
                ACALL write_lcd_data
                CJNE R0,#keypad_Data_buffer+10, go_Get_key
                DEC R0
                CLR error
                RET

delete_pressed: ACALL decrement_cursor
                SJMP read_keypad


enter_pressed:  ret
```

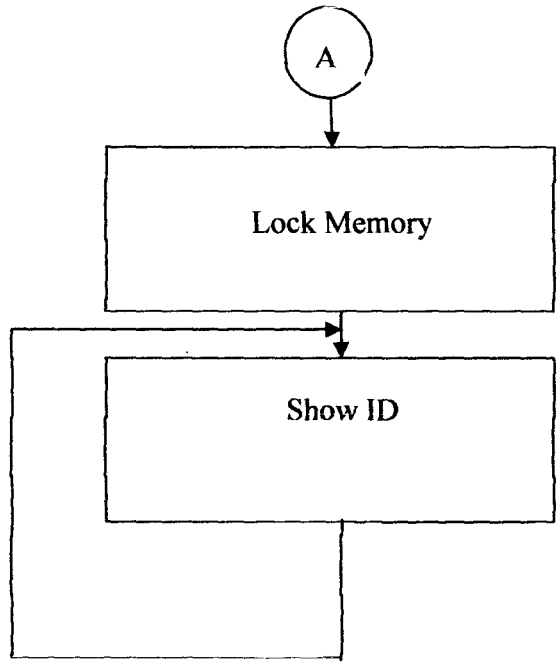
```
write_lcd_Data:    RET
;*************************************************************
*****
decrement_cursor:        RET


write_String:        RET


;*************************************************************
;lowest level routine that handles keypad decoding
read_key_code:    MOV key_code,#10h
                  JB row_1, skip_1
                  MOV key_code,#0
skip_1:           JB row_2, skip_2
                  MOV key_code,#4
skip_2:           JB row_3, skip_3
                  MOV key_code,#8
skip_3:           JB row_4, flip_bits
                  MOV key_code,#12
flip_bits:        MOV p2,#11110000b
                  ACALL settle_Delay
                  JB col_1, skip_5
                  MOV temp,#0
skip_5:           JB col_2, skip_6
                  MOV temp,#1
```

```
skip_6:         JB col_3,skip_7
                MOV temp,#2
skip_7:         JB col_4,compute_key
                MOV temp,#3
compute_key:    MOV p2,#00001111b
                MOV A, key_code
                XRL A,#10h
                JZ no_key
                MOV A, key_code
                ADD A,temp
                MOV DPTR,#xlate_table
                MOVC A,@a+dptr
no_key:         RET

xlate_table: DB 1,2,3,15,4,5,6,14,7,8,9,13,10,0,11,12

settle_delay:MOV R7,#0
                DJNZ R7,$
                RET
;*********************************************
```

Fig 3.2 THE PROGRAM ALGORITHM.




A
PIN Code Match
NO
YES
Read key again
Activate Relay
PIN code Match?
NO
YES
Show ID
Read key again
YES
NO
PIN code match
A


A
Lock Memory
Show ID

CHAPTER FOUR

4.1 CONSTRUCTION

Construction is basically the monitoring or assembling, connection, casing and the arrangement of components.

As mentioned previously, the system is made up of different stages which include:

i. Power control unit
ii. Relay switch
iii. LCD display
iii. Key pad operation
iv. Non-volatile memory
v. Microcontroller
vi. System operation

In the process of construction of this project, the construction was carried out in stages on a breadboard and tested to have a satisfactory output. The stages were being coupled with appropriate coupling devices which have been well designed to match the situation. After coupling all the stages and satisfactory performance obtained, the layout diagram was drawn as it should appear on the printed board. The components here then transferred on to the view board, cutting were made on the view board where continuity was not needed.

4.2 ASSEMBLING OF COMPONENTS

According to the drawing operations assembling work is segmented. This allows easy identification of odds/problems along the lines as work progresses the power supply unit i.e. 12V battery is provided and tested okay. A 12Volt relay is mounted on the view board and is well configured. Liquid crystal display and key pad is attached. This arrangement acts as an external remote to the system. It is a major mover of the entire components in the system.

Lastly, all connected in line with microcontroller, the microcontroller is configured and it allows the operation of all other circuit component. microcontroller serves as the brain box behind the operation of the device.

The circuit at large was finally tested. However if problem is encountered at any stage, the problem is detected and rectified before the next stage is mounted. This is because it will ensure easy detection of the problem and hence reduce time wastage. Possible damages to the components and condemnation of other components due to heating and wrong mounting when the work is due without testing at each stage. Thus segmentation helps for neatness of the job, safely of both components and economy of time.

4.3 CASING

The constructed hardware was enclosed in a wooden box. The various unit of the hardware were firmly fitted to the base and side of the box.

4.4 TESTING

The device comprises of three wires, two for positive connections and the remaining wire for negative connection. The wire from the ignition was cut into two, the cut wire part from the ignition is connected to the first of the two wires and the second wire of the two wires is connected to the remaining cut wire coming from the engine, thereby interposing the relay (12V, 30A) and negative wire was connected to the metallic part of the car serving as the negative terminal. The ignition key was turned on, the LCD display the operation of the device, waiting for the entrance of the PIN CODE. Once the PIN CODE is correctly entered, the system unlocks and the car starts working. The entrance of wrong PIN CODE will never unlock the system. If the PIN CODE is entered more than three times, it will block the device operation unless re-initialized by the owner.

4.5 DISCUSSION OF RESULTS

The car demobilizer with personal identification number (PIN) system work on the principle of set executed and reset mode as observed from the hardware test carried out.

A common voltage with a magnitude of about 12V is required throughout the circuit operation. When the ignition key is turned once the system is on trigger the relay and the screen picked up waiting for the entrance of PIN, if entered wrongly, this result to the demobilization of the system.

4.6 PROTECTION AND CONTROL

With reference to the design and construction of this project, there is every need for the system protection. The protection of this system is due to its nature and basically centered on the packaging.

Due to the fact that the system is to be installed in a hidden place preferably in the dashboard part of the vehicle, there is therefore insufficient supply of air to the device, it is then protected from being overheated by the provision of a wooden enclosure covered with Formica capable of resisting heat dissipated by the component and external heat due to the motor engine for proper and efficient functioning, the control components as designed in the system must meet its wiring requirement. The component for the control of this project is turning on the ignition to the first level.

4.7 TROUBLESHOOTING AND MAINTENANCE

This is a brief finding and rectification of faults in equipment. The following several methods and stages depending upon the nature of the equipment and faults. In the maintenance of any electronics device troubleshooting can be said to be the most difficult once the finally components has been traced, the rest of the problems is as good as solved.

Fault diagnosis carried in state of the concerted circuit is naturally split into several parts such as the power circuit, the signal generation, time delay. Car interruption. Some faults causes and their rectification are given below.

S/NO	FAULT	CAUSES	REMEDIES
1	System not functioning	Check the connection	i. Remove if is faulty ii. Correct if desired
2	Demobilize after ignition	Check the relay	Replace the relay
3	Fainted display in the LCD screen	Check the supply voltage (less than 12V)	Correct by servicing the alternation (change)
4	Wrong output or result on the screen	Check the keypad	Replace the keypad
5	Demobilized and failed to mobilized	Disconnect, open the system and check the relays	Replace the relay
6	Mobilized and failed to demobilized	Check the personal identification number (PIN) if its correct	Re enter the PIN

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

After careful design and construction of the project it was tested and proved to be successful. Some problems were encountered during the construction of the project, i.e non availability of the exact design values in the market and lack of Integrated Circuit (IC) tester to check the condition of the IC bought. In conclusion, the aim of designing the car demobilizer with personal identification numbers (PIN) system is because its cheep and affordable, its ability to avoid car theft has been achieved as observed from the test carried out in the device.

5.2 RECOMMENDATION

This project has been logically designed to be able to rescue all possible approaches to car theft and to give maximum protection to the owner. The scope of the work leaves much room for greater improvement mostly to time constraint and limited resources.

The circuit could be further enhanced to cater for a lot of needs in car security. It is therefore suggested as a further improvement on this project to incorporate a sequential and remote logic lock to further turn off and on the ignition switch.

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